



The Future of Digital Terrestrial Television

Enabling new services for viewers

Consultation

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Foreword

This is a time of intense innovation and change in UK television. Digital technologies are bringing choice and variety to viewers as never before. Digital platforms, like cable, satellite and broadband, are developing rapidly. They are making new types of content available and new ways of experiencing it, from High Definition to video-on-demand.

Digital Terrestrial Television (DTT) is one very important part of this new television landscape. Digital switchover will mean that DTT services are available throughout the UK – allowing DTT to become the way in which we ensure that the whole country has access to Public Service Broadcasting, free-to-air.

Under the Communications Act, Parliament gave Ofcom important responsibilities for the regulation of DTT. These are wider and deeper than our responsibilities for other television platforms, reflecting the role that DTT has in making PSB content available to all.

We think it is very important that the regulation of DTT allows it to stay at the forefront of broadcasting - adopting new technologies, so it can offer new services, and make the very best use of valuable spectrum. This document sets out our thoughts on how the DTT platform could evolve over the next few years.

In brief, it describes a tremendous opportunity - to begin upgrading DTT by embracing the latest technologies. These have the potential to bring huge increases in capacity to the platform, enabling it to offer richer and more varied services, including High Definition.

Our proposals describe how this huge prize can be achieved without needing more spectrum, while protecting existing viewers' access to the existing PSB services.

I encourage all those who support the development of the DTT platform – broadcasters, multiplex operators and consumer groups – to work with us to turn this prize into reality.

Ed Richards, Chief Executive

Section 1

Executive Summary

DTT – now and at DSO

- 1.1 Digital terrestrial television (DTT) is an important part of the landscape of UK broadcasting. It will become even more important as digital switchover (DSO) is completed between 2008 and 2012.
- 1.2 Today, the DTT platform already offers viewers a vastly greater choice and variety of content than analogue broadcasting. Like other digital platforms, it uses the superior efficiency of digital technology to ‘pack’ much more information or content into any given capacity.
- 1.3 But DTT is presently only available to around 73% of the population. The platform is organised into six multiplexes, each of which carries a number of television and other services. These multiplexes cannot cover more of the country because of the constraints imposed by the need to exist alongside analogue television broadcasting.
- 1.4 At DSO, those constraints will be removed. DTT will be made available throughout the UK, reaching as many people as analogue - 98.5% of the population - and offering all viewers a wider choice and variety of content. At the same time, DTT will become the means by which we can ensure that viewers have ready access, free-to-air, to Public Service Broadcasting (PSB).
- 1.5 The DTT platform will therefore have a critical role in ensuring the delivery of high quality television to the people of the UK. This is a role reflected in successive decisions by Parliament¹, the Government², and Ofcom.
- 1.6 It is also a role that has already been recognised explicitly in decisions about the future use of the radio spectrum. In particular, in 2003, the Government decided³ that 70% of the spectrum currently used for analogue television should be reserved specifically for use by DTT from switchover (256 of 368MHz).
- 1.7 This decision will allow the *coverage* of DTT to expand, to match analogue television. It will also allow the *capacity* of DTT to increase, for a variety of reasons, by at least 20% - the equivalent of more than a whole extra multiplex.

Purpose of this document

- 1.8 The purpose of this document is to set out proposals for building on the success already achieved by DTT, and the decisions already made, to ensure that the platform continues to develop – maximizing the benefits it can bring to citizens and consumers.
- 1.9 In brief, the document describes an exceptional opportunity that exists to upgrade the DTT platform over the next few years by introducing new technologies that will greatly increase the capacity available. This upgrade will in turn enable the platform

¹ Communications Act 2003

² http://www.culture.gov.uk/Reference_library/Press_notices/archive_2005/dcms116_05.htm

³ See particularly, statement on radio spectrum availability and review of spectrum management, 30 January 2003: http://www.digitaltelevision.gov.uk/pdf_documents/publications/statement_on_availability.pdf

to offer a wider, richer and more varied set of services - including the potential for services in High Definition (HD).

- 1.10 The document describes how this opportunity can be realised without requiring additional spectrum, and while protecting viewers with existing equipment.
- 1.11 For viewers, the effect of these proposals should be to increase significantly the choice that is available to them without requiring a reduction in the number of services that can be received through existing DTT receivers (ie set-top boxes (STBs) and integrated digital televisions (IDTVs)). That said, the composition of the platform will of course continue to change between now and DSO and beyond – and some services may as a result of these proposals need to move between PSB and commercial multiplexes.
- 1.12 Realising this opportunity is technically complex. But in brief, it exists for two key reasons:
 - the emergence of new technical standards that are more efficient than those presently used on DTT;
 - the extra capacity that will be created on DTT at DSO, and the scope for more effective use of existing capacity.

New standards – and use of extra capacity

- 1.13 Digital broadcasting technology, unlike analogue, is subject to a process of continuous evolution and improvement. This is a phenomenon familiar from other digital technologies - for instance Moore's Law in computer hardware, albeit the rate of progress in that case may be higher.
- 1.14 We have identified two technical advances that together could result in a very significant increase in the DTT platform's capacity. These relate to improvements in the standards used (a) for coding (compressing) information, to squeeze as much as possible into a given amount of spectrum, and (b) in its physical transmission.
- 1.15 The two changes are:
 - An improved video and audio coding compression standard called MPEG-4⁴. This is expected (over time) to operate at up to double the efficiency of the coding standard that is used at the moment on DTT, MPEG-2. This means that a DTT multiplex could carry up to twice as many services using MPEG-4 as can currently be achieved using MPEG-2, whilst maintaining similar picture quality.
 - A new transmission standard, known as DVB-T2. This is expected to deliver an increase of at least 30% in the capacity of a DTT multiplex over the current standard, whilst maintaining the same coverage. This standard is a development of the existing DVB-T standard used in the UK since 1998. DVB-T2 is still

⁴ Digital compression systems remove redundant information from the television pictures before they are transmitted and hence reduce the digital multiplex capacity required to broadcast them. MPEG-4 is an enhanced, more efficient version of the current MPEG-2 digital video compression standard. It further reduces the bit rate needed to carry a video service by approximately 30% compared with MPEG-2. In practice the actual level of improvement achieved is dependent on the picture content. Future developments are expected to increase this efficiency saving to as much as 50%.

undergoing development by DVB⁵ in Geneva, but is expected to be finalised in spring 2008.

- 1.16 It is important to note that MPEG-4 and DVB-T2 differ in one important respect. MPEG-4 can be introduced within a multiplex (so it can offer a mix of services coded in MPEG-2 and MPEG-4). But the introduction of DVB-T2 requires a whole multiplex to be converted from DVB-T. This is, of course, a larger step-change.
- 1.17 The introduction of these two technologies could, if combined, increase the capacity of a multiplex by up to 160%. This is a very large increase. It is the equivalent of raising the number of Standard Definition (SD) services that can be carried on a DTT multiplex from around eight currently to around 13-15 at DSO, and over 20 in the longer term. HD is generally regarded as unfeasible on DTT in the UK without use of MPEG-4: but with the use of these two technologies combined, a single DTT multiplex could in time offer at least four HD services.
- 1.18 However, there are important consumer issues that need to be considered in relation to any development of the technical standards used on DTT. At present, all DTT digital receivers marketed for use in the UK use the existing standards, MPEG-2 and DVB-T. Services broadcast using the new standards will only be receivable on equipment designed to the new standards (though that new equipment will also be able to receive services broadcast using the old standards, MPEG-2 and DVB-T⁶).
- 1.19 This means that some important factors need to be considered if the new technologies are to be introduced in a way that meets the interests of all DTT viewers – both those with existing equipment and those who acquire new equipment. In particular:
- The new technologies need to be deployed in a way that helps to avoid displacing existing services from the platform - so that viewers with existing equipment are not disadvantaged.
 - The new technologies need to be deployed in a way that creates strong incentives for viewers to buy new equipment, such as new STBs, if they wish to do so – so that the benefits of the upgrade are maximised.
 - There needs to be a high level of co-ordination in introducing new technologies, especially between the operators of the DTT platform and the manufacturers and retailers of consumer equipment, but also other interested parties such as Digital UK and consumer groups.
- 1.20 In some ways the most important of these conditions is the first – as it is a precondition for subsequent action. This is one reason why the existence of extra capacity on the DTT platform at DSO is so important – because it will enable new services to be offered, using new technologies, without having to reduce the availability of existing services using existing technologies.
- 1.21 The extra capacity on DTT itself has several sources, detailed in this document. The most important is DSO – which will allow a change in the existing transmission standard (the ‘mode’ of transmission) used by some DTT multiplexes, increasing the

⁵ The DVB (Digital Video Broadcasting) Project is an industry-led consortium of over 270 broadcasters, manufacturers, network operators, software developers, regulatory bodies and others committed to designing open technical standards for the delivery of digital television and data services.

⁶ This is often referred to as being “backwards-compatible”.

capacity of the platform as a whole by some 20%. Other sources include gains in technical efficiency already being planned by various multiplex operators.

The case for intervention

- 1.22 This document sets out how, using the extra capacity available on DTT at DSO, a whole multiplex could be converted to use the new technical standards, MPEG-4 and DVB-T2. It explains how this can be done without requiring either a reduction in the number or picture quality of services carried on the platform, or any additional spectrum – while still enabling a significant gain in the depth and variety of services available on DTT.
- 1.23 However, this is a complex task. In particular, services displaced from the converted multiplex need to be carried on other multiplexes if they are still to be available - in effect requiring a reorganisation of at least part of the platform, shuffling services between multiplexes to create a clear multiplex that can then be upgraded.
- 1.24 We have considered carefully whether this upgrade, or one similar to it, could be achieved by the DTT multiplex operators without active regulatory intervention. Ofcom's regulatory principles are to avoid intervening unless it is clearly necessary to do so, and the benefits outweigh the costs.
- 1.25 However, our analysis in this consultation suggests that not intervening in this case risks a worse outcome for citizens and consumers. The DTT platform would probably still be upgraded eventually, but the upgrade is likely to be smaller in scope and/or delayed.
- 1.26 There are several reasons for this:
- First, the upgrade proposed is a large step-change and it needs very effective co-ordination. But the mechanisms available to the parties who would have to co-ordinate are fewer than in a normal commercial context. This is because the DTT platform is, for important reasons, subject to significant regulation. DTT multiplex operators are also subject to regulation in varying degrees, which can affect their incentives and behaviour. Both these points can make co-ordination of the right kind more difficult to achieve.
 - Second, there is an important public interest in the use of the capacity on the DTT platform and the capacity that can be created through this process. This public interest may not in all cases be perfectly aligned with the interests of the parties who would need to co-ordinate.
 - Third, the issue is urgent. We need to resolve the path for future development of the platform quickly, if we are to maximise the benefits that can be delivered during DSO, and to provide certainty to the many other parties with an interest, notably manufacturers, retailers, and consumers. Non-intervention would create a material risk of delay and uncertainty.
- 1.27 Our judgement is that, without intervention, there is a significant risk that the adoption of these new technologies will be delayed, at best, and that a worse outcome will result for citizens and consumers.
- 1.28 We have tested this assessment with quantitative analysis. Our modelling indicates that the net present value of the benefits to consumers of the strategy we propose could be in the region of £3-5 billion over 25 years.

Detailed proposals

- 1.29 On the basis that intervention is likely to be needed, the document sets out detailed proposals for how this could happen.
- 1.30 There are three key steps in the process:
- The identification of a multiplex to be cleared and upgraded.
 - The reorganisation of other multiplexes to absorb services displaced from the cleared multiplex.
 - The allocation of capacity on the cleared multiplex, so that new services can be launched.
- 1.31 In preparing these proposals, we have sought to identify the approach that best meets our statutory objectives, notably our duties to secure optimal use of the spectrum and the availability of a wide range of high quality television services throughout the UK which appeals to a variety of viewers. We have also sought to ensure that our approach is fair, transparent and proportionate, and that it constitutes the minimum intervention necessary to achieve public interest goals.
- 1.32 Our proposals are set out in summary form below.

Clearance and upgrade of a multiplex

- 1.33 We propose that one multiplex should be cleared of existing services in order to be upgraded to the new technologies, MPEG-4 and DVB-T2. We propose that these new technologies should be introduced together, to reap the combined benefits and to avoid a proliferation of different types of consumer equipment for free-to-air DTT services in the UK.
- 1.34 We suggest that the multiplex selected should be one of those presently carrying fewest services on the platform, in order to minimise the scale of platform reorganisation required. We also suggest that it should be one of the PSB multiplexes, as these will be available to 98.5% of the population from DSO. This will ensure that the new services are universally available.
- 1.35 These two factors point to selection of Multiplex B, which is operated by BBC Free to View Ltd. Under our proposals, the BBC would continue to operate the multiplex but it would be cleared of existing services (which comprise BBC4/CBeebies, BBC Parliament, three interactive video services, ten radio and two data services). These services would be accommodated elsewhere.
- 1.36 Our analysis suggests that the multiplex could be upgraded to use new technologies from late 2009 or early 2010. This would mean that new services (such as HD channels) could be made available in time for DSO in the Granada region. The new services and new consumer equipment could then be available, as an additional option for DTT viewers, as DSO occurs in most UK nations and regions. (The new services would, of course, also be made available in Border and West Country shortly after DSO in those regions, probably in late 2009 or 2010.)

Reorganisation of other multiplexes

- 1.37 We propose that the services displaced from Multiplex B should be accommodated on the other two PSB multiplexes. These are Multiplex 1 (also operated by the BBC) and Multiplex 2 (operated by Digital 3 and 4).
- 1.38 Our specific proposals are that the majority of the BBC services should move from Multiplex B to Multiplex 1, and one BBC video service should move from Multiplex B to Multiplex 2. Capacity should also be made available on Multiplex 2 for: one video service in each of Scotland, Wales and Northern Ireland; and for Five, which should move to a PSB multiplex (it is presently carried on a commercial multiplex) in order to ensure universal access to this service from DSO.
- 1.39 The effect of these proposals will be to ensure that sufficient capacity is available for all PSB services on Multiplexes 1 and 2 but that their capacity will be used more intensively than it is now. S4C, the Gaelic Digital Service (GDS), and TG4 will each be available on a PSB multiplex in, respectively, Wales, Scotland, and Northern Ireland (subject to any other agreements or consents required); and Five will be available to 98.5% of the UK population via DTT.
- 1.40 As a result of this reorganisation, some non-PSB services are likely to be displaced from Multiplex 2 in order to make room for PSB services, which need to be available universally. It will be a matter for the operators of Multiplex 2 (the Channel 3 and 4 licensees) to determine which services these are, and more generally the future of their commercial services, taking into account the capacity available elsewhere on the platform. However, the effects of this displacement are limited. We estimate that:
- one UK-wide commercial service will need to be displaced from Multiplex 2 to accommodate a BBC service; however, Five's departure from Multiplex A will free up a slot for another commercial service on that multiplex;
 - another commercial service on Multiplex 2 will not be available in Scotland, Wales and Northern Ireland in order to ensure PSB capacity is available to carry S4C, GDS and TG4.
- 1.41 Our proposals for a regulatory reorganisation are limited to the three PSB multiplexes; Multiplexes B, 1 and 2. We are not proposing to require the operators of the three commercial multiplexes (Multiplex A, operated by SDN, a wholly-owned subsidiary of ITV plc; and Multiplexes C and D, operated by National Grid Wireless (NGW)) to make capacity available for particular services.
- 1.42 However it is relevant that DSO will increase the capacity available on commercial Multiplexes C and D as well as on PSB multiplexes. To ensure this capacity gain is realised at the same time as the other changes discussed here, we propose a change in the technical requirements for Multiplexes C and D, so that these use the same transmission mode (known as 64QAM) as other multiplexes. This will help ensure that the DTT platform as a whole develops in a co-ordinated manner.

Allocation of cleared multiplex

- 1.43 We also need to consider the process for allocating the upgraded capacity on Multiplex B, so that it provides the maximum benefit for citizens and consumers.
- 1.44 This document looks at a range of options for this process, consistent with the powers available to the Government and Ofcom. It identifies three key objectives,

consistent with the statutory regime and the status of Multiplex B as a PSB multiplex. These are:

- promoting efficient use of the spectrum, particularly through the adoption of new technologies;
- promoting the purposes and characteristics of PSB; and
- promoting the range and variety of high quality television services across the UK.

1.45 Our proposals are:

- to invite the organisations with PSB status (principally the BBC, the Channel 3, 4 and 5 licensees, and S4C) to put forward proposals for the use of the capacity;
- to hold a comparative selection process that provides a fair, transparent and objective means of deciding between these proposals, using criteria that reflect the three key objectives above;
- to award capacity in blocks that are large enough to offer an HD service, but to give PSBs the flexibility to propose different options for the balance between HD and SD services (for example, in different parts of the day);
- to award three such blocks next year, for services to begin in late 2009/early 2010; to award a fourth block in 2010, for services to begin in 2012.

These proposals will create the opportunity for PSB broadcasters to offer three HD services on the DTT platform from 2009 or 2010, and four from 2012 – or to offer a mix of new HD and SD services.

Alternative proposals

1.46 This document describes one way of implementing a complex and intricate set of changes, to reorganise and upgrade the platform. There may be other ways of achieving this goal that could deliver the same or greater benefits to viewers.

1.47 We would welcome alternative proposals to this end, and will assess those proposals against the three key objectives identified above.

Longer-term development of DTT

1.48 In the long-term, the benefits of upgrading the DTT platform will be greatest if we can achieve a 'virtuous circle' in which more and more consumers have equipment using the new technologies, more and more services are made available in this way, and the cost of equipment with the new technologies keeps falling.

1.49 Virtuous circles of this kind can be seen in many other mass-market communications technologies – from mobile phones to other digital TV platforms. One of the aims of these proposals is to help initiate the next virtuous circle in the development of DTT.

1.50 Our analysis shows that the potential benefits of this development are enormous. However, we also think that the process is one that will need to be managed carefully, for two reasons.

- 1.51 First, it is very important that PSB services continue to be available universally to DTT viewers who have existing equipment. This means that, for the foreseeable future, we think that the multiplexes carrying existing PSB services (Multiplexes 1 and 2, under these proposals) must be required to continue operating in DVB-T and MPEG-2.
- 1.52 Second, in relation to the commercial multiplexes, we think that any change in technical standards will need to be evaluated carefully, case by case, to ensure that it does not unacceptably diminish the range, variety and quality of services available to DTT viewers.
- 1.53 The statutory framework exists to allow the regulator to oversee such changes, and to promote the best interests of viewers as a whole. We propose to clarify the regulation by amending the list of technical standards that can be used by commercial multiplexes. We will also make clear that any change in the standards used must first be agreed with Ofcom.

Next steps

- 1.54 This consultation closes on 30 January 2008.
- 1.55 Some of the powers that could be used to reorganise the DTT platform rest with the Secretary of State for Culture, Media and Sport, while others rest with Ofcom.
- 1.56 The Government and Ofcom have agreed that the issue needs to be approached in a co-ordinated way, and the Secretary of State has asked Ofcom for advice on how his powers might be exercised so as to promote the public interest. This consultation is being undertaken in part to inform the advice that Ofcom expects to give the Secretary of State.
- 1.57 We think it is important to take this issue forward quickly so that there is the best possible chance of upgrading the DTT platform quickly, maximising the benefits to citizens and consumers. Depending on the outcome of this consultation, we will therefore:
- aim to issue a Statement by the end of March 2008
 - at the same time, issue an invitation to the PSBs to make proposals for the use of the cleared capacity
 - allow two months for the submission of such proposals, which would need to be received by the end of May 2008;
 - conclude the comparative selection process by the end of July 2008.
- 1.58 Implementation would then follow in the rest of 2008 and 2009, with new services available on the DTT platform in late 2009 or early 2010.

Section 2

Introduction

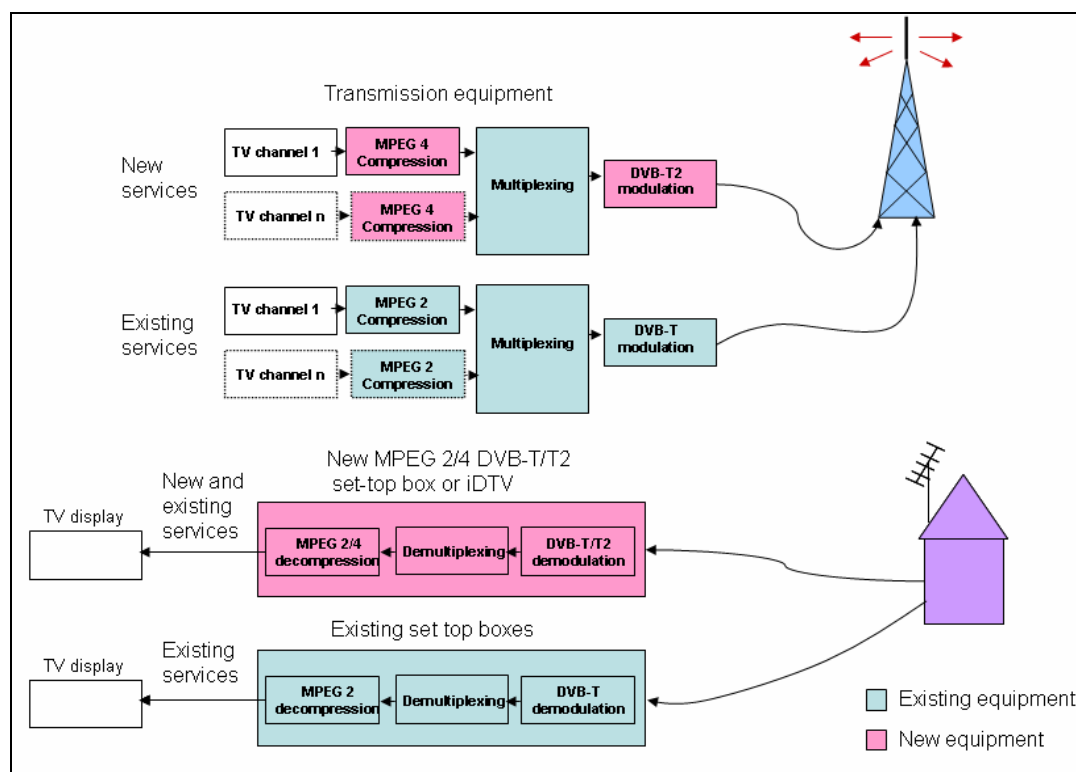
- 2.1 Digital Terrestrial Television (DTT) services were launched in the UK in 1998. They currently cover around 73% of UK households compared with 98.5% coverage for the existing analogue public service broadcasters (PSBs) - BBC1, BBC2, ITV and C4/S4C. The six DTT multiplexes currently carry over 30 television channels, and a number of radio, digital text and interactive services (see Annex 8).
- 2.2 The completion of digital switchover (DSO) in 2012 will result in the coverage of the three PSB DTT multiplexes (Multiplexes 1 and B operated by the BBC, and Multiplex 2 operated by Digital 3&4) matching that of the analogue television services. The three commercial multiplexes (Multiplex A operated by SDN, and Multiplexes C and D operated by National Grid Wireless (NGW)) will also increase their coverage from 73% to around 90% at DSO.
- 2.3 It is expected that two of the multiplex operators (BBC and NGW) will be able to increase their capacity at DSO through a change in the transmission mode. Four multiplexes will change mode at switchover, resulting in an increase in the capacity of the DTT platform equivalent to more than an additional multiplex. This would allow further standard definition (SD) television services to be carried whilst still enabling the multiplexes to achieve the coverage set out above.
- 2.4 Ofcom believes that these improvements in both the coverage and capacity of the DTT platform will be of great benefit to UK citizens and consumers. There are a number of technical developments in transmission and coding technologies which could also be very beneficial if introduced to the platform. However, we are concerned that due to a variety of factors the DTT platform may not be able to take full advantage of these recent developments. We believe that if adopted, these could allow a much more significant improvement in the overall efficiency, and hence capacity, of the platform. The factors which may limit the platform's rapid adoption of these new technologies include the complex regulatory, control and management structure of the platform.
- 2.5 The purpose of this consultation document is to set out our proposals as to how the DTT platform could be restructured in order to take advantage of these technical developments. If adopted we believe they could facilitate greater efficiency in the use of the valuable spectrum used by the DTT platform, and allow for the introduction of a variety of new services for the benefit of DTT viewers. Over time, we believe that the adoption of these new technologies could result in more than doubling the capacity of the DTT platform.
- 2.6 However, we also think that the process of introducing new technologies to the platform is one that will need to be managed carefully, for two reasons.
- 2.7 First, it is very important that PSB services continue to be available universally to DTT viewers who have existing equipment. This means that, for the foreseeable future, we think that the multiplexes carrying existing PSB services (Multiplexes 1 and 2, under these proposals) must be required to continue operating in DVB-T and MPEG-2.
- 2.8 Second, in relation to the commercial multiplexes, we think that any change in technical standards will need to be evaluated carefully, case by case, to ensure that it

does not unacceptably diminish the range, variety and quality of services available to DTT viewers. The statutory framework exists to allow the regulator to oversee such changes, and to promote the best interests of viewers as a whole.

- 2.9 This consultation is particularly focussed on the introduction of two new, more efficient technologies.
- One of these is an improved video and audio coding compression standard called MPEG-4. It is projected that over time this will be able to operate at up to twice the efficiency of the current coding compression standard, MPEG-2. This means that a multiplex could carry up to twice as many services using MPEG-4 as can currently be achieved using MPEG-2 whilst maintaining a similar picture quality.
 - The second technology is DVB-T2, which is still undergoing development by the DVB in Geneva, but is expected to be finalised in spring 2008. This is an update of the current DVB-T standard which has been used in the UK since 1998. The use of DVB-T2 is expected to give at least a 30% increase in multiplex capacity over the current standard whilst maintaining the same coverage. To adopt this standard, a complete multiplex would have to be converted. A key issue in our considerations has therefore been how one of the existing six multiplexes could be upgraded to use DVB-T2 and how the services currently carried on that multiplex could be carried on other multiplexes with minimum disruption to both broadcasters and viewers.
- 2.10 We believe that there could be very significant benefits to the DTT platform from the early introduction of these new technologies. As noted above it is predicted that the use of MPEG-4 could roughly double the number of services that could be carried on a single multiplex and that the use of DVB-T2 would add a *further* 30% of capacity to that multiplex without requiring any additional spectrum. Taken together these technologies would allow 2.6 times more services to be delivered (x2 for MPEG-4; x1.3 for DVB-T2; = 2.6 times more services). This increase in capacity would enable the DTT platform to continue to develop and offer UK viewers a very wide range of television services including the potential introduction of some high definition (HD) services to the DTT platform.
- 2.11 However, neither of these technical changes are compatible with existing DTT receivers (set top boxes (STBs) or integrated digital televisions (IDTVs)). This means that viewers wanting to receive services carried using either of these standards would have to purchase a new MPEG-4 and DVB-T2 compatible DTT receiver⁷. Hence it is our view that the introduction of these new technologies should be carried out in such a way that wherever possible access to the existing services by the current range of digital receivers is maintained and that a new STB or IDTV is only required if the viewer wishes to access new (rather than existing) services.
- 2.12 The diagram below (Figure 1) sets out where in the TV production chain new equipment would be required as a result of an upgrade to DVB-T2 and MPEG-4, for the reception of new services.

⁷ New MPEG-4 & DVB-T2 receivers will be backwards compatible with existing MPEG-2 DVB-T services

Figure 1: System changes needed to deliver MPEG-4 and DVB-T2 services



Ofcom's proposals

- 2.13 In this consultation, we set out proposals to clear a multiplex and upgrade it to use new technologies – DVB-T2 and MPEG-4. We also set out our proposals for how the reorganisation of existing services on the platform should be carried out in order to clear this multiplex, and our proposals for how the capacity on the cleared and upgraded multiplex should be allocated and used.
- 2.14 In drawing up these proposals, Ofcom has conducted discussions with the PSBs and multiplex operators as well as many other relevant stakeholders including manufacturers of both professional and consumer equipment and industry groups. We have also sought expert technical advice on compression technology and we are publishing a report on these matters alongside this consultation.
- 2.15 We have also considered carefully the potential impact that these proposals could have on the DSO process which is just starting to roll-out across the UK. A summary of this analysis is included in the Impact Assessment contained in Annex 7. The main issue that has arisen from our analysis is that early adoption of these new technologies will in general help to maximise the number of households who will have the option of purchasing a MPEG-4/DVB-T2 compatible receiver at DSO. This is one of the reasons why we believe that the process should start in late 2009 alongside the switchover of the Granada region.
- 2.16 However, there is also a risk that any changes to the options faced by consumers at DSO will increase the chances of consumer confusion. We therefore believe that it is very important to ensure that we work closely with the DSO campaign and specifically with Digital UK and the Digital Switchover Help Scheme (DSHS) to ensure that clear and consistent information about any changes is made available to viewers as soon as is practicable.

- 2.17 We now believe that there is general agreement about the scale of efficiency improvements that these technologies could offer and about the potential timing of their adoption. There is also a measure of agreement about how one multiplex could be cleared and how its services could be carried on other multiplexes. This is discussed in more detail in Sections 5 and 6 below.
- 2.18 Our proposals take account of a number of duties and objectives relevant to both Ofcom and the Department for Culture, Media and Sport (DCMS) and it is intended that we would continue to work very closely with Government throughout this process.
- 2.19 The Secretary of State for Culture, Media and Sport has the power under section 243 of the Communications Act 2003 (CA03) and under Clause 42 of the BBC Charter and Agreement to reserve capacity on DTT multiplexes for those broadcasters named under those provisions.
- 2.20 The Government and Ofcom have agreed that the issue needs to be approached in a co-ordinated way, and the Secretary of State has asked Ofcom for advice on how his powers might be exercised so as to promote the public interest. This consultation process will help inform the recommendations which we intend to present to DCMS early in 2008.
- 2.21 The consultation document is structured as follows:
- Section 3 of this document sets out Ofcom's broader duties and objectives relevant to the proposals set out in this document.
 - Section 4 reviews the current status of the DTT platform and discusses recent developments in broadcasting which could enable the introduction of new services within existing DTT capacity.
 - Section 5 examines how we could unlock a significant amount of additional capacity for new services if these new technologies were introduced to the DTT platform, and the role (if any) of Ofcom and/or Government intervention to bring about the upgrade.
 - Section 6 outlines our proposed approach for reorganising existing services on the DTT platform.
 - Section 7 provides options for how upgraded capacity might be allocated and used.
 - Section 8 sets out our conclusions and next steps for the proposed process.
 - The Annexes set out:
 - Ofcom's general approach to consultations (Annexes 1-4);
 - a glossary of terms used in the consultation document (Annex 5)
 - the applicable legal framework (Annex 6)
 - an Impact Assessment of the proposal (Annex 7);
 - services currently in operation on the DTT platform (Annex 8)

- We are publishing the independent consultants' report on technical issues at the same time as our consultation. It is available on our website at <http://www.ofcom.org.uk/consult/condocs/dttfuture/report.pdf>

Section 3

Duties and objectives

- 3.1 The radio spectrum is a valuable national resource of great importance in the modern world. It is estimated that activities directly dependent on use of the radio spectrum contribute around 3% to the UK's GDP. Spectrum is also a key input that underpins many essential public services, such as defence and the emergency services.
- 3.2 It is generally agreed that the most useful spectrum in a developed economy such as the UK is below 1GHz in frequency, and in particular in the range 200MHz-1GHz. This is because these frequencies offer a combination of capacity (bandwidth) and coverage (signal penetration) that makes them useful for a very wide range of services. At present, analogue television is the primary user of just under half of this spectrum band.
- 3.3 Securing more efficient use of these valuable frequencies is a principal objective of digital switchover, and this objective has been reflected in decisions that the Government and Ofcom have made about both the future use of spectrum and the DSO programme. In 2003, the Government decided⁸ that around 70% of the spectrum presently used for analogue television should be reserved for DTT at DSO (256 of 368MHz). This reservation of capacity will allow a significant increase in both the coverage and capacity of DTT. The Government also decided in 2003 that the remaining 112 MHz should be released for new uses. Ofcom's Digital Dividend Review (DDR) is currently considering how this 112MHz (and a few smaller adjoining bands) should be awarded.
- 3.4 In its consultation on the DDR in 2006⁹, Ofcom noted that, after DSO, the DTT platform would, if operated with maximum efficiency, be able to carry more services than at present, and that it would in total have significantly more capacity. Ofcom noted that this increase in capacity offered the potential for carriage of services in HD format as well as the option of carrying more SD services. This increase in capacity reflected the gains that could be achieved through adopting superior technical standards at switchover (mode change) as well as the benefits of adopting best practice in compressing video and audio services.
- 3.5 Ofcom has now further developed its understanding of how such efficiencies could be achieved and this has, in turn, resulted in the proposals contained in this consultation document.
- 3.6 In the light of this background, this section sets out Ofcom's statutory duties, powers and objectives that we consider are relevant to this consultation. Their application will though depend on any decision that the Secretary of State for Culture, Media and Sport might take in exercising his powers under the Communications Act 2003 (CA03).
- 3.7 This consultation can result in a number of regulatory outcomes.
 - We could decide that no further action is required,

⁸ See statement on radio spectrum availability and review of spectrum management, 30 January 2003:

http://www.digitaltelevision.gov.uk/pdf_documents/publications/statement_on_availability.pdf

⁹ <http://www.ofcom.org.uk/consult/condocs/ddr/>

- We could decide that minimal regulatory action is required to enable the use of the new technologies but take no further action to require any structural changes be made in the carriage arrangements of the multiplexes, or
- We could decide that both technical and structural changes are necessary to achieve the objectives set out below.

3.8 Should Ofcom recommend that regulatory intervention is required to implement both structural and technical changes to the platform then a number of legal powers will be available to both Ofcom and the Secretary of State. A summary of the relevant legal powers are set out in Annex 6, including a more detailed account of regulatory functions and duties. We explain in broad terms below how these powers may be exercised.

Ofcom's duties

3.9 Under the CA03, Ofcom's principal duty, in carrying out its functions, is to further the interests of citizens and to further the interests of consumers in markets for any of the services, facilities, apparatus or directories in relation to which Ofcom has functions, where appropriate by promoting competition.

3.10 In so doing, Ofcom is required to secure a number of specific objectives and to have regard to a number of matters, as set out in section 3 of the CA03. As to the prescribed specific objectives, Ofcom considers that the following objectives are particularly relevant to this consultation.

Our duty to secure the optimal use of the electro-magnetic spectrum.

Our duty to secure the availability of a wide range of television and radio services of high quality and wide appeal throughout the UK.

3.11 In performing its duties, Ofcom is also required to have regard to a range of other considerations, as appear to us to be relevant in the circumstances. In relation to this consultation, we consider that a number of such considerations are relevant, in particular the desirability of promoting the fulfilment of the purposes of public service television broadcasting in the UK, and the desirability of encouraging investment and innovation in relevant markets. We have also had regard to the principles under which regulatory activities should be transparent, accountable, proportionate, consistent, and targeted only at cases in which action is needed, as well as the interest of consumers in respect of choice, price, quality of service and value for money.

3.12 Ofcom also has a wide measure of discretion in balancing its statutory duties and objectives where these conflict. In so doing, Ofcom will take all relevant considerations into account, including responses that will be made to this consultation.

3.13 Ofcom has developed the proposals set out in this consultation with a view to the fulfilment of its duties as described in this section. But, as noted above, the extent to which these duties apply will depend on the function(s) that Ofcom may ultimately carry out in implementing the proposals set out in this consultation document. This may also depend, in turn, on any decision taken by the Secretary of State in light of Ofcom's recommendations following the end of this consultation process to confer additional powers on Ofcom to vary the relevant multiplex licences. Ofcom will also have regard to its statutory duties in any variation to the technical conditions under

which the digital multiplex operators must operate and to the terms of the digital replacement licences (“DRLs”).

- 3.14 In the case of any change to the technical conditions under which the digital multiplex operators must operate, Ofcom would expect to use its powers to amend the Ofcom Reference Parameters (the current version of which is Issue 4 of 13 September 2007). In proposing these technical upgrade requirements, Ofcom has taken account of its above-mentioned statutory duties to secure the objectives set out in Section 5 of this consultation document.

Ofcom’s policy objectives

- 3.15 In developing the proposals set out in this consultation, we have taken our statutory duties fully into account.
- 3.16 We consider that the proposals set out in this consultation are likely to be beneficial to citizens and consumers, by securing better use of the spectrum and enhancing the range, diversity and quality of television services available throughout the UK. We also consider that the proposals are likely to promote investment and innovation, to serve the interests of consumers in respect of choice, price, quality of service and value for money, and to promote the purposes of Public Service Broadcasting.
- 3.17 The consultation has been prepared in light of a number of important policy objectives, including those that follow:

Ofcom believes that significant benefits for consumers, citizens and the DTT platform can be achieved through adoption of more efficient technologies by the DTT platform.

We believe that these new technologies could enable the platform to introduce new services, which will in turn assist in promoting the range, diversity and quality of services on the platform, and can assist in the furthering of PSB purposes. It is also expected to be in the interest of consumers and citizens, through promoting more choice of services

Given the wider context of the DTT platform as the platform which will deliver universal access to PSB content post DSO, we want to ensure the upgrade can take place with the minimum impact on our stakeholders, while maximising the potential value it can create.

We therefore also have as an objective to ensure that all DTT viewers continue to have access to the vast majority of services that are currently carried on the DTT platform using their existing DTT receiving equipment. We can confirm that the main public service channels will continue to be broadcast using MPEG-2 coding and will be carried on multiplexes using DVB-T standards for the foreseeable future. Viewers will therefore not be forced to acquire new STBs to continue receiving these important PSB services.

- 3.18 Accordingly, Ofcom considers that the proposals will further the interests of citizens and to further the interests of consumers, in accordance with its principal duty. The remainder of this consultation document elaborates on Ofcom’s reasoning in support of that view.

Summary of relevant powers

3.19 It seems to us likely that some regulatory action will be required in order to ensure that the DTT platform develops in a way that maximises benefits to citizens and consumers. If so, we expect that both Ofcom and the Secretary of State would have an important role to play. This is because, while some of the powers required to intervene fall within Ofcom's remit, others fall within the Government's remit.

3.20 Broadly, these powers fall into three distinct areas.

First, the ability of the Secretary of State under section 243 of the CA03 by order to provide that certain provisions of the Broadcasting Act 1996 (BA96) are to have effect with the modifications specified in the order and for provision made by the order to have effect in place of any or all of those provisions. Specifically pursuant to section 243, such order may, where (as here) frequencies have been reserved for listed PSB organisations, allow Ofcom to include conditions in multiplex licences allocating capacity to named relevant PSBs, including obligations as to carriage terms.

Secondly, the ability of the Secretary of State under Clause 42 of the BBC Agreement¹⁰ to direct, where it appears to him appropriate to do so in the interests of PSB in the UK, the BBC to grant such PSBs the right to use any capacity on a TV multiplex service that is under the BBC's control.

Thirdly, the ability of Ofcom to vary the terms of multiplex licences (covering matters such as technical standards) and DRLs, subject to consultation with the licensees.

3.21 Again, as with statutory duties, the extent to which these (and other potentially relevant) powers apply will depend on the function(s) that Ofcom may ultimately carry out in implementing the proposals set out in this consultation document. This matter is in part also pending any decision that the Secretary of State may take following Ofcom's recommendations to him at the end of this consultation process.

¹⁰ http://www.bbc.co.uk/bbctrust/assets/files/pdf/regulatory_framework/charter_agreement/bbcagreement_july06.pdf

Section 4

DTT – the status quo and potential developments

The important role of the DTT platform

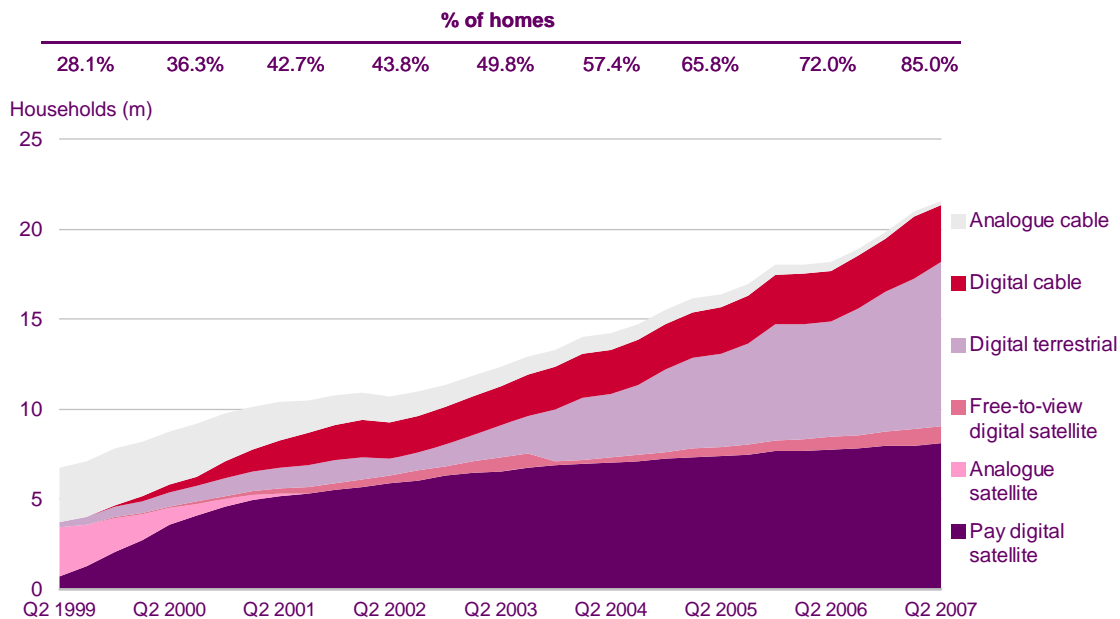
- 4.1 As noted in the previous section the Government decided in 2003 that about 70% of the radio spectrum (256 of the 368 MHz) currently used for analogue television broadcasting should, from switchover, be used for DTT broadcasting. In September 2005, the Secretary of State for Culture, Media and Sport confirmed that the UK's analogue television signals would be switched off on a region by region basis between 2008 and 2012¹¹.
- 4.2 A major reason for these decisions was to allow for the expansion of terrestrial broadcasting. The coverage of DTT services will at DSO increase from the present 73% of population (for all six multiplexes) to around 98.5% (for the three PSB multiplexes) and 90% or more (for the three commercial multiplexes).
- 4.3 Hence at DSO, the DTT platform will provide universal access to PSB television services to UK viewers. It will therefore play a key role in the fulfilment of Government and Ofcom objectives regarding the delivery of quality television services to the UK population.
- 4.4 Ofcom's latest Digital Progress Report (September 2007)¹² shows that 12.9m UK households (over 50%) have DTT, with over 9.1m households (35.9%) having DTT as their only television platform. This makes DTT the largest digital television platform in the UK. It is also the fastest growing of all the television platforms, as shown in Figure 2 below.

¹¹ http://www.culture.gov.uk/Reference_library/Press_notices/archive_2005/dcms116_05.htm

¹² http://www.ofcom.org.uk/research/tv/reports/dtv/dtv_2007_q2/dtvq207.pdf

Figure 2: Television platform share of households Q2 1999 – Q2 2007

Take-up by platform % homes



Source: Ofcom, GfK, Sky, NTL

The structure of the DTT platform

4.5 Unlike the satellite and cable platforms the DTT platform does not feature a single organisation that co-ordinates and manages its evolution. Instead it comprises a wide range of different organisations, each of whom only controls a part of the value chain. This fragmented structure means that a number of parties have to co-operate to deliver a service or product.

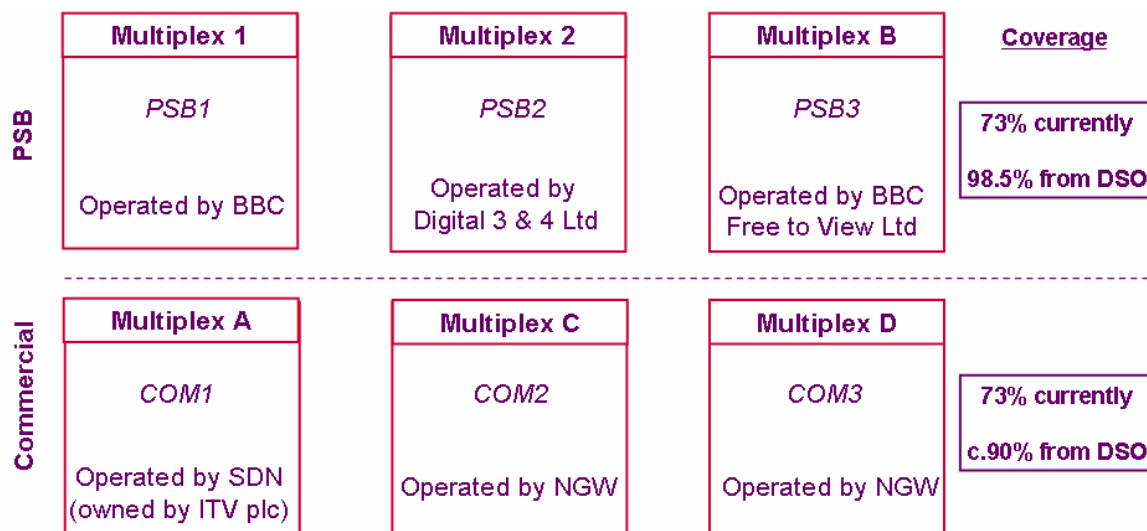
4.6 The key elements of this value chain comprise:

- **Multiplex Operators:** who have access to the frequencies used to transmit the DTT services to viewers' aerials;
- **Programme providers:** who have to secure carriage on a multiplex to reach and provide content to viewers' television sets;
- **Transmission companies:** who own and operate transmission networks under contract to the multiplex operators;
- **Consumer equipment manufacturers:** who design and manufacture digital receiving equipment (either STBs or IDTVs);
- **Retailers:** who market and sell digital receiving equipment; and
- **Consumers and citizens:** who upon purchase of the appropriate digital receiving equipment are able to watch the programmes available on the DTT platform.

4.7 A summary of the six multiplexes and the control over them is set out below (Figure 3). The name of each multiplex (as used by the Ofcom licensing process) is listed in

bold. However, some organisations in the industry prefer to use alternative names for the multiplexes; these are listed in italics. For example, Ofcom refers to the multiplex operated by BBC Free to View Ltd as “Multiplex B”. However, other organisations sometimes refer to it as PSB3.

Figure 3: DTT multiplexes and control



- 4.8 There is a wide range of services currently operating on the DTT platform. Over 30 SD channels, plus a large number of radio, digital interactive and text services are currently carried.
- 4.9 Most of the services on the DTT platform are available on a free-to-air basis and together, these comprise the service known as “Freeview”. However, there is also a small number of pay services in operation on the platform. These are operated by Top Up TV and Setanta. BSkyB has also recently proposed to convert its current range of free to air services into pay services. These proposals are currently being considered by Ofcom. A consultation document was issued in October 2007¹³.
- 4.10 The line-up of services carried on the DTT platform is constantly changing. The services carried on the platform during November 2007 when this document was being finalised are set out in Annex 8.
- 4.11 It is clear from the range of operators of DTT multiplexes (including both commercial and PSB players), the differing coverage levels, the variety of services available and the independent participation of a large number of manufacturers and retailers supplying a wide range of digital receivers to the market that there are a number of different organisations with interests in the DTT platform, whose incentives may not always be aligned.

DTT licensing and regulation

Licensing

- 4.12 The legal framework under which the DTT platform operates was laid down in the BA96. However, it should be noted that the BA96 does not cover Multiplex 1, which is used by the BBC under the terms of its Royal Charter and is regulated (for purposes equivalent to the BA96) by the BBC Trust.

¹³ <http://www.ofcom.org.uk/consult/condocs/dtv/>

- 4.13 There is a parallel regime for the licensing of spectrum for use by terrestrial broadcasting. Licences are issued under the Wireless Telegraphy Act 1949 (as amended in 2006) (the WTA) to authorise the establishment and use of equipment for the purpose of providing broadcasting services for general reception¹⁴.
- 4.14 The BA96 and WTA licences are complementary. WTA licences authorise the use of all the transmissions from the transmitters and relay stations from which DTT services are currently broadcast, and will be transmitted after DSO. WTA licences are currently held by transmission companies, but Ofcom has stated that it expects these licences to be transferred to the multiplex operators at DSO.
- 4.15 The BA96 set out a range of conditions which the ITC (Ofcom's predecessor) included in the DTT multiplex licences issued initially in 1998, and subsequently in 2002 (when the Multiplex B, C and D licences were re-tendered following the collapse of ITV Digital). The conditions in the multiplex licences include:
- A requirement for the applicant to propose a technical plan for the operation of the licensed service;
 - A requirement for the applicant to identify the type and characteristics of the services it proposes to carry on the service; and
 - A requirement that the applicants' proposals in relation to these requirements are then incorporated into the multiplex licence and form their Core Proposals which cannot be amended without Ofcom's consent;
 - A requirement that the signals carrying the multiplex service achieve high levels of quality and reliability.
- 4.16 Section 28 of the BA96 also provided a power for the Secretary of State to direct the ITC to include conditions in multiplex licences relating to carriage of services provided by independent analogue broadcasters (these being the commercial PSBs). This power was used to reserve capacity on Multiplex 2 (Digital 3 & 4) for services provided by Channel 3 licensees, Channel 4 and Teletext Limited, and on Multiplex A (SDN) for services provided by Channel 5 and S4C.
- 4.17 Subsequent to the issuing of the multiplex licences the CA03 required Ofcom to replace the commercial PSB licences (which were issued under the Broadcasting Act 1990 (BA90)) with digital replacement licences (DRLs). These amongst other matters require the licensees to implement DSO to a timetable that has been endorsed by the Government. As noted above the Government has subsequently made a number of important policy announcements relating to the DSO timetable¹⁵.
- 4.18 Ofcom has consulted several times on how to implement these provisions. These consultations^{16 17 18} have covered issues such as:
- The coverage obligations for the three PSB multiplexes (these are linked to the overall requirements to substantially match analogue coverage included in the CA03 DRL conditions);

¹⁴ It should be noted that a new Wireless Telegraphy Act was passed in 2006 and this is now used to issue any new WTA licences

¹⁵ http://www.culture.gov.uk/Reference_library/Press_notices/archive_2005/dcms116_05.htm

¹⁶ DRLs <http://www.ofcom.org.uk/consult/condocs/drl/>

¹⁷ DSO Management of transition coverage issues <http://www.ofcom.org.uk/consult/condocs/transition/>

¹⁸ Switchover related changes to DTT licences http://www.ofcom.org.uk/consult/condocs/dtt_changes/

- The detailed region by region DSO timetable to be adopted by all DTT multiplexes;
- The frequency assignments and DSO obligations placed upon the operators of the three commercial multiplexes.

Regulation

4.19 Overall the regulation applicable to the DTT platform can be viewed as covering four distinct areas: control, carriage, content and technical standards. These areas are predominantly linked to the licensing and legal framework discussed above, and are summarised below.

Control

4.20 The control of two of the three multiplexes that will have universal coverage from DSO is determined directly by secondary legislation under the BA96 or the BBC Royal Charter. These are (respectively) Multiplex 2 and Multiplex 1.

- The Independent Analogue Broadcasters (IAB) Order required that control over Multiplex 2 (operated by Digital 3 & 4 Ltd) is limited to the holders of the Channel 3 and Channel 4 DRLs. It is therefore not possible for control of this multiplex to change, unless the DRL holders change, or unless a further Order (this time under the CA03) is issued.
- Multiplex 1 (operated by the BBC) is used by the BBC under the terms of the Royal Charter and Agreement. It would not be possible to change the control of this multiplex without changes to the Royal Charter and Agreement.

4.21 Multiplex B is also operated by the BBC but this was awarded to the BBC by the ITC. As the Multiplex B licence is held under the BA96 this would, in principle, allow control to be transferred to other organisations. However, as this Licence is held by BBC Free to View Limited any change of control would be subject to BBC governance requirements.

4.22 The other three multiplexes are subject to less regulation on control – and they have all changed hands since their initial award. Multiplexes C and D are currently controlled by NGW (and were formerly held by Crown Castle)¹⁹. Multiplex A is controlled by SDN which is ultimately controlled by ITV plc, which acquired SDN in 2005.

4.23 The extent of regulation over the control of the multiplexes is relevant in that it is one of the determining factors affecting the overall level of control over the platform that can be exercised. For example, under the current structure of legislation and regulation, it would not be possible for one party to control all of the multiplexes. Hence it can be more difficult for decisions to be made regarding the platform as a whole, given the range of interests which together make up the platform.

Carriage

4.24 The five multiplexes which are regulated under the BA96 and the CA03 (ie all excluding Multiplex 1) are subject to regulation under statute and licence conditions

¹⁹ NGW was acquired by Macquarie UK Broadcast Ventures in 2007. The acquisition is currently being reviewed by the Competition Commission, which is expected to publish its findings in January 2008.

concerning the content that can be carried on the multiplex. Multiplex 1 is regulated under the terms of the BBC Charter and Agreement. Any material changes to the content of Multiplex 1 require the agreement of the BBC Trust.

- 4.25 As noted above, applicants for multiplex licences are required to state what type of services they propose to carry on the multiplexes. These form part of their Core Proposals and they are obliged to ensure that services carried on the multiplex conform to these proposals unless Ofcom agrees with a request from the licensee to vary them. Operators are permitted to amend the services they carry subject to not unacceptably diminishing the quality, variety and range of services available (an assessment is carried out by Ofcom to determine whether or not the proposed change should be accepted).
- 4.26 Under section 12(1)(h) of the BA96 90% of capacity on any of these multiplexes must be used for television services (rather than data or non-BBC radio services).
- 4.27 The IAB order also reserved capacity on a designated multiplex for each PSB. This was assigned as follows:
- 48.5% of the (UK-wide capacity) on Multiplex 2 was reserved for Channel 3 licensees and a further 48.5% of the UK-wide capacity was reserved for Channel 4. The remaining 3% of the Multiplex 2 capacity was reserved for the Public Teletext licensee.
 - 50% of the capacity of Multiplex A in Wales was reserved for S4C.
 - 50% of the capacity of Multiplex A across the UK was reserved for the holder of the Channel 5 licence.
- 4.28 This reserved capacity was sufficient for the carriage of at least two services per licensee in 1998 when DTT was launched. Due to improvements in the efficiency of MPEG-2 coding systems, this capacity is now sufficient to carry at least twice that (four services), as is done now by Channel 3 and Channel 4 licensees on their reserved capacity on Multiplex 2 (Digital 3 & 4).
- 4.29 The IAB Order required the broadcasters to use this capacity for their own services but also allowed it to be used for other services provided that Ofcom gave its permission.
- 4.30 The IAB Order also required that the designated public service broadcasters (Channels 3, 4, 5 and the Public Teletext licensee and S4C) ensured that a digital version of their qualifying service was carried within the reserved capacity.
- 4.31 Hence the regulation of the carriage of services on particular multiplexes has, for various policy reasons, tended to reduce the flexibility available to some multiplex operators in the choice of services that can operate on a particular multiplex. Given the need for certain services and therefore multiplexes to be universally available, it can also be difficult for certain technical advances to be made, given the need to maintain consumers' access to these services.

Coverage

- 4.32 As noted above, some of the multiplexes are subject to coverage obligations. Multiplexes 1, 2 and B (operated by BBC, Digital 3&4 and the BBC Free to View Limited) are required to adopt all of the existing analogue terrestrial broadcasting

sites at DSO in order that they match the coverage of the existing analogue terrestrial services. These obligations have been put in place to ensure that the PSB services which are carried on these multiplexes are available through terrestrial means to all viewers who currently have access to analogue television services through their aerial. This will mean that these multiplexes will cover 98.5% of UK households at DSO.

- 4.33 The remaining three multiplexes (Multiplexes A, C and D) are required by their licence to continue to operate from their existing sites (currently 80 for Multiplexes C and D, and 81 for Multiplex A) but at new higher power assignments following switchover, meaning that they will cover around 90% of UK households at DSO.
- 4.34 Differences in coverage between the multiplexes, and the requirement that certain services must be carried on the multiplexes offering universal coverage, means that multiplex operators may face different incentives in use of their capacity, and some operators are somewhat more limited than others in their choice of carriage of services.

Technical standards

- 4.35 Some important aspects of technical performance on the DTT platform are controlled directly by Ofcom, through its the Technical Performance Code (and the more detailed document on Reference Parameters) which are linked to DRLs and digital multiplex licences.
- 4.36 These presently require that all multiplex operators must:
- use the DVB-T broadcast transmission standard, using one of two transmission modes (16 or 64 QAM);
 - broadcast their services in SD format using MPEG-2; and
 - carry a minimum level of Service Information (SI) data to support the DTT electronic programme guide (EPG).
- 4.37 Multiplex operators wishing to move to any different standards than those specified above may apply to Ofcom to seek approval.
- 4.38 These regulations were put in place in order to ensure that the services carried on the DTT multiplexes achieved high standards of technical quality and reliability as required under the BA96. By setting these standards the ITC (and Ofcom) have enabled manufacturers of receiving equipment to know with certainty the technical standards that would be employed on the DTT platform. This certainty has helped to create an open market in DTT products and has in turn helped manufacturers achieve economies of scale (and therefore offer reasonably priced equipment to consumers).

Reasons for regulation

- 4.39 The DTT platform is regulated in the manner described above in order to secure a number of important public policy objectives. The legal framework, set out in the BA90, BA96 and CA03, determines the manner in which Ofcom should conduct its licensing of the services operating on the platform. Other elements of regulation, such as the multiplex coverage obligations, relate to decisions taken in light both of

specific statutory provisions and Ofcom's wider duties to citizens and consumers. These were discussed in more detail in Section 3 of this consultation.

Effects of regulation

- 4.40 The DTT platform appears able to coordinate well with regard to specific technical issues. For instance the multiplex operators have put in place a process which manages the electronic programme guide and the service information cross carriage arrangements.
- 4.41 However, it appears that the platform tends to be less able to take long term, strategic decisions about its future, and to act decisively to put them in place. In particular, it appears to us that the platform may not be well placed to be able to coordinate, and bring about quickly, significant technical upgrades to the platform without some form of external intervention. This is due to the fragmented control of the platform, the wide range of parties and interests involved, and the differing level of regulation and differing incentives that apply to each of them.
- 4.42 The DTT platform has in the past achieved a high profile and important change to its trajectory, through a combination of regulatory action and broadcaster action. This was the launch of Freeview which followed the re-licensing of the ITV Digital multiplex capacity by the ITC in 2002. This represented a substantial change in both the technical and commercial characteristics of the platform led by the BBC, NGW and BSkyB. However, this process was triggered by a specific regulatory intervention which enabled the market to act; while the market determined the outcome, we believe that the process was triggered by the rapid and open relicensing process put in place by the ITC in 2002.
- 4.43 It therefore appears to us that the fragmented nature of the DTT platform combined with the degree of regulatory control on the platform means that the different parties that make up the platform may not be fully incentivised to work together efficiently. This may in turn make it harder for the main parties to achieve a coordinated and speedy approach to instigate substantial changes to the platform.
- 4.44 We therefore believes that the DTT platform may be less able to react to potential development opportunities, and may therefore find it more difficult to move quickly to take action, without some level of regulatory intervention to enable or trigger further action.

Developments in broadcasting

- 4.45 Against the backdrop of a platform that can find it difficult to make rapid and significant changes to its strategy, structure, and technical operation, there are a number of important developments occurring in the broadcasting sector.

Technical developments

- 4.46 As noted in previous sections, Ofcom has identified a number of potential *technical developments* which could release a substantial amount of capacity on the DTT platform, within existing spectrum²⁰. There are three broad areas of development:

- Mode change at DSO

²⁰ <http://www.ofcom.org.uk/radiocomms/ddr/events/hdmasters.pdf>,
<http://www.ofcom.org.uk/radiocomms/ddr/events/hdddr.pdf>

- Video compression efficiency improvements
 - New, more efficient, technological standards: DVB-T2 and MPEG-4.
- 4.47 Each of these developments is discussed in more detail below
- 4.48 **Mode change:** As a direct result of the launch of Freeview, four of the six DTT multiplexes (operated by the BBC and NGW) currently operate at 16 QAM and provide 18Mbit/s of capacity. The remaining two multiplexes (operated by Digital 3&4 and SDN) operate at 64 QAM and these provide 24Mbit/s of capacity.
- 4.49 The frequency planning for DSO has been carried out using the assumption that all multiplexes will operate using the 64QAM mode. DSO therefore provides the opportunity for the four 16 QAM multiplexes to upgrade to 64 QAM, meaning that they could operate more efficiently, using the same amount of spectrum to offer significantly more capacity. The capacity increase (equivalent to 6Mbit/s for each of the four multiplexes to upgrade) is equivalent to adding at least 20% to the capacity of the DTT platform, or more than a whole multiplex.
- 4.50 **Efficiency improvements using existing technologies:** Ofcom's analysis, and the expert technical advice it has commissioned, indicate that the capacity held within the six DTT multiplexes could be used more efficiently, even if the multiplex operators continue using the MPEG-2 compression standard.
- 4.51 As noted above, the DTT multiplexes were initially launched with only four standard television services being carried in each 24 Mbit/s multiplex. Through a combination of improved coder design and the use of statistical multiplexing it is now possible to carry between eight and nine SD services in such a multiplex. While significant gains have already been achieved, it certainly appears possible that some small further gains might be achievable.
- 4.52 Following a detailed analysis of current DTT multiplex usage, Ofcom believes that if all multiplex operators adopted the latest state-of-the-art coding equipment (featuring full use of statistical multiplexing for all video services) and an optimal usage of their capacity it would be possible to carry more television and other services within the existing capacity of the six multiplexes.
- 4.53 We have discussed these issues extensively with the multiplex operators and believe that this view is now generally shared by them. We are pleased to note that the BBC in particular has already committed to upgrading its coding equipment with the latest equipment to allow it to benefit from these efficiency gains.
- 4.54 **New, more efficient, technological standards:** The use of DVB-T2 and MPEG-4 could together potentially result in doubling the capacity of the DTT platform in the short to medium term, and increasing it by as much as 160% in the longer term. However, it is important to note that consumers would need to acquire new digital receiving equipment to receive services broadcast using either of these standards.
- MPEG-4 is an improved video and coding compression standard. It is projected that over time this will be able to operate at twice the efficiency of the current coding compression standard, MPEG-2²¹. This means that its use could allow the

²¹ Digital compression systems remove redundant information from the television pictures before they are transmitted to reduce the digital multiplex capacity required to broadcast them. MPEG-4 is an enhanced, more efficient version of the current MPEG-2 digital video compression standard. It further reduces the bit rate needed to carry a video service by approximately 30% compared with MPEG-2. In practice the actual level of

carriage of up to twice as many services in a single multiplex as is currently achieved by MPEG-2 systems, whilst maintaining the same picture quality.

- DVB-T2 is still undergoing development by the DVB in Geneva, but is expected to be finalised in spring 2008²². This is an update of the current DVB-T standard and is expected to allow an increase of at least 30% in multiplex capacity over the current standard whilst maintaining the same coverage. The adoption of this standard would require that a complete multiplex would have to be converted.

4.55 Other television platforms in the UK have already begun to adopt these new technologies. Sky's satellite platform already utilises DVB-S2 (the satellite equivalent of DVB-T2), and is also deploying MPEG-4 compression technology, as do IPTV services from Tiscali/Homechoice. The cable industry has not yet felt the need to migrate to MPEG-4, although DVB-C2, a more efficient version of the current DVB-C transmission technology used for cable television, is under development by the DVB organisation.

4.56 MPEG-4 is being adopted in many other countries for DTT broadcasting including: Belgium, Brazil, Croatia, Estonia, France, Hong Kong, Ireland, Lithuania, Macedonia, New Zealand, Norway, Poland, Singapore, Slovenia, Sweden and Ukraine. MPEG-4 is emerging as the compression system of choice for DVB-H mobile TV worldwide and for HD television (HDTV) in countries launching new services. Ofcom also understands that several countries are seriously considering the use of DVB-T2. The new standard is expected to feature a reduction in transmitter infrastructure costs, so will be very appealing to those countries yet to launch DTT services.

Timing

4.57 Ofcom understands that the DVB-T2 technical standard will be finalised by DVB in spring 2008. Our discussions with manufacturers of consumer reception equipment indicate that this could mean that compliant equipment could therefore be available commercially in late 2009. Given that the technology is still in development, it is of course possible that availability could be delayed. However, Ofcom is confident 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.

4.58 We therefore believe that it could be possible to introduce these new technologies (DVB-T2 and MPEG-4) in time for DSO in the Granada region, which is due to take place in late 2009²³. We believe that the early introduction of new technologies is desirable for four reasons which are set out below:

- First, Ofcom believes that if we can facilitate the introduction of these two technologies (DVB-T2 and MPEG-4) *at the same time*, this will reduce the number of receiving equipment upgrades that consumers will need to go through in future, thus decreasing overall cost and disruption to consumers and viewers in the long term.

improvement achieved is dependent on the picture content. Future developments are expected to increase this efficiency saving to as much as 50%.

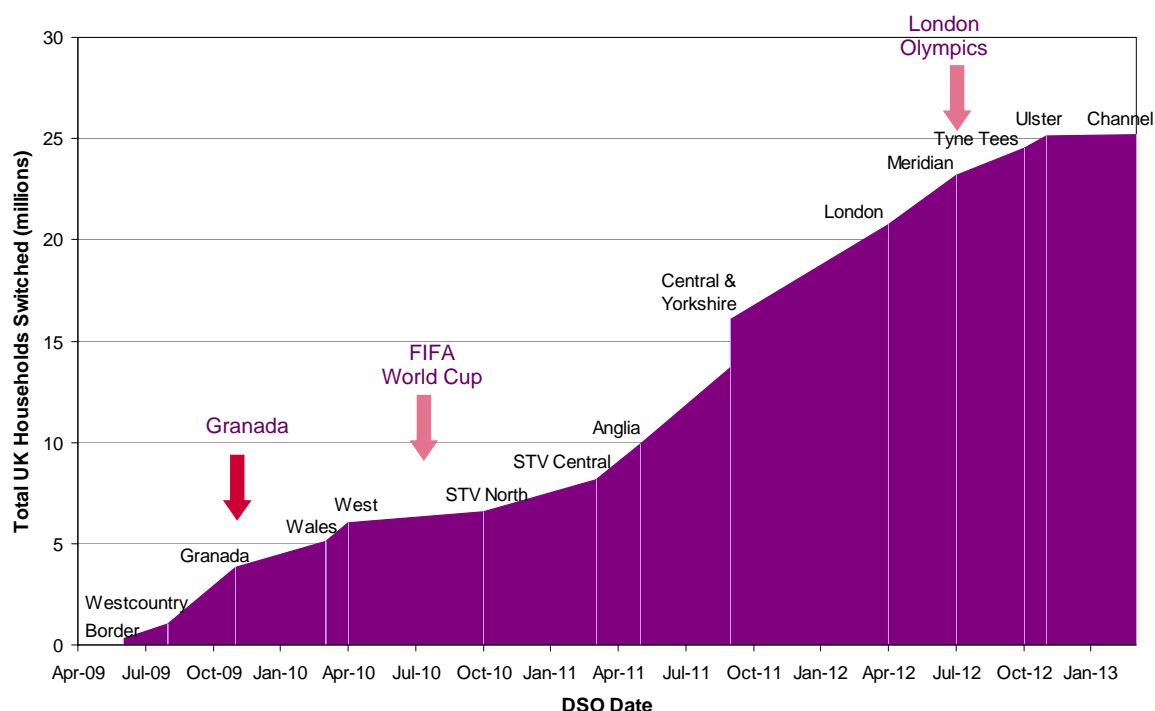
²² <http://www.dvb.org/technology/dvbt2/index.xml>

²³ <http://www.digitaluk.co.uk/en/when/granada.html>

- Second, we believe that an earlier adoption of these technologies could bring forward the availability of new services such as HD on the DTT platform, and would bring forward the more efficient use of the valuable spectrum already allocated to DTT use.
- Third, given the need to convert an entire multiplex to DVB-T2, and the consequent need to reorganise existing services to allow for their continued reception on existing consumer reception equipment, we believe it is important to carry out an upgrade to DVB-T2 at a time when services can be reorganised between multiplexes in the simplest manner.
- The capacity becoming available from mode change at DSO provides such an opportunity, providing additional capacity into which services displaced from the multiplex to be upgraded can be moved. We therefore believe there are very strong reasons to capitalise on this mode change capacity increase through introducing DVB-T2 in line with DSO; the Granada switchover being the earliest time the upgrade could be conducted, due to availability of new equipment.
- Fourth, we believe that earlier adoption of these technologies provides a greater level of consumer choice. Ofcom believes that these technologies might be introduced in time for DSO in the Granada region, due to take place in late 2009. The earlier that these technologies can be introduced, the more consumers will have a choice at their region's switchover of whether to buy a standard DVB-T MPEG-2 STB or IDTV, or whether to buy a DVB-T2 MPEG-4 STB or IDTV. This would reduce the number of people who might buy standard reception equipment, only to want to upgrade to new technologies shortly thereafter.

4.59 Figure 4 below shows that if the new technologies were to be introduced in time for DSO in Granada, a very large proportion of households (around 80%) would be in areas still to switch over, and would therefore have more choice open to them in purchase of reception equipment. While a substantial proportion of households will already have purchased a digital receiver, they may well not have purchased digital receivers for all TV sets in their home.

Figure 4: Households switching over by date



4.60 As noted in the Impact Assessment, the proposed timing for the introduction of new technologies to the DTT platform should have a positive impact on the DSO programme, as it has the potential to create more choice for more consumers providing that the communications with viewers affected are clear and well informed about their options at DSO.

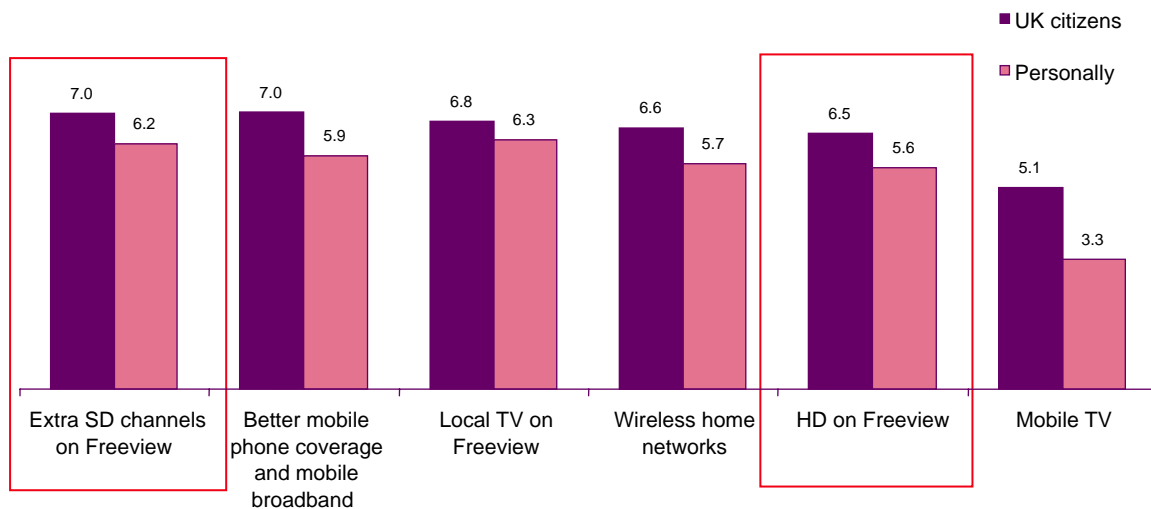
Service developments

- 4.61 There are also a range of *service developments*, which could offer exciting new services to consumers available on the DTT platform.
- 4.62 The most high profile of these developments is HDTV, which offers enhanced picture and audio quality to viewers, but which requires an HD-ready TV set and dedicated HD receiving equipment²⁴. New services could also include more SD channels, more interactive services, and more radio and text services. Interactive services tend to provide more choice of SD services. Radio and text services require a much smaller amount of capacity than SD or HD services, and also appear to be less highly demanded than SD or HD services.
- 4.63 The technological developments described above could - if adopted - provide the capacity on the DTT platform to offer a number of new HD or SD services in addition to those already provided using MPEG-2 and DVB-T technology.
- 4.64 Ofcom's market research for the DDR (see Figure 5 below) suggests that there is a significant level of interest among consumers in both SD and HD services on DTT. Our research also indicated that SD services are rated as more important than HD services but it appears that there is significant interest in both types of service.

²⁴ Any viewer wishing to view HD services would need to purchase an additional HD compatible set top box as none of the current range of HD-Ready televisions on the market actually includes HD receiving or decoding equipment.

Figure 5: Importance of services that could use digital dividend spectrum

Scores on chart bars show mean average score out of ten given by UK population

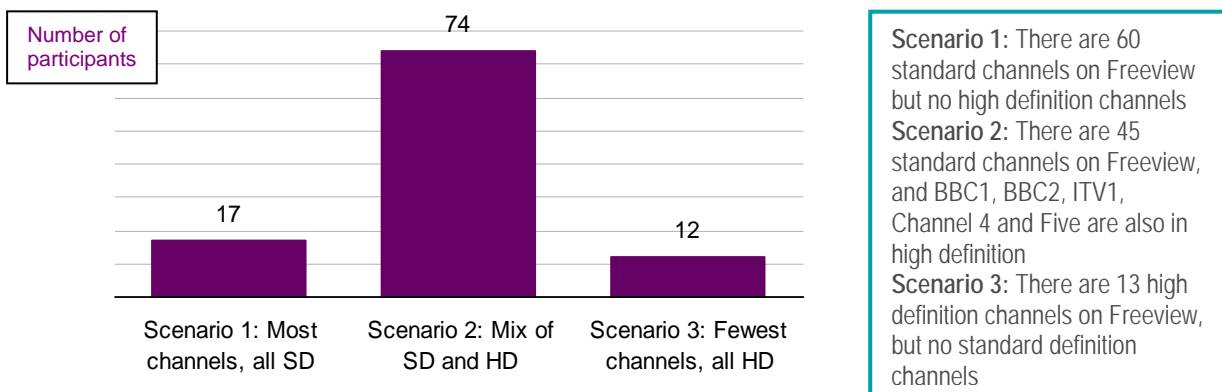


Q8.3a/b For each of these services please score each on a scale of 0 to 10, where 10 means extremely important and 0 means not at all important a) to you personally b) to all UK citizens and society as a whole (mean scores are shown)

Source: Ipsos MORI survey 2007 Base: UK adults: 1,049

4.65 However, Ofcom’s qualitative research found that a significant majority of consumers would prefer a future for the DTT platform in which there was a mix of both SD and HD services available (see Figure 6 results for future Freeview scenarios).

Figure 6: Future scenarios for SD and HD services on Freeview



Source: Opinion Leader Research, August-September 2007. Base: 109 participants.

4.66 Further details of Ofcom’s market research will be published later this month.

Standard Definition

4.67 As noted above, Ofcom’s DDR market research has shown that there is interest from viewers for additional SD services on the DTT platform. The DTT platform currently carries a range of public service, free to view and pay SD services. Demand for new SD slots has been strong with the most recent auction of slots by NGW attracting a large number of bidders.

- 4.68 It is estimated that a single DVB-T2 multiplex carrying MPEG-4 coded SD services could carry from 13 to 15 services using current levels of compression by late 2009, rising to more than 20 services (from 2015). These services could be either free to air or pay.
- 4.69 While consumers do appear to value SD services highly, it is as yet unclear whether more SD services on the DTT platform would encourage them to purchase new reception equipment in order to receive the new services. We would welcome evidence on this issue in responses to this consultation.

High Definition

- 4.70 Given the level of interest from broadcasters in offering HD services on the DTT platform, and statements from manufacturers that HD will be the service that drives take up of new receiving equipment, we explore a little further below the development of HD services in the UK.
- 4.71 Ofcom notes the rapid take up of HD services in the UK on other platforms. The latest data available (as shown in Figure 7) shows that both Sky and Virgin Media have attracted a large number of subscribers to their HD services, in a relatively short time period.

Figure 7: HD subscribers on cable and satellite (Q3 2007)

	Virgin Media	BSkyB
Q2 2006	34,000*	38,000***
Q3 2006	40,000	96,000
Q4 2006	79,000**	184,000
Q1 2007	150,000	244,000
Q2 2007	167,000	292,000
Q3 2007	190,200	358,000

* HDTV service launched in old Telewest areas Feb 2006

** HDTV launched in NTL areas and rebranded from NTL:Telewest to Virgin Media during this quarter. HDTV STB rebranded to V+

*** Sky HD service launched 22 May 2006

- 4.72 New HD services are also developing rapidly in other countries. HD services are available on the satellite platform in a large number of countries, including France, Germany, Italy, the United States, Canada, Japan South Korean and Australia, as well as the UK. HD services are also widely available internationally over cable platforms. There is, to date, less widespread availability of HD services on the DTT platform in other countries, though services are currently available in countries including Australia, the US, South Korea and Japan.
- 4.73 We think it is possible that HD services may be the services most likely to drive widespread and rapid take up of new reception equipment, but are interested to hear the views of stakeholders on this point as part of this consultation.

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?

- 4.74 We believe it is important that there is an opportunity to offer HD services on the DTT platform. Ofcom has received representations from a number of parties suggesting that the best, and indeed the only, way of introducing HD to the DTT platform would be through the use of new spectrum. However, the evidence currently available to Ofcom suggests that the quickest, simplest and least cost method of introducing new services, including HD, to the DTT platform would be to use capacity on the six existing multiplexes, rather than to use new spectrum to build a 7th multiplex.
- The evidence to date indicates that even though the spectrum being released by DSO could be available as DSO rolls out, due to the demands of the complex DSO build out programme, it would be unlikely that build out of a 7th multiplex would start before the DSO programme was completed at the end of 2012 / early 2013. This would mean that new services using this capacity might not be available to consumers until late 2013 or 2014 at the earliest. This compares with potential availability of new services from as early as the end of 2009 using existing spectrum.
 - Further, currently available information shows that the costs of build out and operation of a 7th multiplex could amount to several hundreds of millions of pounds. We believe that this level of cost would be an order of magnitude greater than the cost of introducing new services on the six existing multiplexes, through the proposals set out in this consultation. This is quite apart from the opportunity cost to society of the spectrum used – which could amount to several billion pounds. We believe that avoidance of spectrum and build costs would mean that broadcasters would have more resources available to them to contribute to quality programming.
- 4.75 Ofcom's consultation on the DDR which was published in December 2006, proposed that there was no compelling case for reserving spectrum for HD or SD services on DTT. Ofcom's Statement on the DDR, due for publication later this year, will provide Ofcom's views on whether any spectrum should be reserved for use by HD, by DTT more generally, or for any of the other potential uses of the spectrum.

Policy objectives in relation to the introduction of new technologies

- 4.76 We are keen to see these new developments adopted on the DTT platform as rapidly, and with the minimum level of disruption to viewers and broadcasters, as possible as their adoption would be line with our overall duties and policy objectives as discussed in Section 3. These are considered further below.
- Optimal use of the prime UHF spectrum already allocated to terrestrial broadcasting is an important objective for Ofcom. We believe that introduction of the technologies described above to the DTT platform would very significantly increase the efficiency of use of this spectrum.
 - The range, diversity and quality of television services is also of great importance. We believe that were the technological developments described above to be adopted by the DTT platform; this would provide a substantial opportunity to increase the number and range of services available on DTT, allowing for the introduction of new services to the platform, potentially including HD services.

- Ofcom's primary duty, to further the interests of citizens and consumers in relation to communications matters, and its duty to have regard to promoting choice in the availability of these services, would be furthered through early availability of new reception equipment and new services, through providing more choice to consumers throughout the DSO programme.
- Ofcom's duty to have regard to furthering the purposes of PSB in the UK is also an important element of our considerations in this consultation. The introduction of these new technologies to the platform provides further opportunities to further PSB objectives.

4.77 The following section considers whether the new technologies are likely to be adopted on DTT, and what, if any, role, there might be for Ofcom and Government in this process.

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?

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?

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

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

Section 5

Assessment of future options for DTT

- 5.1 In light of our duties and policy objectives Ofcom has a regulatory interest (see paragraph 4.76) in the commercial and technical development of the DTT platform. We are particularly concerned that the DTT multiplexes make the most efficient use of the UHF spectrum, offer the maximum range and number of services, remain a strong offering providing choice for consumers and citizens, and continue to assist in the delivery of PSB television in the UK. For reasons discussed elsewhere in this consultation we think that an upgrade in the technology used by the platform will assist in the delivery of these objectives.
- 5.2 Therefore in this section we consider firstly the potential gains that a technology upgrade of the platform may offer both viewers and the DTT platform as a whole. This technology upgrade is expected to allow the platform to make more efficient use of the UHF spectrum, and hence allow it to offer a wider range of services to viewers. In considering the potential gains we also take into account the impact of the timing of the upgrade on the size of these benefits.
- 5.3 We then assess whether there are any barriers which might prevent the platform from achieving these gains. For instance the current regulatory regime may affect the choices the platform operators may make. As set out in Section 4 the DTT platform is subject to significant regulation. This regulation reflects, amongst other things, the platform's role in securing wider public policy goals in relation to the availability of PSB content. We believe it is important to consider whether these regulations may have unintended consequences, for example, by reducing the incentives of the platform to bring about a technical upgrade in the most efficient way.
- 5.4 Finally we consider whether any form of regulatory or Government intervention might be desirable in order to either permit or facilitate an earlier upgrade of technologies on the DTT platform than would otherwise happen without any such intervention.
- 5.5 We discussed in Section 4 the technology upgrades which could be adopted by the platform in the near future. In this section we focus firstly on upgrading the platform to use MPEG-4 and DVB-T2, and secondly on the implementation of mode change.

Potential gains from upgrading to MPEG-4 and DVB-T2

- 5.6 In this section we consider the potential gains which may be realised through an upgrade to MPEG-4 and DVB-T2 and how these might be affected by the timing of the upgrade. In doing so we also consider the manner in which this upgrade could be implemented, and identify any implications this may have for the pace of upgrade.
- 5.7 The adoption of both MPEG-4 and DVB-T2 could, if adopted by all multiplexes, increase the capacity of the DTT platform by up to 160%. However, as noted earlier, we expect that for the foreseeable future two of the six multiplexes which carry public service content (Multiplexes 1 and 2) will continue to broadcast using the existing standards (MPEG-2 and DVB-T) to allow viewers to continue to receive these important services using their existing receiving equipment. In this case the increase in the capacity of the platform would be closer to 100%, up to doubling the capacity.

- 5.8 During the upgrade process, we will evaluate carefully any proposals by multiplexes to move to the new technology to ensure that this process does not unacceptably diminish the range, variety and quality of services available to DTT viewers.
- 5.9 At present, the most highly populated multiplexes (Multiplexes A and 2) carry between eight and nine SD channels. The number of services that a DTT multiplex could carry following its adoption of MPEG-4 and DVB-T2 is dependent upon a number of technical factors. Our central assessment is that it would be reasonable to assume that, after the technology upgrade, one multiplex could carry:
- 15 channels of SD content by 2009, rising to 20 by 2012; or
 - Three channels of HD content by 2009 increasing to four by 2012. We believe that it is also credible that a single DVB-T2 multiplex could carry up to five HD services a few years later.

Discussion of Incremental benefits

- 5.10 The potential gains from up to doubling the capacity on the DTT platform are likely to be very significant. For example in their 2006 report assessing the economic impact of the use of radio spectrum, Europe Economics²⁵ estimated that the consumer value generated by terrestrial broadcasting in the UK to be plausibly in the region of £6bn per annum²⁶. Whilst doubling the capacity of the DTT platform would not be expected to double this figure, it is clear that such an increase in capacity would result in significant consumer surplus gains.
- 5.11 We have separately modelled a number of stylised scenarios for how the DTT platform may develop, and the impact this may have upon viewers and the platform itself. This modelling work, and the key assumptions it makes, are discussed in more detail later in this section and in the modelling annex. We summarise the potential impact on consumers and producers that this work identifies below.
- 5.12 **Consumer benefits:** This work suggests that the incremental consumer value which would be generated if the DTT platform were to adopt MPEG-4 and DVB-T2, compared to a scenario in which DVB-T2 is not deployed and there is limited use of MPEG-4, could plausibly be in the region of £15bn over a 25 year period. If we were to take the Europe Economics estimates as a starting point, and conservatively assume that the magnitude of the consumer surplus remains static at £6bn per annum over the 25 year period, a £15bn increase in consumer surplus would represent an increase in the value of the platform to viewers of around 15%²⁷.
- 5.13 **Producer benefits:** The benefits to producers on the DTT platform of increasing capacity are harder to quantify. One particularly important driver of this is the impact that the offering of new services would have on the market share of the DTT platform. In a world where alternative platforms (such as digital satellite and cable) are offering a wide range of new services and technologies (such as HDTV) it seems likely that the market share of the DTT platform would conceivably be lower if the platform did not have the capacity to offer new services.

²⁵ This report is available at:

http://www.ofcom.org.uk/research/radiocomms/reports/economic_spectrum_use/economic_impact.pdf

²⁶ The Europe Economics report identified annual consumer surplus from terrestrial television to be £8,991m. However, in order to obtain a conservative estimate of the consumer surplus we have reduced this figure to reflect the £3,125m paid in licence fees each year.

²⁷ £6bn per annum translates into a consumer benefit of £115bn over a 25 year period (assessed as a net present value using the social discount rate of 3.5%)

- 5.14 Therefore the adoption of new technologies by the DTT platform could result in an increase in the absolute share, or more plausibly in this situation, result in a reduction in the rate of decline of market share of the DTT platform. Our modelling work suggested that even very modest differences in the market share of the DTT platform can create producer gains which are far in excess of the costs of deploying the new technologies. As discussed later in this section a relative boost in DTT platform share of 2% – 4%²⁸ (relative to a counterfactual in which new services are not introduced) could, over a 25 year period, plausibly result in an increase in the value of the platform to producers by in the region of £500m. These benefits include the incremental platform revenue (compared to the counterfactual) adjusted to reflect the costs of the technical upgrade and any relevant incremental costs involved in the production of new services.
- 5.15 These examples are indicative of the potential gains that a move to MPEG-4 and DVB-T2 may realise for viewers and producers. They both suggest that the magnitude of the gains (in particular to viewers) could plausibly be as large as many billions of pounds of economic value.
- 5.16 However, in order to gain an accurate assessment of the impact that this technology upgrade may have it is also important to consider the manner in which this upgrade might occur as this may impact upon the overall size of the gains. For example, there are important differences in the costs of deployment for MPEG-4 and DVB-T2.
- 5.17 In the case of MPEG-4, it is possible that this could be adopted gradually on a service by service basis and be carried on an existing multiplex using DVB-T. This is because a single multiplex could in theory carry a combination of MPEG-2 and MPEG-4 coded services with no impact on existing MPEG-2 receivers (although it should be noted that MPEG-2 receivers would not be able to receive the MPEG-4 coded services).
- 5.18 However, in order to adopt DVB-T2, an entire multiplex will have to be upgraded (resulting in a “step change”). Given that none of the services carried on this DVB-T2 multiplex would be receivable on an existing DVB-T receiver, the upgrade of a multiplex to DVB-T2 will have far more wide-reaching consequences than the adoption of MPEG-4. In order to accommodate such a step change without existing viewers losing out it will be necessary to accommodate any services carried on that multiplex on other multiplexes. Also the revenue for this upgraded multiplex would be low for some time whilst the take-up of new DVB-T2 reception equipment was low.
- 5.19 This suggests that, from a producer perspective, the choice of adoption is potentially complex. For producers there are likely to be pros and cons to adopting both DVB-T2 and MPEG-4 together, compared with adopting MPEG-4 alone or combined with a move to DVB-T2 in the future if demand for capacity warrants this investment.
- 5.20 We believe that at this point in time there are likely to be positive incremental benefits to producers if they combine the adoption of the two technologies together. This is because, if the upgrade to DVB-T2 is not completed in the short to medium-term, the cost to the platform of upgrading to DVB-T2 in the future may be significantly higher.

²⁸ A reduction in platform share of between 2%-4% if the DTT platform is unable to offer new services, such as HD, is relatively modest compared to other estimates of the potential effects of this. For example, in their work for the BBC (available at <http://www.ofcom.org.uk/consult/condocs/ddr/responses/ab/bbcannex.pdf>) Indepem estimated that if the DTT platform were unable to offer new services such as HDTV, its share could fall by an estimated 25%, or alternatively that it would be reasonable to assume in this situation a loss of viewing share for PSB services of in the range of 5%-20%.

This is because of the capacity of the platform is expected to rise as multiplex operators adopt to use the higher capacity 64QAM transmission mode during the implementation of DSO. This is expected to increase the capacity of the platform by approximately 20%.

- 5.21 If DVB-T2 is implemented on one multiplex at the same time as DSO this additional capacity could be used to allow any displaced services to be carried on the platform. If DVB-T2 is adopted later, this opportunity would be lost.
- 5.22 DVB-T2 is still under development, the standard is expected to be agreed by the DVB in spring 2008. Hence, there are likely to be risks involved in adopting this technology in line with DSO. However, we expect that if the technology is introduced in time for DSO in the Granada region (late 2009 / early 2010) this will give sufficient time for consumer and professional equipment to become available. Our discussions with manufacturers of consumer reception equipment indicate that there is a good likelihood that DVB-T2 compliant receivers would be available commercially in late 2009. Therefore, we think that there are likely to be incremental benefits from the introduction of DVB-T2 and MPEG-4 together in the near future.
- 5.23 From the perspective of viewers either option (adopting MPEG-4 and DVB-T2 together or MPEG-4 separately) will require the purchase of a new digital receiver (either a STB or an IDTV). However, as noted above we believe that the maximum efficiency benefits can only be achieved if both are adopted at the same time. We also believe that there may well be benefits to consumers and to the platform in ensuring that the two technologies are adopted at the same time:
- Combining the point at which DVB-T2 and MPEG-4 are available in new reception equipment minimises the number of times that consumers would need to upgrade their reception equipment in order to receive new services. This has the benefit of reducing the potential for consumer confusion and may reduce the number of times a consumer needs to upgrade.
 - The adoption of DVB-T2 and MPEG-4 together maximises the increase in the capacity of the platform at this point which will bring forward the realisation of additional value for viewers. This is particularly so if the DVB-T2 upgrade is carried out in line with DSO. As mentioned above, this would allow the upgrade of one multiplex to this new technology whilst there is sufficient incremental capacity elsewhere on the platform for any displaced services to still be carried.
- 5.24 Therefore, given that we believe that there are incremental benefits from deploying DVB-T2 and MPEG-4 together, particularly if this is completed in line with DSO, we consider only the combined introduction of MPEG-4 and DVB-T2 on (at least) one multiplex on the DTT platform in the remainder of this consultation document. This is discussed further in Section 6 where we consider how a multiplex could be cleared of its existing services.

Maximising take-up of compatible receivers

- 5.25 As there are currently no DVB-T2/MPEG-4 compatible digital receivers in the market a technology upgrade to DVB-T2 and MPEG-4 would mean that any services launched using these technologies would have to build up a new market by persuading viewers to purchase suitable receivers. In order to maximise take up, the services carried on the converted multiplex would therefore need to be appealing to these viewers, and manufacturers would need to be able to produce products at suitable prices at or around the service launch.

- 5.26 If a strategy of converting one multiplex to DVB-T2/MPEG-4 in order to drive take-up of new receivers by viewers is successful, it is expected that over the longer term there would be significant benefits through the resulting increase in capacity for that multiplex. There would also be benefits for the platform as a whole, as once one multiplex has converted and built up a reasonable degree of penetration of compatible digital receivers, there would be a strong incentive for other multiplexes to convert. They would not see the initial drop-off in audience experienced by the first converting multiplex, but would still see a significant increase in capacity.
- 5.27 It is important to be clear that Ofcom is proposing that multiplexes providing core PSB services will need to remain using DVB-T and MPEG-2 technologies for the foreseeable future, to ensure continued access to these services for all UK citizens. We consider that this would require that Multiplex 1 (BBC) and Multiplex 2 (Digital 3 & 4) would remain using DVB-T and MPEG-2 technologies for the foreseeable future. Additionally, we would propose to carefully consider proposals by other multiplexes to move to the new technologies, to ensure that the proposals do not unacceptably diminish the range, variety and quality of services available to DTT viewers.
- 5.28 As discussed earlier and in Section 4, we think the upgrade to DVB-T2 and MPEG-4 on the DTT platform is likely to generate substantial benefits, particularly for viewers but also for producers. In addition, we think there are reasons to suggest that the timing of this upgrade could impact upon the size of the potential gains. In particular, we believe that there would be benefits from implementing the upgrade in time for switchover in the Granada region, which is due to take place in late 2009 / early 2010.
- 5.29 This is because this is likely to increase the value of the upgrade to viewers by reducing the overall cost and disruption to them of moving to the new technology and increase their benefits by bringing forward the availability of new services such as HD on the DTT platform. This timing is also likely to reduce the costs to the platform of moving to the new technology, as the capacity becoming available from the mode change at DSO can be used to allow a multiplex to be converted to DVB-T2 without the loss of services which would be displaced from these multiplexes.
- 5.30 Therefore, to summarise, whilst the upgrade of the DTT platform to use MPEG-4 and DVB-T2 is not straightforward, we believe that is likely to result in a substantial increase in the value of the platform, particularly to viewers. We also believe that the most efficient timing for the implementation of this upgrade would be for these two technologies to be introduced together as soon as possible, and that this could happen in time for switchover in the Granada region in late 2009 / early 2010.
- 5.31 Given the size of the potential benefits from this upgrade, and Ofcom's policy objectives, which mean that it has an interest in the development, both commercial and technical, of the DTT platform, we now consider whether there are any potential barriers to the move to MPEG-4 and DVB-T2 on the platform. In particular, given the specific institutional and regulatory arrangements relating to the platform, we consider whether, in the absence of active regulatory intervention, it may take longer for the parties involved to secure agreement on the upgrade despite there being benefits from upgrading in a timely manner.

Evolution without intervention – potential impact on viewers

- 5.32 If there are potential barriers to the DTT platform implementing a significant technology upgrade, which result in either a failure to adopt a new technology or

inefficiencies in the timing and/or scope of the upgrade, then it can be argued that there is a risk of market failure.

5.33 As suggested by our analysis above, there are likely to be positive benefits to producers on the DTT platform from moving to DVB-T2 and MPEG-4 in the long term. However, there is evidence to suggest that the platform may face barriers to the deployment of this beneficial technological upgrade, which impact upon whether the technology is deployed in a timeframe which allows the benefits of the upgrade to be maximised. This is due to a combination of the following factors:

- The nature of the upgrade suggests that there are likely to be **indirect network effects between viewers**. This form of network effect is often associated with an inefficient delay in the introduction of new technologies and services. This problem is likely to be exacerbated on the DTT platform owing to the following two factors.
- The **complexity of transactions required and existence of externalities** between stakeholders in the DTT platform may create the potential for delay and free-riding on others' activity.
- The **institutional and regulatory arrangements** relating to the platform mean that parties' incentives may constrain the pace of the platform's development or its ability to deliver an efficient outcome sufficiently rapidly.

5.34 The impact of each of these factors is assessed below.

Indirect network effects between viewers negatively impacting upon the timing of the deployment of new technologies

5.35 Given the nature of the upgrade to MPEG-4 and DVB-T2 on the DTT platform there are likely to be indirect network externalities between viewers which take the form of a bandwagon effect²⁹. Bandwagon effects increase the benefits that consumers derive from a product or service as the user set expands. These are present in the case of an upgrade to MPEG-4 and DVB-T2 as consumer take-up of new STBs is a driver for additional multiplexes to convert to the new technology, which will in turn increase the benefits which all viewers with one of the new STBs receive.

5.36 When bandwagon effects are present this can result in a "start-up" problem. This is a problem which can delay or prevent the wide spread adoption of a new technology, as for the bandwagon effect to get started the service needs to reach a critical mass of consumers. If this point is not reached, the new technology may never take-off or alternatively may be subject to significant delay.

5.37 In the presence of bandwagon effects the start-up problem can generally be avoided if the products offered are particularly compelling and hence allow the critical mass to be achieved. Other options for solving the start-up problem include:

- Integration between suppliers who are affected by the bandwagon effect, which can result in coordination between these parties to help overcome start-up problems, for example offering subsidies on consumer equipment can result in this form of externality being internalised.

²⁹ Bandwagon effects and their impact are discussed in Rohlfs, (2003), "Bandwagon Effects in High Technology Industries", MIT Press.

- In some cases Government intervention to overcome bandwagon externalities can be justified. For example, through removing barriers to the extensive deployment of the new technology.

5.38 Therefore, there are often solutions to bandwagon effects which can result in the start-up problem being overcome. On other broadcasting platforms bandwagon effects which would have been generated by the introduction of comparable technologies (eg DVB-S2) appear to have been overcome. In relation to the upgrade to MPEG-4 and DVB-T2 on the DTT platform these solutions could include:

- Coordination between multiplex owners to ensure that a sufficiently compelling service is offered using the new technology to ensure that a critical mass of viewers is achieved.
- Coordination between multiplex owners and manufacturers of the STBs and other consumer equipment to ensure that the equipment is offered at a sufficiently low price to kick-start the take-up process and allow a critical mass to be achieved. This process is likely to be more difficult on a free to view platform, such as DTT, than on subscription platforms, where there is a direct link between the viewers and platform owner which can help to facilitate a speedy replacement of consumer equipment, fuelled by the offering of subsidies.
- Finally, if no commercial solution appears workable, it may be possible for intervention by a relevant party, in this case Ofcom and/or the Government to overcome the externality, for example, by intervening to require the provision of services which are sufficient to allow a critical mass to be achieved.

5.39 The following two potential barriers to the technology upgrade (externalities between multiplex owners and institutional and regulatory arrangements) both impact upon whether the first two solutions presented above are likely to be realisable in practice.

Complexity of transactions and existence of externalities between multiplex operators

5.40 As discussed earlier, the technical upgrade to DVB-T2 requires an entire multiplex to be converted in one go (whereas MPEG-4 can be introduced more gradually). When a multiplex is converted to DVB-T2 the services which are carried on the converted multiplex will only be receivable by those viewers who have acquired the new consumer equipment. This has two effects. Firstly, it imposes a significant cost on multiplexes which are early to switch to the new technology (the value of their capacity will be significantly lower than previously until the take-up of boxes increases). Secondly, those services which were originally carried on the multiplex which converts will no longer be receivable by viewers who have not yet purchased the new reception equipment. Therefore, if these displaced services wish to retain their existing viewer base they will need to find sufficient capacity on a multiplex which is still broadcasting using the old technology. These two effects mean that there may be a complex web of transactions which are required in order for the relevant parties to all agree to the upgrade. For example, if a multiplex owner took the view that the technology upgrade were net beneficial, in order to implement the upgrade, it would potentially have to complete a number of transactions including:

- securing agreement of the channels currently carried on their capacity to a termination of their carriage contracts;

- if the displaced channels wish to retain their viewer base, helping to secure agreement with other multiplex owners to carry these displaced channels, (or, alternatively, compensating the channels for loss of access to the DTT platform altogether); and
 - securing agreement with other multiplex owners to share the initial costs of the technology upgrade (in terms of lower audience share for the first multiplex to convert) in return for a sharing of the longer term capacity benefits to the platform as a whole. This transaction would be required if the externalities between multiplex operators need to be internalised for the upgrade to go ahead.
- 5.41 In addition to these transactions, as discussed above, it may be necessary for a number of the parties to agree to coordinate in order to internalise the indirect network effects between viewers (ie the bandwagon effects).
- 5.42 These transactions might be difficult to complete rapidly:
- the broadcasters currently being carried on the upgrading multiplex may perceive an opportunity to capture some of the benefit of the technology upgrade in return for terminating their existing carriage contracts;
 - the other multiplex owners may also seek to capture more of the benefit in return for accommodating the displaced channels; and
 - it may be difficult to secure agreement to share the costs of the upgrade with the other multiplex owners, and to internalise the bandwagon effect, as they may individually face an incentive to free-ride on the costs being borne by the first converting multiplex.
- 5.43 Finally, securing rapid agreement may be made even more difficult by uncertainty in relation to a number of key future value drivers, such as the number of additional channels the new technology will allow at a given point in time and the level of consumer demand for new services.
- 5.44 While any single one of these problems may not be sufficient to prevent the successful conclusion of the private transactions (including the internalisation of the relevant externalities) required to bring about a beneficial technology upgrade in the long-run, taken together they suggest that there is a significant risk of delay to the process.
- 5.45 One factor which makes these transactions, and hence agreeing to coordinate, difficult is the structure of the platform, in particular the fragmented nature of the control of the platform and the vertical integration of the some broadcasters and multiplex owners. This platform structure was put in place in response to regulatory and Government decisions made about the role of the platform. These issues, alongside other impacts of the regulatory framework are discussed in the following section.

Institutional and regulatory arrangements affecting incentives for expanding the capacity of the platform

- 5.46 As discussed in Section 4 and later in this section, there are number of regulatory constraints which might impact upon the pace at which the platform is incentivised to bring about a technology upgrade. Regulatory constraints which are likely to be of particular importance include:

- Limitations on control of multiplexes, including the prior allocation of some capacity to PSBs. This decision has resulted in the fragmented structure of the platform, which creates the requirement for coordination between different multiplex owners.
- The requirement on the three PSB multiplexes to carry certain PSB content. This decision may impact upon the financial incentives these multiplexes have to bring about a technological upgrade and hence may reduce the ability of the platform to engage in a collective (coordinated) upgrade process.
- Regulations on the technical standards to be used on the platform. Among other things, this requires that services are broadcast using MPEG-2 and in SD format. These currently prevent the adoption of new technologies. Whilst it may be possible to replace these restrictions to allow the upgrade of the platform, we anticipate that, for the foreseeable future, at least two of the multiplexes will need to remain operating with the old technology in order to ensure continued reception of services for existing viewers. This restriction is likely to reduce the realisable benefits from the upgrade for some of the multiplex owners, which may reduce their incentives to engage in the upgrade process. This will affect the ability of the multiplex owners to achieve a coordinated outcome.

5.47 The fragmented control of the platform and the choices made about the institutions which currently own multiplex capacity have had a number of profound effects upon the incentives of the platform:

- This has resulted in differing relative levels of incentives across multiplex owners. Whilst some of the capacity holders are profit-oriented (e.g. National Grid Wireless), others such as the BBC are, owing to the regulatory environment, not for profit. These differences appear to have had a noticeable impact on the relative incentives of the multiplex owners to maximise the use of their capacity in the past. For example, the BBC has historically used capacity only for its own services, meaning that for periods of time capacity has been less than fully used – for example, it has taken a period of time for the BBC to fill the capacity available on Multiplex B.
- For the reasons discussed above the decision to make the control of the DTT platform fragmented imposes the coordination requirement on the multiplex owners if they are to bring about a technology upgrade such as MPEG-4 and DVB-T2.

5.48 Another decision made in relation to the development of the platform which can impact on the incentives of operators to introduce new technologies is the decision to allow vertical integration between multiplex owners and broadcasters. The operators of Multiplexes 1, B, 2 and A (BBC, Digital 3 and 4 Ltd and SDN) are vertically integrated. This may create different incentives to those of a “pure” multiplex owner. Vertical integration may mean that the operators might have greater incentives to hold on to capacity rather than sell it to someone whose service will compete with their own.

5.49 Finally, the requirement to carry some services in MPEG-2 / DVB-T, to ensure that PSB services can be received using existing equipment, will reduce for the foreseeable future the potential gains that are available to those multiplex owners which are required to remain at the existing technology.

5.50 Taken together these factors suggest that the coordination problem faced by the DTT platform is made significantly more complex by the regulatory structure within which the platform operates and by decisions which have been made in relation to the institutional arrangements for the multiplex owners. These decisions are the main determinant of the fragmented structure of the control of the platform, and mean that the multiplex owners are likely to face differing financial and strategic incentives for engaging in the upgrade process. This is important as it may mean that parties assign different values to the creation of increased capacity in the longer term. Therefore, given the need to coordinate in order to bring about a technology upgrade such as DVB-T2, the pace of the upgrade may be constrained by the party with the weakest incentives to bring it about.

Likely impact of the potential barriers to technological upgrade

5.51 Taken in the round, the analysis set out above suggests that there is a risk of market failure. It appears that absent any intervention, the DTT platform may not secure agreement to allow the optimal introduction of a technology upgrade, such as the upgrade to MPEG-4 and DVB-T2, to maximise the benefits to consumers. The key reasons for this are as follows:

- The upgrade to DVB-T2 and MPEG-4 is complex – it is likely to involve a number of externalities which would need to be internalised (not least indirect externalities between viewers which are likely to result in a bandwagon effect).
- There is a web of transactions which may be involved in bringing about the upgrade process – the successful realisation of these transactions is made difficult by differences in the financial incentives of the different parties and by the potential for strategic behaviour owing to the structure of the platform.
- Many of these complexities are in large part due to the regulatory environment the platform faces, and the impact of this on the platform structure (namely its fragmented nature) and the differences between the institutions which own capacity on the platform.

5.52 Taken together these issues may not be enough to prevent the platform from moving to a new technology where the upgrade would result in significant benefits to the platform. However, these issues all suggest that there is at least a risk of delay. This is not least because of the presence of bandwagon effects, which are known to be a likely cause of delay if the platform is unable to co-ordinate to internalise these effects. As we mentioned earlier we think there are reasons why the timing of the upgrade is potentially strongly related to the overall gains which are realisable. Hence, this suggests that a delay in the upgrade process could be a cause of concern.

5.53 To date, Ofcom has been engaging actively with the relevant parties to understand how the technology upgrade might best be brought about. We have:

- Commissioned technical work to ensure all parties have a full understanding of the complex technical issues involved. This work is published alongside this consultation;
- Held a number of meetings with broadcasters and multiplex operators on the DTT platform in order to discuss and consider the most appropriate ways in which an upgrade might take place; and

- Engaged with a number of manufacturers of consumer reception equipment (STBs and IDTVs) to ensure we have the most up to date and full knowledge of the technological developments and potential timing of commercial availability.

5.54 It may be that the market failure drivers discussed above do not materialise as real constraints, and that this facilitative role will be sufficient to remove any barriers to the technology upgrade being undertaken. As part of this consultation, we are seeking the views of the relevant parties, and of other interested parties, in whether this is possible or likely. However, it may equally be the case that some form of proactive regulatory intervention is required to ensure that an efficient upgrade takes place. In order to assess whether intervention may be justified we first need to consider how significant the consumer and citizen detriment may be from a delayed introduction of new technologies.

Significance of potential barriers to technological upgrade

5.55 In order to illustrate the magnitude of the potential cost arising from a technology upgrade being delayed, we have modelled the likely value to consumers and producers of different scenarios for the evolution of the DTT platform. Since this evolution is inherently uncertain, we have considered three different stylised scenarios – deliberately chosen to represent a wide range of potential future outcomes:

- **Scenario 1 – no DVB-T2, limited MPEG-4:** under this scenario, the DTT platform does not convert to DVB-T2 technology. MPEG-4 is adopted for a small number of channels only, and as a result, customer uptake of compatible STBs is relatively low.
- **Scenario 2 – slow adoption of DVB-T2 and MPEG-4:** under this scenario, MPEG-4 capable boxes begin appearing on the market but take-up is held back by the lack of content utilising the new technology. Eventually the commercial attractiveness of using new technologies reaches a level where one multiplex is cleared for DVB-T2. In this scenario, the new content on the cleared multiplex is sufficient to encourage uptake of DVB-T2/MPEG-4 STBs. However, take-up remains slow in the early years.
- **Scenario 3 – fast adoption of DVB-T2 and MPEG-4:** this scenario is similar to Scenario 2, but initial intervention eliminates the delay in the adoption of DVB-T2. As a result of the earlier technology upgrade and corresponding content, customer uptake of STBs is quicker. As the penetration of DVB-T2 capable equipment increases faster than in Scenario 2 above, further multiplexes move more quickly to adopt DVB-T2 and this correspondingly increases the uptake of boxes. Depending upon the level of demand for new services, multiplex conversion to DVB-T2 starts 5-10 years earlier than in Scenario 2. This period of delay is followed by a period of around a further 5 years during which the delay scenario catches-up until the two scenarios converge.

5.56 As noted earlier in this document, Ofcom proposes that multiplexes providing core PSB content should not adopt DVB-T2 or MPEG-4 for the foreseeable future. Hence the modelling assumes that two of the six multiplexes remain operating with DVB-T and MPEG-2 for the entire period modelled (which is 25 years).

5.57 These stylised scenarios were chosen as we judged that a comparison between Scenarios 1 and 3 would provide an illustration of the potential size of the gains from the combined upgrade to DVB-T2 and MPEG-4. In addition, a comparison between

Scenarios 2 and 3 provide a reasonable illustration of the potential effect of a delay in the upgrade process. In the next few paragraphs we set out some of the key factors which were incorporated into the modelling and then discuss our illustrative results for the potential costs of delay.

- 5.58 In order to model these stylised scenarios we have necessarily made a number of assumptions about the likely demand for new capacity on the DTT platform. For example, for the purpose of the modelling we have assumed that the new service which is used to drive take-up is HD channels, which are assumed to be simulcasts of existing content available on the platform. Given the level of uncertainty we have modelled a number of different potential outcomes for each of the stylised scenarios. Some key assumptions used in our modelling are set out in the modelling annex.
- 5.59 We believe the approach taken to the modelling is both reasonable and conservative:
- The modelling is based on there being an initial compelling consumer proposition which kick-starts a virtuous circle. This type of behaviour has been proved in DTT's own history (with the advent of Freeview which resulted in a significant uplift in take-up), and more generally in most markets that are subject to some type of network effects. Given the nature of the start-up problem faced by the DTT platform we believe that a delay of around 5-10 years in the introduction of the new technology absent intervention is not unreasonable.³⁰
 - We used conservative assumptions on gains for consumers and broadcasters, and whilst we have also made conservative assumptions about the responsiveness of the platform (which are reflected in the period of delay which results absent intervention), we believe these are reasonable given the barriers to adoption discussed earlier in this section.
 - Additionally, in order to arrive at a conservative estimate of the potential costs of delay, Scenario 2 was chosen as the base case (ie the outcome for the platform in the absence of any intervention) and Scenario 3 the case arising from intervention to facilitate the move to DVB-T2. This is conservative as it assumes that the platform is able to move to the new technologies, just over a longer time period. If we were to assume that the scale of the adoption also varied, the magnitude of the cost of delay would have been greater.
- 5.60 Table 1 below shows the additional benefits that arise for consumers from Scenario 3 (early adoption) over Scenario 2 (delayed adoption). This comparison was made under two different underlying cases for the demand for HD services, one where there is moderate initial demand, and one where initial demand is greater. When demand for HD services is greater then broadcasters will have greater incentives to expand capacity more quickly than if demand is more modest.
- 5.61 These benefits to consumers of removing a delay in the adoption of the new technologies are substantial.

³⁰ However, our modelling work suggests that even if the delay was only around 2 years the incremental consumer benefit of reducing delay would still be significant.

Table 1: Consumer benefit of early adoption (incremental benefit of Scenario 3 over Scenario 2)

25 year NPV	High initial demand	Moderate initial demand
Additional consumer surplus	£3bn	£5bn

5.62 Whilst these figures are significant, they represent a relatively modest increase in the consumer surplus generated by terrestrial broadcasting as a whole. The work completed by Europe Economics (as mentioned above) to assess the economic value of spectrum, would suggest that the consumer surplus generated by the terrestrial platform as a whole over this period could be in the region of £114bn.

5.63 Note that the incremental benefits of the reduction in the delay are lower in a high initial demand scenario. While this may seem counter-intuitive, it reflects a reasonable hypothesis: that, if demand for HD is high, broadcasters and network operators will be quicker to act, in their own interest, to start the process of upgrading the platform. If demand is somewhat lower, it becomes more plausible to think that the industry response could be much slower, and therefore action from the regulator becomes more relevant. We believe that these timing effects are likely to outweigh the assumed lower average benefit per viewer in the moderate initial demand scenario.

5.64 Table 2 below shows the additional benefits to producers on the DTT platform under Scenario 3 as opposed to Scenario 2.

Table 2: Incremental producer benefit generated by DTT platform (Scenario 3 v Scenario 2)

NPV of additional benefits (£m)	High initial demand	Moderate initial demand
2% platform boost	£325m	£225m
4% platform boost	£725m	£650m

5.65 These additional benefits, which take into account the costs of moving to the new technologies and any relevant incremental costs involved in the production of new services, arise from the increased attractiveness of the DTT platform as a result of the extra HD and SD content available under Scenario 3. The overall viewing share of the platform is modelled as being 4% higher under Scenario 3 than in Scenario 2. As a sensitivity we also include values for platform producer benefit if this increase is only 2%. Whilst the producer benefits shown are the result of an increase in platform share this is an increase relative to what the platform share would have been in the counterfactual. Hence, this is actually represented in our model by the share of the platform falling less than would otherwise have been the case, owing to the earlier availability of new services.

5.66 From this modelling, it is clear that there is substantial potential benefit to consumers and the DTT platform as a whole resulting from the increase in capacity brought about by a rapid technology upgrade to DVB-T2 and MPEG-4 – the cost of a delayed

uptake (to both consumers and producers) would appear to be between £4bn and £6bn (over a 25 year period)³¹.

- 5.67 This assessment does not explicitly include the benefit to viewers of the new digital receivers being available during the DSO process. As highlighted earlier, one of the benefits of bringing forward the upgrade is that through the DSO process, customers will be buying STBs in significant numbers (even if they have already purchased a STB for their main television, they may need to purchase boxes for other sets). Hence, if the technology upgrade were to be undertaken quickly, a large number of consumers may be able to move straight to a DVB-T2 and MPEG-4 compatible STB rather than having to purchase a DVB-T and MPEG-2 box and then purchase a new box in due course.

Intervention options

- 5.68 In this section we consider whether there are intervention options which could reduce the risk of a significant delay in the introduction of DVB-T2 and MPEG-4 on the DTT platform.
- 5.69 Where there is a significant risk of market failure, it is important to consider whether regulatory or Government intervention could cost effectively resolve this market failure. In considering the options for intervention it is important to consider the extent to which such interventions carry the risk of regulatory failure.
- 5.70 Regulatory failure is in many ways the counterpart of market failure. It is the probability that a regulatory intervention does not have the outcome that was intended, because the benefits are less than expected and/or the costs (static and dynamic) are larger.
- 5.71 Even in the presence of a material market failure, if there is a significant risk of regulatory failure in relation to the corrective regulatory intervention options, it may still be preferable not to intervene.
- 5.72 We have identified that there are two broad categories of intervention option. These are firstly to deregulate and secondly to intervene to require the technology upgrade. These categories were identified as possible solutions because:
- Our analysis above suggested that one of the significant barriers to the speedy adoption of new technologies may be the regulatory structure of the platform. Therefore, it is appropriate to consider whether this issue can be effectively resolved through the removal of some of this regulation.
 - An alternative option, if we were to identify that deregulation was either ineffective or unduly costly, would be to intervene to move the platform to the point where significant coordination is no longer required in order to bring about the upgrade to MPEG-4 and DVB-T2. As noted above, particularly when bandwagon effects are present, intervention may be justified if commercial solutions to internalise these effects are not available. In order to minimise the risk of regulatory error in

³¹ The £4 to £6bn includes the incremental producer value on the DTT platform. From a total welfare perspective, much of the producer benefit may be a transfer of value from other platforms rather than an increase in overall producer value. Hence, to assess the incremental welfare effect of the change this value should be excluded. However, even if all of the producer benefit is excluded, the overall benefit of reducing delay is clearly still significant as the consumer benefit amounts to £3 to £5bn.

these situations is it important for the intervention to mimic where possible the sort of outcome which a commercial solution may have reached.

Intervention options - deregulation

- 5.73 As we noted above, the DTT platform is the subject of a significant level of regulation – it may be that this regulation could hamper developments which would result in a rapid technology upgrade.
- 5.74 As we set out in Section 4, the relevant regulatory constraints in this context are likely to include:
- Limitations on control of multiplexes, including the prior allocation of certain capacity (on Multiplexes 1, 2 and A) through Royal Charter and secondary legislation, and the prior allocation of Multiplex B to the BBC in 2002 under the BA96;
 - the requirement on the three PSB multiplexes to carry certain PSB content;
 - obligations on the level of coverage to be provided by certain multiplexes; and
 - regulations on the technical standards to be used on the platform. Among other things, this requires that services are broadcast using MPEG-2 and in SD format.
- 5.75 A first level of deregulation might involve the removal of any of the technical requirements for the platform to use MPEG-2, DVB-T and SD.
- 5.76 This may lead to some conversion to MPEG-4, as this can be done on a channel by channel basis, and would not involve the clearing of an entire multiplex and the significant associated cost in terms of lost audience share and hence of value of capacity. However:
- it could result in a negative outcome for customers, as it would remove the protection currently in place that ensures that they can continue to receive services using their existing STBs; and
 - DVB-T2 would be unlikely to be adopted quickly due to the step change nature of the upgrade that would be required (ie an entire multiplex would need to convert), as the issues noted above driving the market failure would still exist.
- 5.77 We therefore do not believe that a relaxation of the technical conditions relating to the platform would result in the technology upgrade which we consider to be most beneficial.
- 5.78 A more significant deregulation would involve removing further levels of regulation to allow further changes in multiplex control, which might enable one party to control all of the multiplexes. This would remove the issues around the lack of financial incentives on some multiplex owners and reduce or remove some of the issues relating to the complexity of the transactions required to achieve the technology upgrade.
- 5.79 However, such deregulation would constitute a major change to the legal and regulatory framework. It would require major changes to the BBC Charter (eg to enable Multiplex 1 to be controlled by an organisation other than the BBC) and to secondary legislation (eg to enable Multiplex 2 to be controlled by organisations other

than the Channel 3 and Channel 4 DRL holders). It would also be likely to require wider changes in policy towards commercial PSB and the BBC. For example, alternative mechanisms might need to be found to ensure that the purposes of public service television broadcasting in the UK continued to be fulfilled.

- 5.80 It is therefore difficult to conceive of a deregulatory option which would address the problem without creating the need for significant policy change in other areas.

Intervention options: requiring technology upgrade

- 5.81 In the absence of a readily available deregulatory approach to the drivers of the market failure, a more direct approach would involve Ofcom and the DCMS jointly intervening to ensure that one multiplex is cleared (with the displaced channels being accommodated elsewhere) and then immediately upgraded to DVB-T2 and MPEG-4.

- 5.82 This would clearly address the issues related to the possible delay in the upgrade. However, given it is more interventionist, it is important to consider the associated risks of regulatory failure, and whether these might outweigh the potential benefits of the upgrade.

- 5.83 The areas where there could be a risk of regulatory failure associated with the intervention are as follows:

- **the costs turn out to be higher than the benefits:** it may be that the intervention is misplaced – i.e. that the technology upgrade was not net beneficial to start with, the opportunity cost of the cleared capacity was greater than the value secured through the technology upgrade, and therefore it should not have taken place (and, indeed, would not have taken place had it been left to the stakeholders alone³²);
- **the timing was wrong:** it may be that the upgrade was undertaken at the wrong time – i.e. that the net benefits would have been higher had the upgrade been undertaken later (eg because of growth over time in the demand for incremental capacity);
- **the costs of the upgrade are higher than they needed to have been:** assuming that all displaced channels are relocated on other multiplexes, the relevant direct costs relate only to any loss of coverage of displaced channels and any transaction cost in undertaking the upgrade – these might be higher than they needed to be if, for example, the wrong decision was made as to which multiplex should be cleared and upgraded; and
- **the benefits are lower than they could have been:** as a result of the way in which the upgrade is carried out, it is possible that benefits are lost (e.g. if the timing of the intervention results in the upgraded capacity not being available to allow screening of key events which may have driven new box uptake – such as the 2010 FIFA World Cup, or the 2012 Olympics – and as a result box uptake remaining at a lower level than would otherwise have been the case).

³² Even if there is now a view among stakeholders that the upgrade would be beneficial, if its implementation were delayed, there would be a possibility that new information emerged during the period of delay which changed this view.

5.84 We have considered these sources of regulatory failure, and for the following reasons we do not believe that their impact will be unreasonably high. This is because:

- There appears to be a general level of agreement in the industry on the existence of benefits that could be achieved as a result of an upgrade in technologies used by the DTT platform.
- Equally, we have modelled a wide range of scenarios for possible platform evolutions when assessing the level of potential benefits. While uncertainty still clearly exists, this provides at least some evidence to suggest that the first of the regulatory failures described above should not be an issue.
- Similarly, we have carefully considered the most appropriate way of achieving the upgrade, there is a degree of consensus among the parties as to the most effective technical solution.
- Finally, it is possible that the intervention could be accompanied by actions to mitigate some of the risks of regulatory failure, in particular related to ensuring that the benefits envisaged are actually achieved.

5.85 Given the size of the potential benefits of a rapid (rather than a delayed) upgrade identified by our modelling, it therefore seems unlikely that these risks – if appropriately managed – would outweigh the potential intervention benefits.

Question 6: do you agree that some form of intervention is required in order for the DTT platform to commence an upgrade to new technologies without delay?

Intervention for a technical upgrade

5.86 In order to gain the fullest benefits from the upgrade, and to maximise consumer choice throughout the DSO process, Ofcom therefore proposes that it should, with DCMS, intervene to upgrade one multiplex to DVB-T2 and MPEG-4. We would expect that this would commence a virtuous circle that should encourage other DTT multiplexes to upgrade to these technologies in time. As discussed earlier, this virtuous circle would result as we would expect the intervention would act as spur to consumer take-up, which be expected to tap into bandwagon effects and which would result additional multiplexes being incentivised to upgrade to the new technology, which would further drive the bandwagon effect.

5.87 It has also been put to us that some services could launch using MPEG-4 immediately, as the technology and compatible digital receivers are already on the market in other parts of Europe. As discussed in Section 4, Ofcom could intervene to allow the early adoption of MPEG-4 for certain services. Such an early adoption of MPEG-4 coding would obviously bring some efficiency benefits to those services and multiplexes that adopted it.

5.88 However, such a move could also mean that consumers could be confused by a variety of differently specified digital receivers appearing on the market over the next few years and any such consumer confusion could result in a slowing in the take-up of such boxes and hence limit the benefits that these proposals are designed to bring about. As noted in Section 4, it may also limit the ability of the platform to upgrade later to DVB-T2. Ofcom would therefore like to hear from organisations that are interested in launching MPEG-4 only services on one or more multiplexes and would be especially interested in receiving views as to how such an early adoption would

avoid undermining the proposed transition to a more efficient combined MPEG-4/DVB-T2 launch in 2009.

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?

- 5.89 As noted in Section 4, Ofcom regulates the technical standards which can be used on the DTT platform. We would propose to add the technical profiles for SD and HD versions of MPEG-4 and DVB-T2 to the list of permitted standards for DTT in spring 2008 (once the DVB-T2 standard has been finalised). Ofcom's consent would be required before these technologies could be adopted on the DTT platform. We will consult formally on this emerging thinking in due course.
- 5.90 If the proposed intervention is pursued, Ofcom believes that a multiplex will need to be chosen to be upgraded – for the reasons set out above regarding initially low penetration of receivers and consequent impact on multiplex revenues, we would not expect that there would be volunteers.
- 5.91 In choosing which multiplex should be upgraded, Ofcom has considered two important criteria:
- The number of services on the upgraded multiplex should be as low as possible, due to the need to accommodate these on other multiplexes. The lower the number of services that need to move between multiplexes, the simpler the reorganisation process will be. While we consider the full range of services on each multiplex, we have focussed on the number of SD services, given that these services are the most demanding in terms of their need for capacity (and are therefore the most challenging to move between multiplexes).
 - The level of coverage of the upgraded multiplex is also an important consideration. Given the need for consumers to acquire new reception equipment to receive services on the upgraded multiplex, we believe there are a number of reasons which point to the benefits of the upgraded multiplex being available universally:
 - it would be far simpler, as it would significantly reduce the potential for consumer confusion around availability of services as DSO progresses;
 - it would reduce the potential to further the creation of a digital divide, under which some consumers would be able to receive new services while others could not;
 - it would also create the best opportunity to drive rapid sales of receiving equipment, which would ensure that the virtuous circle referred to above would be more rapidly developed.
- 5.92 Ofcom has therefore considered the six existing DTT multiplexes against these criteria, in order to develop a view of which multiplex should be cleared and upgraded to DVB-T2 and MPEG-4.
- 5.93 The multiplexes which currently carry the fewest SD services are Multiplexes B and C – Multiplex B carries three SD-equivalent services, while Multiplex C carries five. .

- 5.94 In order to choose between these two multiplexes, we apply our second criteria: the level of coverage of the multiplexes. Multiplex B offers universal coverage, whereas Multiplex C does not. For the reasons set out above, we believe it is preferable to upgrade a universal coverage multiplex, and we therefore believe that Multiplex B is the most appropriate multiplex to be cleared and upgraded within this process.
- 5.95 Ofcom does not underestimate the complexity involved in moving services between multiplexes, and has conducted a very significant body of research and analysis to determine the most appropriate way in which this should be done. This is considered in detail in the following Section.

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?

Question 9: do you agree with Ofcom's proposal that Multiplex B should be cleared and upgraded to new technologies?

Mode Change

- 5.96 We noted in Section 4 that four of the multiplexes currently operating at 16 QAM will have the opportunity to upgrade to 64 QAM at DSO, thus increasing their capacity by 6Mbit/s each (this process will add the capacity equivalent to more than an additional multiplex to the DTT platform).
- 5.97 We believe that this mode change presents a very significant opportunity for the DTT platform to grow and enhance its position, and for spectrum to be used much more efficiently. In line with our duty to promote the optimal use of the electro-magnetic spectrum, we fully support the mode change of all multiplexes to 64 QAM.
- 5.98 Given the opportunity to increase the amount of (valuable) multiplex capacity, we believe that there are strong incentives for multiplex operators to change mode to 64 QAM at DSO. We also note that our analysis of the implementation of an efficient and timely upgrade to MPEG-4 and DVB-T2 is in part dependent upon the realisation of the mode change benefits. This is because they will allow additional capacity to be created which can be used to carry services which may be displaced from the first multiplex to convert to DVB-T2. Given the role which the mode change may play in facilitating the early adoption of MPEG-4 and DVB-T2, and the potential benefits which could result from this, we believe it is important to ensure that mode change happens in a synchronised fashion across the multiplexes. This will maximise the opportunities for this capacity to act as an enabler for the greater benefits available from the upgrade to new technology.
- 5.99 We also note that, whilst there are likely to be incentives for the multiplex operators to implement mode change, in certain circumstances, for example due to certain forms of contracts for carriage, multiplex operators may not in fact be incentivised to change mode, or may have incentives to move to this on differing timescales. This might arise, for example, if a broadcaster has secured a contract for carriage in terms of a proportion of the overall capacity on the multiplex, as opposed to a fixed amount of capacity. In this situation, the multiplex operator may end up sharing the benefits of the capacity arising from the mode change, rather than being able to take the full benefits of this upgrade.

5.100 Given the strong benefits in terms of spectrum efficiency that can be realised upon mode change, and particularly given the role these efficiencies may play in facilitating an early move to MPEG-4 and DVB-T2, Ofcom believes that mode change should be required rather than optional in order to bring about a synchronised implementation across the remaining multiplexes. To be clear, we believe that in the majority of cases, multiplex operators will be incentivised to change mode; however, we propose to require that all multiplex operators licensed by Ofcom should change mode at switchover, in order to ensure that consumers and citizens can gain the maximum benefit from the valuable spectrum already allocated to broadcasting being used as efficiently as possible. We would welcome views on this proposal.

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

Section 6

The multiplex reorganisation process

- 6.1 Sections 4 and 5 considered the desirability of the DTT platform adopting new technologies and concluded that this could best be achieved by clearing the existing services from Multiplex B and then converting it to use the DVB-T2 and MPEG-4 technologies. In this section we consider how the existing services on the DTT platform could be reorganised so that Multiplex B can be cleared of its existing services.
- 6.2 We first raised the feasibility that the DTT platform could carry a range of new services (including HD) at DSO through a reorganisation of the services carried on the existing DTT multiplexes in the DDR consultation in December 2006. Since then, we have carried out an extensive programme of technical work and discussed our emerging findings with key stakeholders such as the PSBs and multiplex operators. We have also sought external expert advice on the underlying technical assumptions for the reorganisation process, and a report on this work is being published alongside this consultation. This is available at <http://www.ofcom.org.uk/consult/condocs/dttfuture/report.pdf>.
- 6.3 This work has identified a process that would allow the reorganisation of the services carried on the PSB multiplexes to allow one multiplex to be cleared of existing services and then used to carry new services using the new more efficient DVB-T2 and MPEG-4 technologies.
- 6.4 An important starting assumption for this proposed reorganisation process is that all of the services currently carried on the DTT platform should continue to have the opportunity to be delivered following the reorganisation with no reduction in quality. However, it should be noted that service providers may decide in the future to change their current service line-ups and the multiplex on which these are delivered to meet their own business needs. These decisions would be independent of the proposed re-organisation process, and the final decision on whether existing services continue to be carried on the DTT platform or where each service is actually carried will be taken by the respective broadcaster and not Ofcom.
- 6.5 In a number of important respects, responsibility for the regulation of DTT is shared between the Secretary of State for Culture, Media and Sport and Ofcom. Some of the powers to effect a reorganisation of the DTT platform, as proposed here, rest with the Secretary of State, while others rest with Ofcom. An important purpose of this consultation is to enable Ofcom to advise the Secretary of State on how he might exercise his powers – advice on this matter has been requested by the Secretary of State.
- 6.6 We took into account the following principles in developing our reorganisation proposals:
- **Fairness / reasonableness / proportionality:** aiming to avoid negative effects of the reorganisation process on key parties, but where these are unavoidable seeking to minimise their impact and ensure that they are equitably distributed so far as is possible.
 - **Wide availability of new services:** ensuring that new services delivered using MPEG-4, DVB-T2 technologies are available to a maximum possible number of

households by converting a PSB multiplex with 98.5% coverage to these new standards. The alternative of using an existing commercial multiplex would deliver a lower level of coverage for new services, and the alternative of a seventh multiplex using the digital dividend spectrum would deliver a lower level of coverage, take longer to implement and incur much higher costs.

- **Early adoption:** ensuring that the capacity is made available as early as possible. This means starting in the Granada region if possible, in late 2009 - early 2010, and in subsequent regions as DSO rolls out, region-by-region, finishing in 2012.
- 6.7 In order to introduce the new DVB-T2 transmission standard a whole DTT multiplex must be cleared and converted to this standard as it is unable to co-exist with the current DVB-T standard in the same multiplex. In Section 5 we set out our proposals that under the proposed reorganisation process Multiplex B should be cleared for use by the DVB-T2 transmission standard, and that MPEG-4 technology should also be employed by services operating on this multiplex.
- 6.8 The capacity required to accommodate the services displaced from Multiplex B would be provided by a combination of different sources.
- **Mode change capacity:** In Section 4 we identified that a significant amount of additional DTT capacity will become available at DSO as the four multiplexes currently operating at 16QAM upgrade to 64QAM. A similar significant increase in capacity is unlikely to occur in the foreseeable future and hence the availability of this mode change capacity presents a unique opportunity to introduce the new DVB-T2 standard on the platform whilst ensuring that existing DTT services are able to remain receivable on existing DVB-T MPEG-2 consumer equipment.
 - **Multiplex carriage efficiency improvements:** It was also noted in Section 4 that all of the multiplex operators should be able to provide improvements in carriage efficiency of their multiplexes through a combination of measures. These include:
 - using state of the art MPEG-2 coding equipment,
 - maximising the size of the statistical multiplex pool for video services,
 - optimising the statistical multiplex parameters and settings used for each service,
 - minimising null packet overheads, and
 - maximising the video service Group of Picture (GOP) length.
- 6.9 The following analysis assumes that these improvements in carriage efficiency are adopted by all of the PSB multiplex operators. However, it is also noted that due to the complex and wide range of factors impacting on the efficiency of the digital compression and statistical multiplexing process, there is some level of uncertainty over the eventual carriage efficiency gains that are achievable on each multiplex.
- 6.10 There are a multitude of different ways in which services currently carried on Multiplex B could be carried elsewhere on the platform. Our technical work has identified four leading reorganisation scenarios for how this may be achieved. These are based on a range of different assumptions about the relative multiplex efficiency that might be achieved by the respective multiplex operators. Based on independent

advice from Ofcom's technical consultant and detailed discussions with broadcasters, multiplex operators and equipment manufacturers we believe that one scenario represents the most likely and realistic outcome for the reorganisation process.

- 6.11 We are therefore putting this forward as our central case proposal for the reorganisation of the multiplexes. In addition, we outline the potential outcome for other multiplexes if this central case were not achieved. We welcome comments on this proposal from respondents to help us come to robust conclusions on how the reorganisation process should be implemented in practice.
- 6.12 Two of the scenarios we considered were based upon the independent consultant's assessment. Amongst other proposals this report identified a likely (most probable) and maximum (optimistic) set of potential technical efficiency gains. Both are described in detail in the report published alongside this consultation. Both assessments were more optimistic about the extent to which the multiplex operators could achieve greater multiplex carriage efficiency gains than our central case. Hence the knock-on effect of both scenarios would mean that the BBC and ITV/C4 should be able to carry more services on Multiplexes 1 and 2 respectively than in our central case. This would reduce the impact of services moving from Multiplex 2 to other multiplexes.
- 6.13 We have also considered a more conservative scenario based on a minimum set of potential technical efficiency gains. We investigated this option as a result of earlier concern expressed by the PSBs about our technical analysis. They felt that it was too optimistic in relation to future multiplex capacity efficiency gains, and in particular the technical advances in MPEG-2 coding and the benefits that would arise from the use of larger statistical multiplex pools. This scenario (which assumes that only six SD services can be accommodated on Multiplex 1) would result in an additional BBC video service being displaced from Multiplex 1 to Multiplex 2. The knock-on impact of this would be that an additional television service would need to move from Multiplex 2 onto one of the other multiplexes (Multiplexes A, C or D), or be discontinued. This would make the reorganisation process harder to manage.
- 6.14 Following our discussions with the broadcasters and manufacturers and further technical analysis we consider our central case represents a more viable and realistic outcome than these alternatives. We set out the details of this central case proposal below.

Reorganisation Process under Ofcom's Central Case

Clearing Multiplex B

- 6.15 A consistent feature of all of the reorganisation scenarios considered was that all of the existing services on Multiplex B should be transferred to other multiplexes. It should also be noted that it was assumed that this transition will only be adopted at DSO in each region and it is proposed that this process should start with switchover in the Granada region in late 2009.
- 6.16 The services currently carried on the three PSB multiplexes are described in detail in Annex 8. In summary:
- Multiplex 1 carries four full time SD television streams, one or two radio services depending on the region, and BBCi interactive text services;

- Multiplex 2 carries eight full time SD television streams; one or two radio services depending on the region, and the digital Teletext service; and
- Multiplex B carries two full time SD television streams and three interactive video streams) and ten radio services.
- It should be noted that some of the full time video streams listed above are used to deliver different television channels at different times of the day.

6.17 Under our central case scenario three of the BBC video streams and all of the radio services currently carried on Multiplex B are transferred to Multiplex 1 and the remaining video service on Multiplex B is transferred onto Multiplex 2. The video service selected to move onto Multiplex 2 could be an SD channel or an interactive video service, but it is assumed that this service will require a similar level of multiplex capacity as one of the services displaced from Multiplex 2 as part of the overall reorganisation process.

Impact on Multiplex 1

6.18 Under our proposals, Multiplex 1 will carry three additional video and ten additional radio services, transferred from Multiplex B. As noted earlier we believe that a combination of technical changes will make it feasible for Multiplex 1 to carry these additional services. The technical changes assumed are:

- The capacity available on Multiplex 1 will increase by approximately 6 Mbit/s at DSO following a change from 16 to 64 QAM transmissions.
- This increase in capacity and the consequential carriage of more video services will create a larger video statistical multiplex pool and hence further improve the video coding efficiency of the services carried on Multiplex 1.
- The BBC has informed us that it is planning an upgrade of the MPEG-2 coding equipment it currently uses on Multiplex 1 to new more efficient equipment.
- The BBC has informed us that it intends to include BBC1 in the statistical multiplex pool on Multiplex 1 rather than using the less efficient constant fixed bit rate encoding currently used for this service.

Carriage of Five on Multiplex 2

6.19 As part of the DSO strategy proposed by Government and Ofcom it has been previously agreed that the Channel Five service would transfer from its current position on Multiplex A to one of the BBC's multiplexes at DSO. This is in order that it achieves universal coverage at switchover. However, under our proposals, the BBC multiplexes would be either full with existing services, or allocated to services operating with new DVB-T2 and MPEG-4 technologies which are not accessible on existing DTT receivers.

6.20 Therefore, as part of the reorganisation process we propose that Five transfers instead onto Multiplex 2 in order to achieve universal service coverage.

6.21 In order to ensure that the Five service achieves a high technical quality and reliability under these proposals we propose that sufficient capacity is reserved on Multiplex 2 to enable Five to be broadcast at an equivalent quality level to that of the ITV1 and Channel 4 public broadcast services currently carried on Multiplex 2. We

note that the actual bit rate required to deliver Five on Multiplex 2 will depend on the content broadcast, the size of the video statistical multiplex pool and the MPEG-2 encoding equipment used on Multiplex 2.

- 6.22 A working assumption related to this move is that the three core PSB services to be carried on Multiplex 2 (ITV, Channel 4 and Five), will be given a higher priority in the video statistical multiplex pool than the other video services. In addition it is assumed that the BBC video service transferred from Multiplex B to Multiplex 2 would be given a similar priority to that of the other remaining multiplex services.
- 6.23 As DSO is scheduled to start in the Scottish Borders during 2008 it may still be necessary to carry the Five service on Multiplex B prior to DSO. This is to ensure that it is available in those regions which are being switched over before Granada (Border and West Country). We understand that this is currently being discussed between relevant parties and any such agreement would sit outside the proposed reorganisation process described here. We note that this proposal would be a temporary measure prior to the adoption of these proposals at the switchover of the Granada region.

National services

- 6.24 In addition to the move of the Channel Five service to a PSB multiplex the Government and Ofcom have similarly agreed that the S4C Welsh service should be carried on a PSB multiplex at switchover (S4C is currently carried on Multiplex A). It had been intended that the BBC would carry this service within its capacity on Multiplex B. The Government has committed to ensure that the proposed Gaelic Digital Service (GDS) and the Irish language service TG4 are carried on a universal coverage multiplex at switchover, respectively in Scotland and Northern Ireland.
- 6.25 Under the proposed reorganisation plan it would not be possible to carry these national services in the BBC's capacity on Multiplex B. Hence, our central case assumes that these services are carried on Multiplex 2 in their respective nations, resulting in an additional video stream requiring capacity on this multiplex outside England. We note therefore that this video stream could also be used to deliver one of the existing video services on Multiplex 2 in England, and that the coverage of this service could be extended into the other nations during the times of day when it is not used to broadcast the S4C, GDS and TG4 services.
- 6.26 It is proposed that S4C2 would remain in its current position on Multiplex A.

Question 11: do you agree with our proposals for accommodating Five, S4C, TG4 and GDS on Multiplex 2?

Impact on Multiplex 2

- 6.27 Under our proposals, the following services would move to Multiplex 2:
- the Five service which will move from Multiplex A (possibly via a temporary slot on Multiplex B); and
 - one additional BBC video service, which has transferred from Multiplex B,
 - the three national services (S4C, GDS & TG4) in their respective nation.

- 6.28 In order to accommodate these services, some of the existing services on Multiplex 2 will be displaced.
- 6.29 At present the Channel 3 and Channel 4 television services on Multiplex 2 are delivered using two separate statistical-multiplex pools, each carrying four video services. We understand that this multiplex configuration has been adopted to simplify the network distribution arrangements. This is because the main ITV1 service requires significantly more insertion points for its regional programming than does Channel 4, which only requires four regions for its advertising options.
- 6.30 In our central case proposal the Channel 3 companies and Channel 4 would operate their services in a single larger, combined, statistical-multiplex pool rather than in two separate, smaller, statistical-multiplex pools. Moving from two, four service statistical-multiplex pools to a larger eight service statistical-multiplex pool should result in a significant increase in the statistical multiplex coding efficiency. In our assessment this change, coupled with the use of state-of-the-art MPEG-2 coding equipment, minimising multiplex null packet overheads and extending the maximum Group of Pictures (GOP) for all video services should allow the carriage of an additional service on Multiplex 2 without a reduction in the picture quality of the existing services.
- 6.31 Hence we believe that if these proposed changes are adopted we estimate that the efficiency gains would allow the Channel Five service to be delivered as part of a nine service statistical multiplex pool on this multiplex at its current quality level. This outcome would be consistent with the existing regulatory requirements for the picture quality of PSB services.
- 6.32 In our central case it is proposed that Multiplex 2 carries in addition to Channel Five one nationwide BBC service and the national GDS, S4C and TG4 channels in Scotland, Wales and Northern Ireland respectively. This approach would displace services occupying two of the existing video streams on Multiplex 2; one nationwide service and one service in Scotland, Wales and Northern Ireland only. On the basis of fairness and equity to the joint operators of Multiplex 2, we propose that one ITV service video stream and one C4 service video stream is displaced from Multiplex 2.
- By way of example, one of these displaced video streams might be delivered using the capacity vacated by Channel Five on Multiplex A (as set out in the previous section) and the second might seek to purchase additional carriage capacity on NGW Multiplexes C or D. However, it will be for the operators of these services to determine the how they wish to accommodate them.
- 6.33 As noted in the National Services section above, the services currently carried on the video stream that will be used to deliver the GDS, S4C and TG4 services in the nations could still be made available within England whilst these national services are broadcasting.
- We propose that a Channel 4 service should be the service that can continue to operate within England. This is because the move of Channel Five from Multiplex A to Multiplex 2 creates an opportunity to accommodate the displaced ITV plc video stream from Multiplex 2 on Multiplex A (which is ultimately controlled by ITV plc). We would welcome views on this proposal.
- 6.34 Our central case proposal therefore assumes that Multiplex 2 is operated using a nine service statistical multiplex pool and that bit rate demands of the BBC service

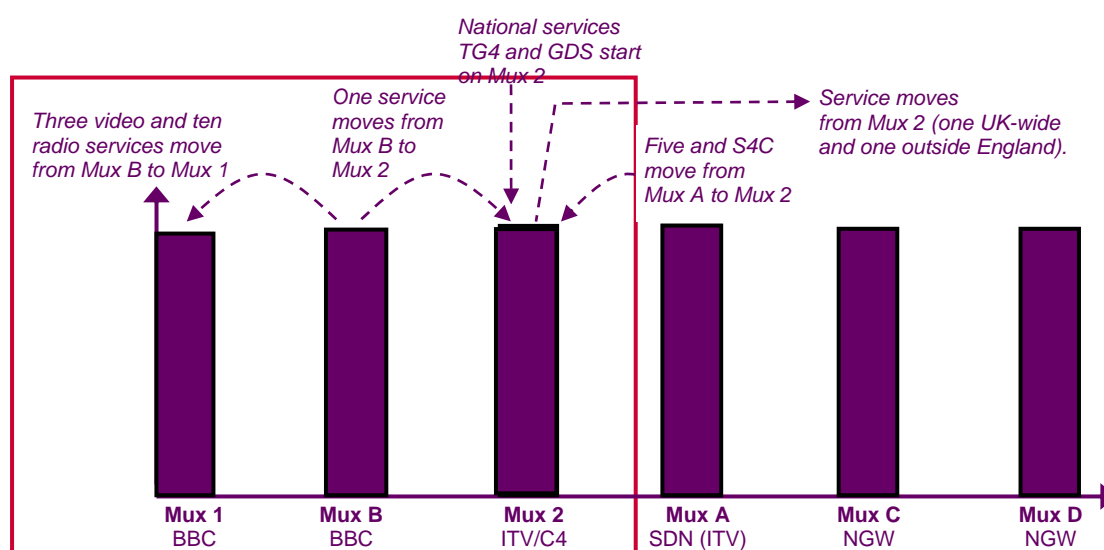
transferred from Multiplex B would be similar to or lower than those currently required by one of the ITV or C4 video streams being displaced from Multiplex 2.

- 6.35 This does not necessarily mean that the BBC service needs to operate at the same bit rate as it does now. This is because its picture quality is dependent on a number of factors including: the size of video statistical multiplex pool into which the services are transferring, the nature of the other services carried in the statistical multiplex, and the generation (and hence efficiency) of MPEG-2 encoding equipment used.
- 6.36 The affected PSBs have expressed concerns over their ability to deliver three of the core PSB services at sufficient quality levels on a nine-service multiplex. It is their view that the competing demands of these three services may reduce viewing quality beyond that which consumers would tolerate, particularly where demanding broadcasts such as live sports may be shown on two or more of the PSB channels.
- 6.37 As we note above, we believe the technical assumptions made in our central case proposal are credible. Based on these assumptions, nine video services could be delivered on Multiplex 2 at their current quality level. However, we note the concerns being expressed by the PSBs and would be prepared to consider alternative proposals from them providing that they met the main objective of clearing Multiplex B and providing sufficient capacity to carry any displaced services plus those from Five and the national services.
- 6.38 One option that could be considered would be to continue carrying eight services on Multiplex 2. However, this would require an additional video stream to be displaced from Multiplex 2 in addition to the two already proposed in the central case discussed above. It should be noted that if the operators of Multiplex 2 opt for this variant to our central case proposal, it would not rule out a nine-service statistical Multiplex B being implemented at some point in the future as further improvements to multiplex technologies are realised.
- 6.39 A second option would be that the BBC service transferring to Multiplex 2 could operate using less capacity than one of the services being displaced. This would require the BBC to transfer one of its lower bit rate services currently on Multiplex B into Multiplex 2.
- 6.40 We note that there will be some reduction in coverage (98.5% to 90%) for any service moving from Multiplex 2 to Multiplex A, C or D. The impact of this change on consumers could be minimised if ITV and C4 elect to move their least frequently watched service(s) from Multiplex 2. We also note that Ofcom would be keen to assist any application from any of the commercial multiplex operators to extend the coverage of their multiplexes.

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?

- 6.41 Figure 8 below shows the anticipated movement of services between multiplexes under our central case proposals.

Figure 8: Proposed movement of services



Ongoing service changes

6.42 Whilst it has been assumed that the reorganisation process should ensure that all existing services have an opportunity to continue to be delivered, we note that regular changes to the number and nature of the services offered on the DTT platform continue to take place. As a result, further service line-up changes are likely to happen before the reorganisation is implemented. In order to minimise impact on the reorganisation process, any further changes to existing services should be implemented in such a way as to have no further impact on other broadcasters and multiplex operators beyond those already set out in our central case scenario.

Carriage costs

- 6.43 We propose that where capacity is reserved for displaced services, the relevant parties (the multiplex operator and the broadcaster) should negotiate and determine the appropriate fees for carriage. However, in the event that the parties cannot agree, the parties will be able to refer the matter to Ofcom for determination of carriage fees. Ofcom will set a rate reflecting market terms, as it has previously done for a carriage dispute between SDN and Five³³.
- 6.44 We also propose that any broadcasters who need to acquire capacity on other multiplexes to deliver their displaced services should do so using existing market mechanisms rather than through any form of regulatory intervention. It is assumed that the relevant parties will negotiate a commercial agreement on those terms.

Question 13: do you agree with our proposals for the reorganisation process for the existing multiplex services set out in the central case scenario?

Alternative proposals

- 6.45 Ofcom has set out what we consider to be a credible approach for how a reorganisation of the multiplexes should take place. However, we recognise that there may be alternative views on how to enact a reorganisation, particularly from those organisations most affected by these proposals.

³³ http://www.ofcom.org.uk/bulletins/comp_bull_index/comp_bull_ccases/closed_all/C11015/sdn.pdf

6.46 We therefore invite relevant parties to submit a proposal to us as part of this consultation process, setting out how they would carry out this reorganisation, if they would do so any differently to the process set out above.

6.47 In assessing the merits of any such proposal, Ofcom proposes to take into account its alignment with the principles set out in paragraph 6.6 and the following criteria:

- **All** broadcasters affected should have agreed to the proposal (ie BBC, Channel 3 licensees, Channel 4, Five, S4C, Teletext).
- The proposal must ensure that Five, S4C, GDS and TG4 move to a universal coverage multiplex in time for DSO.

Question 14: do you agree with the principles / conditions that Ofcom proposes to use to evaluate counterproposals for the reorganisation process?

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

Section 7

Options for use of upgraded capacity

- 7.1 In the event that a multiplex is cleared, and services reorganised to be accommodated elsewhere on the platform, it is important to consider how the capacity on the cleared and upgraded multiplex should be used. For the purposes of this chapter, we assume that the proposals described previously in this document are adopted, and Multiplex B is cleared and upgraded to use DVB-T2 and MPEG-4 technology.
- 7.2 In this section, we therefore consider:
- options for the allocation of the capacity – including both reliance on the market and different intervention options;
 - the way in which an Ofcom-led allocation process could be conducted;
 - the way in which the incremental capacity could be packaged and used;
 - the criteria according to which the incremental capacity could be allocated; and
 - the structure of, and terms of carriage on, the upgraded multiplex.
- 7.3 In considering the options, we keep in mind our duties and the policy objectives we set out in Section 3 of this document. In summary, our policy objectives are:
- to ensure the optimal use of the spectrum;
 - to promote the purposes and characteristics of PSB; and
 - to promote the range and variety of high quality television services across the UK.

Link to Public Service Broadcasting

- 7.4 Multiplex B is a multiplex that is required by regulation to provide near-universal coverage of the UK from DSO in order to ensure access to PSB services.
- 7.5 We consider that, as a PSB multiplex, it is essential that the future use of Multiplex B continues to secure the purposes of Public Service Broadcasting. This is also consistent with the fact that the BBC operates Multiplex B, and the BBC is, of course, the UK's leading public service broadcaster. The proposals in this document for the allocation of Multiplex B therefore focus on how the capacity should be allocated to organisations with PSB obligations. These are, principally, the BBC, the Channel 3, 4 and 5 licensees, and S4C.
- 7.6 These proposals also reflect the nature of the powers available to the Secretary of State and Ofcom to give effect to this reorganisation. These are, in particular, the power of the Secretary of State to reserve capacity for certain broadcasters under Section 243 of the CA03; and the power of the Secretary of State under Clause 42 of the BBC Agreement to direct the BBC to grant certain organisations the right to use capacity on a TV multiplex. Under both these powers, the organisations named or specified in the provisions are those with PSB obligations.

Options for the allocation of capacity

- 7.7 We have considered several options for the allocation of the capacity:
- **Option 1:** the controller of the upgraded multiplex (the BBC, with the BBC Trust) chooses how the incremental capacity should be used;
 - **Option 2:** the BBC's licence relating to Multiplex B is revoked, and the licence is re-awarded by Ofcom, either via a beauty parade or via an auction. The new licensee then chooses how the incremental capacity should be used, subject to licence obligations regarding the nature of the award and use of the capacity; and
 - **Option 3:** Ofcom and the Secretary of State specify (through an administrative process) which organisations should have access to the capacity.
- 7.8 Option 1 would involve the BBC, with the BBC Trust, determining the allocation of the capacity on Multiplex B. Given Ofcom's general principle to operate with a bias against intervention, this option may appear to be attractive.
- 7.9 However, we think there are reasons to be cautious about this option. In particular, the BBC's status as a vertically integrated multiplex operator and broadcaster means that there is a risk that the allocation process might favour the BBC's own content. We note that the BBC has not to date opened its multiplex capacity to non-BBC services. We believe that any limits on the choice and range of services offered on the multiplex may affect the speed at which the benefits of the upgrade are realised, potentially leading to a sub-optimal outcome, both for the range, diversity and quality of services on the multiplex, and in terms of spectrum efficiency.
- 7.10 Moreover, while the BBC Trust fulfils an extremely important governance function in respect of the BBC, its functions and role are limited to the BBC only. The role of the BBC Trust is to ensure, on behalf of the public, that the BBC provides high quality output and good value for all UK citizens, and to protect the independence of the BBC.
- 7.11 In relation to the issues considered in this consultation, the Trust's focus and remit is therefore narrower than the focus and remit of Ofcom. As the sectoral regulator, Ofcom is required to have regard to a number of issues which fall outside the scope of the BBC Trust, but which we believe are relevant in the context of this consultation, and in particular in the context of the allocation of the capacity on Multiplex B. These include, but are not limited to:
- Ensuring the optimal use of the spectrum;
 - The provision of a wide and diverse range of high quality television services across the UK;
 - Delivery of PSB purposes and characteristics, taking into account the full set of providers of PSB services;
 - Ensuring plurality of provision of television services;
 - Ensuring a strong level of consumer choice in relevant markets; and
 - The promotion of competition.

- 7.12 Further, we understand that the parties concerned, and in particular the BBC – for governance reasons, are interested in having a strong level of regulatory certainty attached to the allocation of capacity (to protect the interests of each of the parties). In particular, if there was no reservation of capacity on the multiplex using Orders made by the Secretary of State, there would be no mechanism for the parties to refer any disputes on carriage terms to Ofcom.
- 7.13 We therefore believe that there are reasons why leaving the allocation of capacity to the BBC or the BBC Trust may not result in the optimal outcome for citizens and consumers, or in terms of the most efficient use of spectrum.
- 7.14 In relation to option 2, it is our view that the revocation and re-award of the licence would be disproportionate, given that the BBC has not breached the terms of its licence, and that there appear to be other options available which could be as effective in achieving the desired outcome, but which are less interventionist. In the absence of a breach of the licence, a revocation would need to be made on the grounds of spectrum efficiency. Ofcom believes that there are other options which could equally promote spectrum efficiency, and have regard to Ofcom’s other duties and objectives, but which would be more proportionate than revocation.
- 7.15 This leaves option 3, involving a more direct role for Ofcom and DCMS in the allocation of the capacity. We examine further below how such an intervention might work.
- 7.16 There is clearly a risk of regulatory failure in any intervention, as it would require Ofcom and the Secretary of State to take a judgement on the most appropriate allocation of the capacity (and hence, in part, on the most appropriate content). Different forms of regulatory failure were discussed in Section 5, and the same issues will apply here. Regulatory failure might involve making a decision at the wrong time (for example, too early) or the wrong decision being made on which organisations should be allocated capacity – it may later turn out that a different allocation would have resulted in a higher value outcome.
- 7.17 However, this regulatory failure can, to some extent, be mitigated by the approach taken to allocation – an issue to which we return below.

Options for an Ofcom-led allocation process

- 7.18 As noted in Section 2, the Secretary of State has requested Ofcom’s advice on how a process for allocating the capacity on Multiplex B might be conducted. While it is currently envisaged that Ofcom would lead this process, it is important to note that any allocation of capacity would need to be given effect by the Secretary of State’s powers. The overall process will therefore involve both Ofcom and the Secretary of State.
- 7.19 There are a number of potential options for the design of an Ofcom-led allocation process. These options vary according to:
- the time at which capacity is allocated – now or later;
 - the structure of the process which is used to inform the allocation; and
 - other actions taken to mitigate the risk of regulatory failure.
- 7.20 We have considered three possible options:

- **direct allocation:** consult on and then specify the organisations to which capacity should be allocated;
- **use a comparative selection process:** set out criteria for allocation, and invite submissions from interested parties – then allocate capacity based on the extent to which the submissions set out proposals for use of the capacity which fulfil the predefined criteria; or
- **allocate through the PSB Review:** include a statement as to which organisations should be allocated capacity as one of the outputs of the PSB Review.

7.21 It is important to note that these options are not mutually exclusive, given that the capacity is divisible – for example, some of the capacity could be allocated now, and some left for allocation through the PSB Review.

7.22 We have considered a number of factors in our evaluation of these options. These factors include:

- A key objective should be to reduce the risk of regulatory failure associated with the intervention.
- It is important to consider how the capacity can be allocated to achieve its highest value.
- The timing of the decision on allocation is also of great importance, as a relatively quick allocation is likely to result in the faster availability of new consumer reception equipment and access to new services. The quicker the allocation of the capacity, the faster the benefits (driven by uptake of STBs and associated build-up of viewer share) are likely to start to accrue.
- For example:
 - early allocation of capacity will provide a level of certainty to manufacturers of compatible consumer reception equipment – which may in turn help to ensure lower production costs and that lower price equipment is available - hence increasing the rate of customer take up;
 - early allocation could allow reception equipment to be on sale in time to allow consumers switching to digital from late 2009 / early 2010 the choice of whether to buy a standard (DVB-T, MPEG-2) STB, or whether to buy a DVB-T2 MPEG-4 STB. This would increase the level of consumer choice for around 80% of the population, who would be in areas that are still to go through switchover after late 2009. While many households may have already purchased a digital receiver for their main set, it is likely that this will not have been done for all household sets.

7.23 We now turn to an evaluation of the different options available for such an allocation.

Direct allocation vs. comparative selection process

7.24 The first of the options set out above would involve Ofcom consulting on a proposed set of organisations which would be allocated the capacity. Ofcom would seek views on whether this allocation was appropriate by means of a consultation. This would have the benefit of ensuring a quick allocation versus other options - for example,

allocation through the PSB Review may not be able to take place until late 2008, versus a decision in early 2008 (in an Ofcom Statement which we aim to issue in March 2008) under this process. Direct allocation would also allow some information – in the form of consultation responses – to inform Ofcom’s judgement and its advice to the Secretary of State in terms of allocation.

7.25 However, it would have a number of important drawbacks. While a consultation and direct allocation process would involve potential capacity holders submitting their views, this would not be on the basis of:

- a clear predefined statement of the objectives and criteria of the allocation; and
- clarity that the submissions will be the basis for determining the allocation, given that Ofcom would already have set out which organisations should benefit from the allocation in its initial consultation.

7.26 Although some information on objectives and views on criteria could be provided in a consultation preceding direct allocation, in the absence of a commitment to define criteria and then allocate based upon an evaluation against them, such statements are likely to carry less weight with respondents.

7.27 Compared to a situation where such a clear evaluation framework exists, respondents may be less likely to provide clear and comparable details on:

- their view of the most appropriate propositions;
- why they are best placed to deliver them; and
- their willingness to take on commitments in relation to their broadcasts.

7.28 This means that Ofcom and the Secretary of State would be much more reliant on their own judgement as to the most appropriate content and broadcasters to hold the capacity, and any associated commitments (e.g. as to content, format etc) which should accompany the allocation. Such reliance on regulatory judgement would significantly increase the risk of regulatory failure associated with the intervention.

7.29 A comparative allocation process with predefined objectives, criteria and process for award would be a significantly more transparent and open process – in line with good regulatory practice. There would also be more clarity ex post as to the rationale for the allocation, and the reasoning behind the judgements that the chosen providers were most likely to meet the predefined criteria.

7.30 Equally, while it is true that a comparative allocation process would result in a later allocation (i.e. it may take around four months longer than a direct allocation), the publication of clear criteria will provide stakeholders with information at an early stage. This information may help them to form their own views as to the likely range of outcomes for the allocation – and in turn increase their levels of certainty in relation to decisions such as the need to commit investment to manufacture of consumer reception equipment.

7.31 Ofcom fully recognises the importance of timely decision-making in this regard. In particular, we note that there are several forthcoming events which are likely to significantly drive uptake of new consumer reception equipment – including in particular the FIFA World Cup in June-July 2010, and the London Olympics in summer 2012.

- 7.32 In our analysis of the comparative selection process, we have therefore examined options for conducting this process as quickly as possible, while maintaining consistency with due process. Our thoughts on the potential timeframe for such a process are set out below, but we are confident that this process can be conducted sufficiently quickly to be completed within the timeframe required for important drivers of reception equipment to remain very relevant.
- 7.33 Therefore, we take the view that the risks associated with a direct allocation process are likely to outweigh the timing-related benefits, and prefer a comparative selection process. This may take a few months longer, but we believe that it would provide the opportunity for a more open, transparent and competitive process to be held, which is likely to lead to superior outcomes for viewers.

Comparative selection process vs. decision through PSB Review

- 7.34 Before we turn to a comparison of a decision through the PSB Review with the comparative selection process, it is important to set out the terms of reference of Ofcom's PSB Review and state why it is relevant to this process.
- 7.35 The CA03 requires Ofcom to carry out a Review of Public Service Television Broadcasting at least once every five years. It requires us to report on the extent to which the PSBs have fulfilled the purposes of public service television broadcasting, and to make recommendations with a view to maintaining and strengthening the quality of PSB in the future.
- 7.36 The Review commenced in September 2007 with the publication of the Terms of Reference³⁴. We anticipate that the Review will be conducted in two phases with accompanying consultations, firstly in spring 2008 with policy options published later in the autumn and a final statement early in 2009.
- 7.37 The Review has four key objectives:
- to evaluate how effectively the PSBs are delivering the purposes and characteristics of PSB, particularly in the light of changes in the way TV content is distributed and consumed;
 - to assess the case for continued intervention in the delivery of TV content to secure public service purposes;
 - to consider whether and how the growth of new ways of delivering content to consumers and citizens might create new opportunities for achieving the goals of public service broadcasting, as well as posing new challenges;
 - to assess future options for funding, delivering and regulating public service broadcasting, in light of these challenges and opportunities, and uncertainty about the sustainability of existing funding models.
- 7.38 In light of this remit, it is important to consider whether the PSB Review might present the best opportunity to consider the allocation of capacity considered in this consultation.

³⁴ http://www.ofcom.org.uk/tv/psb_review/psb_2review/

- 7.39 While the last of the options considered above (allocation through the PSB Review), might provide for a more informed process for decision making than allocating the capacity now in a direct allocation process:
- it is not clear that it would result in more interaction with the market – indeed, given the wide range of issues likely to be considered within the Review, a focused comparative selection process might result in a clearer understanding as to the views of the market on the most appropriate content; and
 - it is likely to result in a significant delay in the allocation of the capacity. Especially compared to a situation in which clear criteria for the allocation process are established relatively quickly, stakeholders (including content providers and STB manufacturers) will have significantly less certainty as to the likely range of outcomes early in the process – and the final allocation could be some 12 months later.
- 7.40 We therefore conclude that for both reasons of timing, and of clarity, transparency and openness, a comparative selection process is also preferable to a decision through the PSB Review, as a method for allocation of this capacity.

Conclusion on allocation process

7.41 Table 3 below summarises our analysis of options for allocation of the capacity.

Table 3: Comparison of options for allocation of capacity

	Direct allocation	Comparative selection process	PSB Review
Pros	<ul style="list-style-type: none"> • Speed of process – early certainty for manufacturers, broadcasters • Speed of process – consistent with STBs being on sale well in advance of events likely to drive uptake 	<ul style="list-style-type: none"> • Structured process creates opportunity for competition between PSB institutions – may create more information to inform allocation • Greater ability to convert broadcaster commitments from allocation process into obligations • More open and transparent than direct allocation 	<ul style="list-style-type: none"> • Allows allocation to take place in context of other decisions being taken in relation to PSB • More open and transparent than direct allocation (though less than comparative selection process)
Cons	<ul style="list-style-type: none"> • Less structured process for considering options for use of capacity – greater reliance on regulatory judgement • Less transparency 	<ul style="list-style-type: none"> • Slower process than direct allocation 	<ul style="list-style-type: none"> • Unclear whether it would be possible to create any element of competition for capacity • More significant delay

7.42 Based on these arguments, we believe that a comparative selection process undertaken as soon as possible is the most appropriate approach. Its benefits include that:

- it will ensure interaction with the market against a set of predefined criteria – and hence provide a focused route through which the market can inform regulatory decision making, reducing the risk of regulatory failure;
- it can be completed in four months following Ofcom’s policy Statement, and hence will not result in an unacceptable delay to the allocation – furthermore, the publication of clear criteria will provide stakeholders with information at an early stage with which they can form their own views as to the likely range of outcomes for the allocation; and
- it will ensure an open and transparent allocation process, consistent with good regulatory practice.

7.43 It will, however, be important to take account of the outcome of the allocation process in the PSB Review, in order to ensure that the PSB Review can consider and assess the full set of relevant issues affecting the delivery of PSB in the UK.

Question 16: do you agree with Ofcom’s assessment of the options for allocating the upgraded capacity?

Alternative proposals

7.44 We recognise however that the proposals in this document for the reorganisation and upgrading of the platform are complex, and the allocation of capacity on the cleared multiplex is one part of this wider picture. We also recognise that, to the extent that intervention may be needed to resolve the difficulty that the operators of the DTT platform face in effective co-ordination, there may be other ways of resolving the problem – notably more intensive efforts at co-ordination. In the typical functioning of an efficient market, problems such as this might be resolved by a combination of co-ordination and trade – as the buying and selling of capacity.

7.45 This suggests that there may be other ways of achieving the goals set out in this document that could deliver the same or greater benefits to viewers, but might be less complex to implement. For example, this might include not direct allocation by Ofcom, but agreement amongst the operators of the DTT platform as to how capacity was to be re-arranged and upgraded.

7.46 We would welcome alternative proposals that could deliver the goal of upgrading the DTT platform while protecting the interests of viewers with existing equipment. We would assess those proposals against the three key objectives identified, namely: securing optimal use of the spectrum, promotion of the purposes of PSB, and promotion of a wide and diverse range of high quality television services available throughout the UK.

7.47 A further option would be to vary the comparative selection process proposed above, by allowing proposals for use of some or all of this capacity by organisations seeking to deliver content that meets the purposes of PSB, but which do not presently have PSB obligations. Our view is that to meet the purposes and characteristics of PSB and to be carried on a PSB multiplex, such content would need to be available free to air. In the more detailed proposals which follow, we have concentrated on a process that would focus on organisations that already hold PSB obligations, as this is more consistent with current PSB policy. But respondents may wish to comment on this variant and its potential relevance in the short or long term.

- 7.48 Assuming, however, both that intervention will be necessary, and that it should be conducted on the basis of the comparative selection process proposed in paragraphs 7.4 – 7.43, we now turn to issues relating to the design of such a comparative selection process.

Comparative selection process

- 7.49 We propose that a comparative selection process - a beauty parade - should be the process which is used to select the organisations to whom capacity on Multiplex B is allocated. To be clear, applicants would not be bidding sums of money for capacity; rather, they would be required to demonstrate how their proposals would meet certain selection criteria.
- 7.50 This process would be conducted by Ofcom, using specific criteria for selection, which are set out below for consultation.
- 7.51 Ofcom envisages that invitations to apply for capacity under this process would be issued at the same time as its Statement on the issues covered in this consultation. We aim that invitations to apply would be released in late March 2008.
- 7.52 We propose that a period of two months should be sufficient for potential applicants to consider the invitation, decide whether they wish to apply, and submit a formal application, stating how they propose to meet the selection criteria. This is shorter than the period used by Ofcom to select commercial radio licensees (a three month period). However, the application process for capacity described in this document should be less onerous than that for commercial radio licences, given that we do not propose to request business plans, and that the number of criteria is low. Further, organisations which could submit applications for this capacity will have notice of Ofcom's proposed process for the allocation of the capacity from the date of publication of this consultation, which should provide ample notice of the process.
- 7.53 Ofcom would then consider the applications and publicise the winners within two months of the closure of the application process.
- 7.54 The Secretary of State would at some point make an Order(s) to reserve capacity for the eventual winners of the competition process. Ofcom would reflect the outcome in licences as appropriate.
- 7.55 We would expect to make amendments to the DRLs of those commercial PSBs who acquire capacity through this process. Amendments would also be required to the technical standards used on Multiplex B, and to the Core Proposals for that multiplex. The BBC does not of course hold a DRL, and we envisage that beyond changes to the Multiplex B licence which would need to be made by Ofcom, other issues regarding the usage of any capacity allocated to the BBC as part of this process would need to be considered by the BBC Trust.

Packaging and use of capacity for the selection process

- 7.56 In order to consider how to package the capacity, we need to consider what the capacity could be used for. Ofcom's bias against intervention means that we prefer wherever possible to allow the market, rather than the regulator, to determine the use of a particular asset. We therefore aim to package the capacity in a manner which provides as much flexibility as possible for any potential user of the capacity to gain access to it.

- 7.57 Given the limits on the use of the multiplex set out in the licence, which state that at least 90% of the capacity must be used for television services, we consider that there are two main potential uses of the capacity – SD and HD services. Other potential uses are interactive streams, and radio and text services. However, interactive streams tend to provide greater choice of SD services – so in terms of capacity requirements, these would tend to be the same or similar to SD requirements. For radio and text services, the capacity these require is significantly lower than that required for SD or HD services, these services tend to fit within the gaps between the other services, and they could in any case account for a maximum of 10% of the capacity on the multiplex. Therefore we do not consider these services further in our analysis of the appropriate usage and packaging for this capacity.
- 7.58 The following table (Table 4) sets out, for the two main potential uses of this spectrum, how many of each service could fit onto a DVB-T2 MPEG-4 multiplex – at our proposed launch date for new services (late 2009/early 2010 at Granada DSO), at the end of the DSO process (late 2012/early 2013), and in the longer term (2015 onwards). The figures for SD and HD capacity factor in the statistical multiplex improvements that can be achieved by carrying several services together in one multiplex and also include the capacity for any associated audio and data services

Table 4: Capacity requirements and number of SD and HD services per multiplex

	DSO in the Granada region (late 2009 / early 2010)	End of DSO (late 2012 / early 2013)	Longer term (2015 onwards)
<i>SD bit rate requirements</i>	2.1-2.5	1.6-2	<1.6
Number of SD services	13-15	16-20	20+
<i>HD bit rate requirements</i>	10-11	8	6-7
Number of HD services	3	4	5

- 7.59 The consultant's technical report³⁵ assumes that the video stream for each HD service will require 8 Mbit/s in 2010 and 7 Mbit/s in 2012. We note that we have taken a more conservative view of the capacity requirements that could be achieved, taking into account factors such as the uncertainties surrounding future improvements in MPEG-4 compression efficiency for HD.
- 7.60 Ofcom notes that there are different formats for the display or transmission of programming in HD – these are interlaced and progressive formats³⁶. The evidence currently available to Ofcom³⁷ strongly suggests that the progressive format is significantly more efficient in capacity usage than the interlaced format. Ofcom has therefore assumed in the bit rate requirements for HD set out above that the progressive format is used. Given the capacity-constrained nature of the DTT

³⁵ <http://www.ofcom.org.uk/consult/condocs/dttfuture/report.pdf>

³⁶ Progressive or non-interlaced scanning is any method for displaying, storing or transmitting moving images in which all the lines of each frame are drawn in sequence. This is in contrast to the interlacing used in traditional television systems where only the odd lines, then the even lines of each frame are drawn alternatively (each image now called a field) are drawn.

³⁷ See, for example, http://hdmasters2007.com/pdf/Presentations/HDM2007_Hoffmann-EBU.pdf

platform, Ofcom proposes that HD broadcasts on this platform should therefore only use the progressive format. We believe that HD services on DTT could be offered using 720p at launch, eventually moving to 1080p as technology and production equipment allow.

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?

- 7.61 We do not propose to specify what type of service the capacity must be used for before we receive any applications for the use of the capacity – we propose to leave it to applicants to inform us of their views on which use(s) of the capacity will meet the objectives of Ofcom in this process, as expressed through the selection criteria described below. We think that the broadcasters are better placed than Ofcom to inform as to the best use of the capacity.
- 7.62 We note that there is a significant amount of interest in using this capacity for HD services, and we would view use of the capacity for HD services as a likely outcome of this process. However, we do not believe that we have sufficient evidence to mandate that this capacity must be used for HD. We also consider that there is scope for innovation in the mix between SD and HD services – for example in different parts of the day. A regulatory requirement for services in HD risks getting the mix wrong.
- 7.63 Ofcom’s market research conducted for the DDR during 2007³⁸, set out in Section 4 of this consultation, shows that consumers tend to value more SD services on DTT more highly than HD services. However, manufacturers and broadcasters have argued strongly that HD services are more likely than SD services to drive sales of new receiving equipment, which is essential in order to achieve the long term development of DTT described in this consultation.
- 7.64 Given the lack of definitive evidence, we propose to let those organisations submitting proposals for the use of the capacity to determine the appropriate use, whether it be SD or HD services. We would welcome views on this proposal, and in particular we are keen to gather further evidence to enable us to form a conclusion on this point.

Question 18: do you agree with the proposal that Ofcom should not mandate the use of the capacity for any particular service type (SD or HD) but allow the broadcasters to make proposals?

- 7.65 In light of the capacity requirements of the main potential uses of the capacity, we have identified several options for the packaging of the capacity. Under each option, we have included an assumption about the increase in efficiency of use of the capacity. Such increases are widely expected within the market. This means that, for each option, we have an initial number of “blocks” for use in late 2009 / early 2010, and a subsequent number of blocks, which would be available from late 2012 / early 2013. We have assumed that blocks allocated for use from 2009/2010 will decline in size at the end of DSO, to capture the expected efficiency gains.
- 7.66 The possible options are set out in Table 5 below:

³⁸ To be published on 28 November 2007

Table 5: Options for packaging of capacity

Option	Granada DSO (late 2009 / early 2010)	End of DSO (late 2012 / early 2013)
1 – HD sized blocks (which are also suitable for several SDs)	3 HD-sized blocks (10-11 Mbit/s each)	4 HD-sized blocks (8 Mbit/s each)
2 – SD sized blocks (which can be combined to form HD sized blocks)	13-15 SD-sized blocks (2.1-2.5 Mbit/s each)	16-20 SD-sized blocks (1.6-2 Mbit/s each)
3 – mix of SD and HD sized blocks (for example, can be requested as a combination)	2 HD-sized blocks (10-11 Mbit/s each) <u>AND</u> 5 SD-sized blocks (2.1-2.5 Mbit/s each)	3 HD-sized blocks (8 Mbit/s each) <u>AND</u> 5 SD-sized blocks (<1.6 Mbit/s each)

7.67 The blocks available under Option 1 would be capable of providing one HD service or five SD services. This option is particularly attractive for organisations wishing to offer HD services, as they would not need to aggregate any smaller-sized blocks in order to provide the HD service.

7.68 The blocks available under Option 2 would be most suitable for organisations wishing to provide SD services.

7.69 Option 3 provides a further variant, which would be best suited to situations in which there was demand from some organisations for HD services, and demand from other organisations to provide SD services.

7.70 We consider that it would be significantly simpler and less risky to offer larger blocks than smaller ones especially as our understanding is that this would also be the preference of most or all PSB organisations. We therefore propose that Option 1, ie three blocks initially, rising to four blocks at DSO, is the most appropriate option for the packaging of this capacity.

7.71 Due to the proposed DRL conditions detailed below, it will not be possible to trade the capacity allocated under this process.

7.72 We also propose that blocks should be allocated on a UK wide basis. This will simplify the selection and allocation process, and is also in line with the current general practice in the market for the leasing of multiplex capacity. This will not preclude the winning applicants from offering services on a sub-UK wide basis, for example, an applicant may wish to offer different services in different Nations at certain times of the day.

Question 19: do you agree with the proposal that the capacity should be allocated in three UK-wide blocks initially, rising to four blocks at DSO?

7.73 We propose that the selection process during the first half of 2008 will determine the allocation of the initial three blocks only. We propose that a similar selection process would be run in 2010 in order to determine which organisation should have access to

the fourth block of capacity. We believe that it is prudent to defer a decision on allocation of the fourth block for several reasons:

- It is as yet not fully clear when efficiency improvements in the use of capacity can be achieved. It is therefore prudent to review the extent of efficiency improvements once services have been in operation for some time, prior to making a final decision on when a fourth block would become available;
- Greater information on consumer preferences for new services will be available in 2010, allowing for a more informed application and selection process for the fourth block than that which could be conducted today. This is likely to improve the eventual quality of the service offered, and is therefore in the interests of both citizens and consumers – as well as the eventual owner of the capacity, and other participants in the selection process; and
- The PSB Review which has recently commenced will have concluded by 2010, and may result in some important changes to the system of PSB which should, as far as is possible, be taken into account in the allocation of this capacity. (It is however important to note that many aspects of PSB are matters for Parliament and / or Government, not Ofcom).

The application process

- 7.74 We propose to allow applications from single parties and from combinations of parties. For example, S4C might offer a joint application with Channel 4 or the BBC; the Channel 3 licensees might offer an application that is joint with Five.
- 7.75 We propose that any bid must include a proposal for use of one block of capacity. However, bidders may also make proposals for additional blocks..
- 7.76 Parties will be permitted to bid on the basis that they will subsequently split the blocks into several components to provide services separately, either in terms of day part, or in terms of division of the capacity into sub-blocks for simultaneous transmission, subject to their proposal and the terms of their licence.
- 7.77 Parties will be permitted to share capacity on a geographical basis (eg one party might offer a service in Wales and Scotland, with another offering a service in England and N Ireland).
- 7.78 Given the limitations of the process to PSB institutions only, we believe it is appropriate that bids from Channel 3 licensees should be made by all Channel 3 licensees collectively, as this is how the holding in Digital 3 & 4 is held. ITV plc would therefore not be able to submit its own sole proposal for capacity; it must do so in conjunction with SMG, UTV and Channel, the other Channel 3 DRL holders.
- 7.79 We would expect to publish all proposals on receipt (with confidential material redacted).
- 7.80 The conduct of the process will be subject to the usual provisions of competition law.

Conditions attaching to capacity

- 7.81 We propose that licensees must offer services in MPEG-4 using DVB-T2.

- 7.82 We propose that rights for the capacity would end in 2014. This will align with the expiry date of the DRLs and of the Multiplex B licence. We propose that rights should not be automatically renewable; instead, we would envisage that a further allocation process would be held in sufficient time prior to the end of the licence period, likely during 2012. Ofcom and DCMS would consider at that time the number and size of blocks to be awarded from 2014 onwards. We propose to issue further information on the process for the use of the capacity post-2014 as part of Ofcom's ongoing PSB Review, in order that the full set of issues relating to PSB may be considered.
- 7.83 As noted above, Ofcom envisages that the rights to the capacity on Multiplex B will be included via an amendment to the DRL for relevant licensees, and via the BBC Trust in the case of the BBC. The right to capacity on Multiplex B will therefore be added as a right which is conferred by the holding of that DRL.
- 7.84 It is Ofcom's expectation that for DRL holders, elements of the winning proposals will be transferred into licence obligations, in order to incentivise the participants in the process to make and keep to realistic proposals. Ofcom is currently considering the options available for this process. Broadly, Ofcom expects to be able to use amendments to DRLs, with the possible addition of the use of DTSPS licences in conjunction with (and linked to) the DRL, should it be necessary to do so.
- 7.85 Specifically, any allocation of capacity on Multiplex B to DRL holders will be conditional on them retaining their DRL. The (amended) DRL will confer the right to any capacity allocated on Multiplex B.³⁹
- 7.86 We propose that those organisations allocated capacity on Multiplex B as part of this process should negotiate terms for carriage with the multiplex operator (the BBC). This negotiation should include the cost of carriage, which is expected to be at rates reflecting market terms. In the event of a dispute over the cost of carriage, we propose that the matter could be referred to Ofcom for resolution, under the terms of any Order reserving capacity on the multiplex.

Comparative selection criteria

- 7.87 We propose that there should be a set of "selection criteria", upon which the selection will be based. Applicants will be required to put forward proposals explaining how they will satisfy each of these criteria.
- 7.88 We believe that the following set of three criteria should be used to determine the allocation of capacity on the cleared, upgraded multiplex. Ofcom is requesting views on the appropriateness of these criteria.
- **Selection Criterion 1:** Efficiency in the use of spectrum, as reflected in the use of the capacity on the multiplex and in plans for promotion of rapid and widespread adoption of DVB-T2 MPEG-4 consumer reception equipment;
 - **Selection Criterion 2:** Contribution to the purposes and characteristics of PSB in the UK⁴⁰; and

³⁹ The criterion does not apply to the BBC as it does not hold a DRL.

⁴⁰ PSB Purposes and Characteristics are set out in Ofcom's PSB Review Phase 2, page 6:
http://www.ofcom.org.uk/consult/condocs/psb2/psb2/psb_phase2.pdf

- **Selection Criterion 3:** Contribution to the range and diversity of high quality television services available throughout the UK (both between and within individual services).

7.89 These criteria are firmly based on Ofcom's duties in the CA03. The reasons why Ofcom is proposing these criteria, and further detail on each of the criteria are set out below.

Selection criterion 1: efficiency in the use of spectrum

7.90 Ofcom proposes that the first of the selection criteria should reflect our objective to ensure the efficient use of spectrum. Specifically, applicants should demonstrate how their proposals will promote efficiency in the use of spectrum, as reflected in the use of the capacity on the multiplex and in plans for promotion of rapid and widespread adoption of DVB-T2 MPEG-4 consumer reception equipment.

7.91 One of Ofcom's objectives in this process is to promote the optimal use of the electromagnetic spectrum, which relates directly to our duty under section 3(2)(a) of the CA03. As such, we believe that applicants should demonstrate how they will make efficient use of spectrum through efficient use of multiplex capacity. We also believe it is important that applicants demonstrate how they will drive uptake of consumer reception equipment, as the faster that penetration occurs, the more quickly other multiplexes are likely to upgrade to these more efficient technologies – thus increasing the overall benefits of this process even further.

7.92 In light of our objective, we propose that the following guidelines are considered by applicants in forming their proposals:

- Applicants should put forward proposals which are calculated to ensure that that consumer reception equipment is made available as quickly as possible. Ofcom believes that this should be feasible in time for DSO in the Granada region in late 2009 / early 2010. These proposals should specifically address three key issues:
 - **a:** Proposals must demonstrate how the relevant party(ies) plan to encourage manufacturers to build DVB-T2, MPEG-4 consumer reception equipment (STBs and IDTVs) as quickly as possible, and to encourage retailers to offer them widely for sale.
 - **b:** Proposals must show how the parties will market their new services so as to drive uptake of consumer reception equipment as quickly and widely as possible.
 - **c:** Proposals must also demonstrate robust plans to launch services as soon as possible (and should aim for Granada DSO – ie late 2009 / early 2010).
- Further, proposals must demonstrate how the relevant party(ies) will seek to reduce any potential consumer confusion relating to DSO and availability of DTT services. Proposals must also demonstrate how they will ensure that the launch of the new services will avoid any negative impacts on the DSO programme.
- In addition, if the capacity is used for HD, Ofcom expects that three channels could be offered initially (from late 2009), with four from late 2012. Proposals must show how this expectation will be met, in terms of ensuring that applicants have plans in place to reflect future efficiency gains in their use of capacity, which are widely expected to occur.

Selection criterion 2: contribution to the purposes and characteristics of PSB in the UK

- 7.93 We propose that the second of the selection criteria should reflect our objective to further the purposes and characteristics of PSB in the UK. Applicants should demonstrate how their proposals will further this objective.
- 7.94 We include this objective as part of the selection criteria because the multiplex that we propose to clear and upgrade (Multiplex B) has been designated as a PSB multiplex, offering universal coverage. It currently provides PSB programming. Further, this process has been limited to PSB organisations only. Given Ofcom's duties in respect of PSB⁴¹ we believe that the capacity on the multiplex should continue to be used for programming that satisfies PSB purposes and characteristics.
- 7.95 The purposes and characteristics of PSB were set out in Ofcom's first Review of Public Service Broadcasting.⁴²

Selection criterion 3: Contribution to the range and diversity of high quality television services available throughout the UK

- 7.96 We propose that the third of the selection criteria should reflect our objective to secure that there is a wide range and diversity of high quality television services available throughout the UK. Applicants should demonstrate how their proposals will further this objective.
- 7.97 As noted above, Ofcom has a duty to have regard to "the availability throughout the United Kingdom of a wide range of television and radio services which (taken as a whole) are both of high quality and calculated to appeal to a variety of tastes and interests"⁴³. We therefore consider it important that the selection process should consider the contribution of each proposal to the range of services available, both between and within individual services. We also note that we would welcome proposals which cater to the tastes and interests of those viewers in the Nations and Regions of the UK.
- 7.98 In light of this duty and objective, we propose that the following guidelines are considered by applicants in forming their proposals:
- a: In light of our duty to have regard to the quality of the television services provided, we believe it is important to ensure that the long term aim of applicants wishing to provide HD services should be to provide all HD programming in full HD format, rather than up-converted from SD format – which tends to provide lower picture quality. Proposals must therefore demonstrate that, if the capacity is used for HD, in the long term the broadcaster plans to provide all UK originated programming in full HD format (ie not up-converted from SD format, which tends to be of lower picture quality). We also propose that we should include a medium term target to ensure that broadcasters reflect this quality requirement in the early years of any service. We therefore propose that, by 2012, over 80% of UK originated programming must be shot in HD, not up-converted. We believe that this target is realistic, but would welcome views from relevant parties as part of this consultation process.

⁴¹ Communications Act 2003, Section 3, Part 4(a)

⁴² PSB Purposes and Characteristics are set out in Ofcom's PSB Review Phase 2, page 6:

http://www.ofcom.org.uk/consult/condocs/psb2/psb2/psb_phase2.pdf

⁴³ Communications Act 2003, Section 3, Part 2(c)

- b: Proposals should demonstrate that there will be no reduction in commitments to developments on other platforms as a result of any successful proposal and allocation of capacity.

7.99 It is important to note that Ofcom places high importance on the use of the capacity on Multiplex B which will result from this process. We have set out criteria which aim to produce the highest value outcome for citizens and consumers from this process. We propose to apply these criteria rigorously to applications for capacity which we receive. We note that while we expect that the relevant organisations will present us with well considered and strong applications as part of this process, we reserve the right to hold back on any award of the capacity if applications (either in totality, or individually) do not meet the criteria set out above.

7.100 We would welcome views on the appropriateness of the criteria set out above for the achievement of Ofcom's policy objectives. In particular, we would welcome views on the types of service that might be commercially viable, and how the proposed criteria may impact on the viability of a particular service.

Question 20: do you agree with the proposed criteria for the comparative selection process?

Ofcom's selection process

7.101 As stated above, Ofcom proposes to select the organisations which should be allocated capacity using the criteria set out in the above section.

7.102 Upon receiving applications, a project team will commence evaluation of the applications. These will be collated and summarised and presented to the Committee responsible for selection.

7.103 We propose that this Committee will be a committee nominated by the Ofcom Board, comprising five members. The Committee will be comprised of Ofcom colleagues, including at least one non-Executive member of the Ofcom Board, and at least one member from the Ofcom Content Board.

7.104 We propose that the Committee would have delegated authority from the Ofcom Board to make the selection. There would be no right of appeal to the Ofcom Board.

7.105 We propose that the Committee would make a decision on which organisations should be allocated capacity, which would then be reflected in the relevant legal instruments. We would publish our reasons for the recommendation.

The upgraded multiplex

7.106 This section provides an overview of how we envisage the upgraded multiplex operating under the multiplex operator. For the reasons provided previously, it is proposed that the upgraded multiplex will be Multiplex B which is currently licensed to the BBC until 2014.

7.107 We do not propose to alter the current BBC multiplex licence conditions other than as outlined in this consultation.

Technical architecture

7.108 Once the multiplex has been cleared, the multiplex operator will be required to upgrade the multiplex using mandated technical requirements, which will be as follows:

- The multiplex must operate using DVB-T2 and MPEG-4 technologies
- The multiplex must operate at the maximum bit rate possible consistent with maintaining the coverage level predicted for the multiplex after DSO.

7.109 We are aware that there may be a degree of trade-off required between coverage and capacity in introducing DVB-T2 and 64QAM technologies. We do not intend to reduce current service coverage levels through this proposal. This matter will be discussed further with the multiplex operator during implementation, should the process go ahead.

7.110 The current multiplex architecture allows services to be provided on a national level. We note the desirability of the multiplex continuing to provide services at a national level.

Carriage of services

7.111 We aim to identify the successful candidates from the comparative selection process in mid 2008.

7.112 Capacity for each candidate will be reserved in an Order, as outlined by the legal framework described in Annex 6. Under Ofcom's proposals for the packaging of the capacity, reserved capacity will be defined as follows for each service:

- From the launch of the service until the DSO process is completed, each of the three services will be allocated around 10 Mbit/s of capacity (the exact amount will be determined by the capacity available under the DVB-T2 standard consistent with the multiplex maintaining its coverage of 98.5%)
- From the completion of the DSO process, when (subject to review) a fourth service is proposed to be added, each of the four services will be allocated 8 Mbit/s of capacity.

7.113 As noted above, the use of the capacity after the end of the licence periods in 2014 will be considered as part of Ofcom's PSB Review.

7.114 Carriage terms for reserved capacity will be left to relevant parties to negotiate at rates reflecting market terms. However, in the event that agreement on carriage rates cannot be reached, matters may be referred to Ofcom for resolution.

Question 21: do you have any comments on Ofcom's proposals for the upgraded multiplex?

Section 8

Conclusions and next steps

Conclusions

- 8.1 This consultation document describes an exceptional opportunity to upgrade the DTT platform over the next few years by introducing new technologies that will greatly increase the capacity available. This upgrade will in turn enable the platform to offer a wider, richer and more varied set of services - including the potential for services in HD.
- 8.2 We set out in this document how this opportunity can be realised.
- 8.3 Using the extra capacity available on DTT at DSO, a whole multiplex could be converted to use the new technical standards, MPEG-4 and DVB-T2. This can be done without requiring either a reduction in the number or picture quality of services carried on the platform, or any additional spectrum – while still enabling a significant gain in the depth and variety of services available on DTT.
- 8.4 However, this is a very complex task. In particular, services displaced from the converted multiplex need to be carried on other multiplexes if they are still to be available - in effect requiring a reorganisation of at least part of the platform, shuffling services between multiplexes to create a clear multiplex that can then be upgraded.
- 8.5 We have considered carefully whether this upgrade, or one similar to it, could be achieved by the DTT multiplex operators without active regulatory intervention. Ofcom’s regulatory principles are to avoid intervening unless it is clearly necessary to do so, and the benefits outweigh the costs.
- 8.6 However, our analysis in this consultation suggests that not intervening in this case risks a worse outcome for citizens and consumers. The DTT platform would probably still be upgraded eventually, but the upgrade is likely to be smaller in scope and/or delayed.
- 8.7 On the basis that intervention is likely to be needed, the document sets out detailed proposals for how this could happen.
- 8.8 There are three key steps in the process:
- The identification of a multiplex to be cleared and upgraded.
 - The reorganisation of other multiplexes to absorb services displaced from the cleared multiplex.
 - The allocation of capacity on the cleared multiplex, so that new services can be launched.
- 8.9 In preparing these proposals, we have sought to identify the approach that best meets our statutory objectives, notably our duties to secure optimal use of the spectrum and the availability of a wide range of high quality television services throughout the UK. We have also sought to ensure that our approach is fair, transparent and proportionate, and that constitutes the minimum intervention necessary to achieve public interest goals.

8.10 Our proposals are set out in summary form below.

Clearance and upgrading of a multiplex

- 8.11 We propose that one multiplex should be cleared of existing services in order to be upgraded to the new technologies, MPEG-4 and DVB-T2. We propose that these new technologies should be introduced together, to reap the combined benefits and to avoid a proliferation of different types of consumer equipment for free-to-air DTT services in the UK.
- 8.12 We suggest that the multiplex selected should be one of those presently carrying fewest services on the platform, in order to minimise the scale of platform reorganisation required. We also suggest that it should be one of the PSB multiplexes, as these will be available to 98.5% of the population from DSO. This will ensure that the new services are universally available.
- 8.13 These two factors point to selection of Multiplex B, which is operated by BBC Free to View Ltd. Under our proposals, the BBC would continue to operate the multiplex but it would be cleared of existing services (which comprise BBC4/Cbeebies, BBC Parliament, three red interactive services, ten radio and two data services). These services would be accommodated elsewhere.
- 8.14 Our analysis suggests that the multiplex could be upgraded to use new technologies from late 2009 or early 2010. This would mean that new services (such as HD channels) could be made available in time for DSO in the Granada region. The new services and new consumer equipment could then be available, as an additional option for DTT viewers, as DSO occurs in most UK nations and regions. (The new services would, of course, also be made available in Border and West Country shortly after DSO in those regions, probably in late 2009 or 2010.)

Reorganisation of other multiplexes

- 8.15 We propose that the services displaced from Multiplex B should be accommodated on the other two PSB multiplexes. These are Multiplex 1 (also operated by the BBC) and Multiplex 2 (operated by Digital 3 and 4).
- 8.16 Our specific proposals are that the majority of the BBC services should move from Multiplex B to Multiplex 1, and that one BBC video service should move from Multiplex B to Multiplex 2. Capacity should also be made available on Multiplex 2 for: one video service in each of Scotland, Wales and Northern Ireland; and for Five, which should move to a PSB multiplex (it is presently carried on Multiplex A) in order to ensure universal access to this service from DSO.
- 8.17 The effect of these proposals will be to ensure that sufficient capacity is available for all PSB services, but the capacity on Multiplexes 1 and 2 will be used more intensively than it is now. S4C, GDS, and TG4 will each be available on a PSB multiplex in, respectively, Wales, Scotland, and Northern Ireland (subject to any other agreements or consents required); and Five will be available to 98.5% of the UK population via DTT.
- 8.18 As a result of this reorganisation, some non-PSB services are likely to be displaced from Multiplex 2 in order to make room for PSB services. It will be a matter for the operators of Multiplex 2 (the Channel 3 and 4 licensees) to determine which services these are, and more generally the future of their commercial services, taking into

account the capacity available elsewhere on the platform. However, the effects of this displacement are limited. We estimate that:

- one UK-wide commercial service will need to be displaced from Multiplex 2 to accommodate a BBC service; however, Five's departure from Multiplex A will free up a slot for another commercial service on that multiplex;
- another commercial service on Multiplex 2 will not be available in Scotland, Wales and Northern Ireland in order to ensure PSB capacity is available to carry S4C, GDS and TG4.

8.19 Our proposals for a regulatory reorganisation are limited to the three PSB multiplexes; Multiplexes B, 1 and 2. We are not proposing to require the operators of the three commercial multiplexes (Multiplex A, operated by SDN, a wholly-owned subsidiary of ITV plc; and Multiplexes C and D, operated by NGW) to make capacity available for particular services.

8.20 However it is relevant that DSO will increase the capacity available on commercial Multiplexes C and D as well as on PSB multiplexes. To ensure this capacity gain is realised at the same time as the other changes discussed here, we propose a change in the technical requirements for Multiplexes C and D, so that these use the same transmission mode (known as 64QAM) as other multiplexes. This will help ensure that the DTT platform as a whole develops in a co-ordinated manner.

Allocation of cleared multiplex

8.21 We also need to consider the process for allocating the upgraded capacity on Multiplex B, so that it provides the maximum benefit for citizens and consumers.

8.22 This document looks at a range of options for this process, consistent with the powers available to the Government and Ofcom. It identifies three key objectives, consistent with the statutory regime and the status of Multiplex B as a PSB multiplex. These are:

- promoting efficient use of the spectrum, particularly through the adoption of new technologies;
- promoting the purposes and characteristics of PSB; and
- promoting the range and variety of high quality television services across the UK.

8.23 Our proposals are:

- to hold a comparative selection process that provides a fair, transparent and objective means of deciding between proposals put forward by organisations with PSB status (principally the BBC, the Channel 3, 4 and 5 licensees, and S4C);
- to use criteria for the selection process that reflect the objectives above;
- to award capacity in blocks that are large enough to offer an HD service, but to give PSBs the flexibility to propose different options for the balance between HD and SD services (for example, in different parts of the day);
- to award three such blocks next year, for services to begin in late 2009/early 2010; to award a fourth block in 2010, for services to begin in 2012.

Alternative proposals

- 8.24 This document describes one way of implementing a complex and intricate set of changes, to reorganise and upgrade the platform. There may be other ways of achieving this goal that could deliver the same or greater benefits to viewers, but might be less complex.
- 8.25 We would welcome alternative proposals to this end, and will assess those proposals against the three key objectives identified above.

Longer-term development of DTT

- 8.26 In the long-term, the benefits of upgrading the DTT platform will be greatest if we can achieve a 'virtuous circle' in which more and more consumers have equipment using the new technologies, more and more services are made available in this way, and the cost of equipment with the new technologies keeps falling.
- 8.27 Virtuous circles of this kind can be seen in many other mass-market communications technologies – from mobile phones to other digital TV platforms. One of the aims of these proposals is to help initiate the next virtuous circle in the development of DTT.
- 8.28 Our analysis shows that the potential benefits of this development are enormous. However, we also think that the process is one that will need to be managed carefully, for two reasons.
- 8.29 First, it is very important that PSB services continue to be available universally to DTT viewers who have existing equipment. This means that, for the foreseeable future, we think that the multiplexes carrying existing PSB services (Multiplexes 1 and 2, under these proposals) must be required to continue operating in DVB-T and MPEG-2.
- 8.30 Second, in relation to the commercial multiplexes, we think that any change in technical standards will need to be evaluated carefully, case by case, to ensure that it does not unacceptably diminish the range, variety and quality of services available to DTT viewers.
- 8.31 The statutory framework exists to allow the regulator to oversee such changes, and to promote the best interests of viewers as a whole. We propose to clarify the regulation by amending the list of technical standards that can be used by commercial multiplexes. We will also make clear that any change in the standards used must first be agreed with Ofcom.

Next Steps

- 8.32 We note the linkages between this work and other projects currently being considered by Ofcom, including DSO, the PSB Review and the DDR.
- 8.33 Ofcom has carried out a detailed assessment of the impact on the DSO process of these proposals, a summary of which is contained in Annex 7, the Impact Assessment. We expect that these proposals will have a very positive impact on the DSO process as they will allow consumers and citizens to reap further benefits from the DSO. We will continue to monitor the interrelationships between the DSO process and these proposals, with a particular view to ensuring that consumers are fully informed of the options that will be open to them at different stages of the process.

- 8.34 The PSB Review will be running concurrently to this process and we will work closely to ensure these proposals are consistent with its objectives and conclusions. In particular, we note the potential bearing their conclusions may have on the proposals for a comparative selection process outlined in this document. The PSB Review is due to report its findings in early 2009.
- 8.35 We recognise that if a reorganisation of the six existing multiplexes to enable new and upgraded services on DTT were to be pursued, a significant amount of further work will be required to achieve the desired outcome(s). We also recognise that a minimum level of certainty that this can be achieved is preferable prior to any award of digital dividend spectrum.
- 8.36 However, we reiterate that we believe that the reorganisation of the multiplexes can be achieved, and that this would carry very significant benefits.
- 8.37 Ofcom will continue to:
- i) Work with PSBs and other multiplex and channel operators to fine-tune the options and if the work proceeds, create a plan for implementation;
 - ii) Work closely with the DCMS;
 - iii) Consider legal issues around the potential reorganisation of the platform;
 - iv) Consider practical and commercial issues to enable the most beneficial and achievable path to a solution; and
 - v) Manage the read across to other linked issues.
- 8.38 Ofcom plans to publish a short technical consultation on the use of standards in digital broadcasting, including MPEG-4 and DVB-T2 in spring / summer 2008, once the DVB-T2 standard is finalised.
- 8.39 The ten week consultation period for this document will run until 30 January 2008. We note this is slightly shorter than Ofcom's usual period for consulting on an issue of this nature, but we have proposed this for the following reasons:
- ensuring any reorganisation can be completed as quickly as possible to reduce impact on DSO rollout and consumer confusion over consumer reception equipment;
 - providing surety to broadcasters and manufacturers as soon as possible to enable appropriate planning and development to take place; and
 - taking a clear view on these proposals prior to final decisions being taken on the DDR (we note that the DDR Statement will be published in December 2007).
- 8.40 We aim to publish a Statement outlining our approach to the reorganisation in March 2008 along with our criteria for the proposed comparative selection process, under which applications for capacity on Multiplex B will be considered.
- 8.41 We anticipate that the application component of the comparative selection process will be open for two months until May 2008. We expect to take an additional two months to make a decision about those applications, and who capacity will be awarded to. This should therefore be done by July 2008.

- 8.42 New services could be launched at end 2009 in line with the DSO timetable for the Granada region.
- 8.43 The timetable does not cover the making of an Order by the Secretary of State for Culture, Media and Sport, which does not fall within Ofcom's powers. However, as we noted in Section 2 of this consultation the Government stands ready to work with Ofcom to facilitate the proposals set out in this document.

Annex 1

Responding to this consultation

How to respond

- A1.1 Ofcom invites written views and comments on the issues raised in this document, to be made **by 5pm on 30 January 2008**.
- A1.2 Ofcom strongly prefers to receive responses using the online web form at <http://www.ofcom.org.uk/consult/condocs/dttfuture/howtorespond/form>, as this helps us to process the responses quickly and efficiently. We would also be grateful if you could assist us by **completing a response cover sheet** (see Annex 3), to indicate whether or not there are confidentiality issues. This response coversheet is incorporated into the online web form questionnaire.
- A1.3 For larger consultation responses - particularly those with supporting charts, tables or other data - please email DTTefficiency@ofcom.org.uk attaching your response in Microsoft Word format, together with a consultation response coversheet.
- A1.4 Responses may alternatively be posted or faxed to the address below, marked with the title of the consultation.
- Jo Dench
Floor 3
Riverside House
2A Southwark Bridge Road
London SE1 9HA
- Fax: 020 7981 3990
- A1.5 Note that we do not need a hard copy in addition to an electronic version. Ofcom will acknowledge receipt of responses if they are submitted using the online web form but not otherwise.
- A1.6 It would be helpful if your response could include direct answers to the questions asked in this document, which are listed together at Annex 4. It would also help if you can explain why you hold your views and how Ofcom's proposals would impact on you.

Further information

- A1.7 If you want to discuss the issues and questions raised in this consultation, or need advice on the appropriate form of response, please contact Jo Dench on 020 7981 3257.

Confidentiality

- A1.8 We believe it is important for everyone interested in an issue to see the views expressed by consultation respondents. We will therefore usually publish all responses on our website, www.ofcom.org.uk, ideally on receipt. If you think your response should be kept confidential, can you please specify what part or whether all of your response should be kept confidential, and specify why. Please also place such parts in a separate annex.

- A1.9 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and will try to respect this. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.
- A1.10 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's approach on intellectual property rights is explained further on its website at <http://www.ofcom.org.uk/about/accoun/disclaimer/>

Next steps

- A1.11 Following the end of the consultation period, Ofcom aims to publish a Statement in March 2008.
- A1.12 Please note that you can register to receive free mail Updates alerting you to the publications of relevant Ofcom documents. For more details please see: http://www.ofcom.org.uk/static/subscribe/select_list.htm

Ofcom's consultation processes

- A1.13 Ofcom seeks to ensure that responding to a consultation is as easy as possible. For more information please see our consultation principles in Annex 2.
- A1.14 If you have any comments or suggestions on how Ofcom conducts its consultations, please call our consultation helpdesk on 020 7981 3003 or e-mail us at consult@ofcom.org.uk . We would particularly welcome thoughts on how Ofcom could more effectively seek the views of those groups or individuals, such as small businesses or particular types of residential consumers, who are less likely to give their opinions through a formal consultation.
- A1.15 If you would like to discuss these issues or Ofcom's consultation processes more generally you can alternatively contact Vicki Nash, Director Scotland, who is Ofcom's consultation champion:

Vicki Nash
Ofcom
Sutherland House
149 St. Vincent Street
Glasgow G2 5NW

Tel: 0141 229 7401
Fax: 0141 229 7433

Email vicki.nash@ofcom.org.uk

Annex 2

Ofcom's consultation principles

A2.1 Ofcom has published the following seven principles that it will follow for each public written consultation:

Before the consultation

A2.2 Where possible, we will hold informal talks with people and organisations before announcing a big consultation to find out whether we are thinking in the right direction. If we do not have enough time to do this, we will hold an open meeting to explain our proposals shortly after announcing the consultation.

During the consultation

A2.3 We will be clear about who we are consulting, why, on what questions and for how long.

A2.4 We will make the consultation document as short and simple as possible with a summary of no more than two pages. We will try to make it as easy as possible to give us a written response. If the consultation is complicated, we may provide a shortened version for smaller organisations or individuals who would otherwise not be able to spare the time to share their views.

A2.5 We will normally allow ten weeks for responses to consultations on issues of general interest.

A2.6 There will be a person within Ofcom who will be in charge of making sure we follow our own guidelines and reach out to the largest number of people and organizations interested in the outcome of our decisions. This individual (who we call the consultation champion) will also be the main person to contact with views on the way we run our consultations.

A2.7 If we are not able to follow one of these principles, we will explain why. This may be because a particular issue is urgent. If we need to reduce the amount of time we have set aside for a consultation, we will let those concerned know beforehand that this is a 'red flag consultation' which needs their urgent attention.

After the consultation

A2.8 We will look at each response carefully and with an open mind. We will give reasons for our decisions and will give an account of how the views of those concerned helped shape those decisions.

Annex 3

Consultation response cover sheet

- A3.1 In the interests of transparency and good regulatory practice, we will publish all consultation responses in full on our website, www.ofcom.org.uk.
- A3.2 We have produced a coversheet for responses (see below) and would be very grateful if you could send one with your response (this is incorporated into the online web form if you respond in this way). This will speed up our processing of responses, and help to maintain confidentiality where appropriate.
- A3.3 The quality of consultation can be enhanced by publishing responses before the consultation period closes. In particular, this can help those individuals and organisations with limited resources or familiarity with the issues to respond in a more informed way. Therefore Ofcom would encourage respondents to complete their coversheet in a way that allows Ofcom to publish their responses upon receipt, rather than waiting until the consultation period has ended.
- A3.4 We strongly prefer to receive responses via the online web form which incorporates the coversheet. If you are responding via email, post or fax you can download an electronic copy of this coversheet in Word or RTF format from the 'Consultations' section of our website at www.ofcom.org.uk/consult/.
- A3.5 Please put any parts of your response you consider should be kept confidential in a separate annex to your response and include your reasons why this part of your response should not be published. This can include information such as your personal background and experience. If you want your name, address, other contact details, or job title to remain confidential, please provide them in your cover sheet only, so that we don't have to edit your response.

Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing	<input type="checkbox"/>	Name/contact details/job title	<input type="checkbox"/>
Whole response	<input type="checkbox"/>	Organisation	<input type="checkbox"/>
Part of the response	<input type="checkbox"/>	If there is no separate annex, which parts?	

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here.

Name

Signed (if hard copy)

Annex 4

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?

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?

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?

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

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

Question 6: do you agree that some form of intervention is required in order for the DTT platform to commence an upgrade to new technologies without delay?

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?

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?

Question 9: do you agree with Ofcom's proposal that Multiplex B should be cleared and upgraded to new technologies?

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

Question 11: do you agree with our proposals for accommodating Five, S4C, TG4 and GDS on Multiplex 2?

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?

Question 13: do you agree with our proposals for the reorganisation process for the existing multiplex services set out in the central case scenario?

Question 14: do you agree with the principles / conditions that Ofcom proposes to use to evaluate counterproposals for the reorganisation process?

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

Question 16: do you agree with Ofcom's assessment of the options for allocating the upgraded capacity?

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?

Question 18: do you agree with the proposal that Ofcom should not mandate the use of the capacity for any particular service type (SD or HD) but allow the broadcasters to make proposals?

Question 19: do you agree with the proposal that the capacity should be allocated in three UK-wide blocks initially, rising to four blocks at DSO?

Question 20: do you agree with the proposed criteria for the comparative selection process?

Question 21: do you have any comments on Ofcom's proposals for the upgraded multiplex?

Question 22: Do you agree with Ofcom's impact assessment?

Question 23: Do you agree with Ofcom's assessment of the potential benefits, risks and mitigations strategies relating to the impact of these proposals on the DSO programme?

Annex 5

Glossary

BA90	Broadcasting Act 1990
BA96	Broadcasting Act 1996
Bandwidth	The amount of information that can be transmitted in a given period of time. A large amount of bandwidth is generally associated with better picture quality. Compression techniques reduce the bandwidth required, especially for transmission and storage.
Bit	Short for binary digit. The smallest piece of binary digital data, represented by either a 1 or a 0. 8 bits = 1 byte.
Bits/sec	Normally shown as Kb/s (thousands of bits per second) or Mbit/s (millions of bits per second). A 'bit' is one binary digit of information.
CA03	Communications Act 2003
DCMS	Department for Culture, Media and Sport
Digital Dividend Review (DDR)	Ofcom's review process for allocating the DTT spectrum freed up by DSO
Digital Switchover (DSO)	The process of switching over the current analogue television broadcasting system to digital, as well as ensuring that people have adapted or upgraded their televisions and recording equipment to receive digital TV.
DTT	Digital Terrestrial Television, currently most commonly delivered through the Freeview service.
DVB	Digital Video Broadcasting. A set of internationally accepted open standards for digital broadcasting, including standards for distribution by satellite, cable, radio and handheld devices
DVB-T / DVB-T2	Terrestrial Digital Video Broadcasting. T2 is a second generation standard currently under development, but expected to launch in 2009
Enhanced television services	Television services which include interactive applications as well as audio and video.
EPG	Electronic Programme Guide. A programme schedule, typically broadcast alongside digital television or radio services, to provide information on the content and scheduling of current and future programmes.
Free to air (FTA)	Broadcast signals that do not require payment at the point of reception
GDS	Gaellic Digital Service

GHz	Gigahertz
HD (HDTV)	High Definition (High Definition Television). A TV system which provides a clearer, sharper picture through higher resolution. HD transmission may be in 720p, 1080i or 1080p standards, where the number refers to the number of lines of vertical resolution (an HD format must display at least 720 lines), 'p' refers to progressive and 'i' to interlaced.
IDTV	Integrated Digital Television
iPTV	Internet Protocol Television. The term used for television and/or video signals that are delivered to subscribers or viewers using Internet Protocol (IP), the technology that is also used to access the Internet. Typically used in the context of streamed linear and on demand content, but also sometimes for downloaded video clips.
Mbit/s / Mbps	Megabits per second. A measure of data transfer speed, with 1 Mbit/s representing 1,000,000 bits being transmitted in one second
MHz	Megahertz
MPEG	Moving Pictures Expert Group. Group which established a set of international standards for compression and transmission of digital audio-visual content. Most digital television services in the UK use MPEG-2, but MPEG-4 offers greater efficiency and is likely to be used for new services including TV over DSL and High Definition TV.
Multiplex	A digital stream or service that carries multiple signals or streams of information on a carrier at the same time in the form of a single, complex signal. The separate signals are then recovered at the receiving end. In broadcasting, this relates to a collection of compressed digital channels which typically occupies the same bandwidth as a single analogue service. May be abbreviated to 'mux'.
NGW	National Grid Wireless
Ofcom	Office of Communications. The UK's independent regulator and competition authority for broadcasting, telecommunications and radiocommunications matters
PSB	Public Service Broadcasting, or Public Service Broadcaster. The Communications Act in the UK defines the PSBs to include the BBC, the channel 3 licensees, Channel 4, Five and S4C.
PVR	Personal Video Recorder (may also be referred to as a Digital Video Recorder). A device, usually built into a set-top box or TV set, which records content digitally onto a hard disk. The unit may have several tuners to record programmes simultaneously, as well as enabling facilities such as live pausing.
QAM	Quadrature Amplitude Modulation. A method of combining two amplitude-modulated (AM) signals into a single channel, thereby doubling the effective bandwidth

Resolution	The number of pixels displayed on a screen
S4C	Welsh national broadcaster
SD	Standard Definition. In the UK, this is the 625 line system, of which 576 lines are visible – a lower resolution than HDTV.
STB	Set-top Box. A receiver/decoder for digital broadcast signals
Up-conversion	A process to enable a lower resolution picture to be shown on a higher resolution display – for example, so that SD content can be included in an HD broadcast. Although the number of lines and frame rate might be increased, the overall resolution remains the same as the original.
VoD	Video on Demand. A service or technology that enables TV viewers to watch programmes or films whenever they choose to, not restricted by a linear schedule.
WTA	Wireless Telegraphy Act 2006

Annex 6

Legal framework

Introduction

- A6.1 This Annex sets out provisions of the legal framework that may be particularly important for achieving both the reorganisation of the existing DTT multiplexes and the use of upgraded capacity on proposed Multiplex B following this reorganisation.
- A6.2 We have already noted in Section 3 of this document that the extent to which these (and other potentially relevant) powers apply will depend on the function(s) that Ofcom may ultimately carry out in implementing the proposals set out in this consultation document.
- A6.3 This matter is in part also pending any decision that the Secretary of State may take following Ofcom's recommendations to him at the end of this consultation process.

Regulatory functions

- A6.4 It is possible that the proposals discussed in this consultation document could involve Ofcom exercising a variety of its regulatory functions.
- A6.5 Ofcom already has powers under section 211 of the CA03 to regulate⁴⁴ certain television services in accordance with the CA03, the BA90 and BA96. Such services (each of which is defined in section 362 of the CA03) include certain (non-satellite) television broadcasting services, digital television programme services and additional television services, on the one hand, and television multiplex services and digital additional television services, on the other hand.
- A6.6 Those powers do not cover any similar services provided by the BBC (although they do cover services provided by a BBC company⁴⁵). Ofcom has powers under section 198 of the CA03 to regulate the provision of the BBC's services⁴⁶, but only to the extent that provision for it to do so is contained in the BBC Charter and Agreement and the provisions of the CA03 and of Part 5⁴⁷ of the BA96.
- A6.7 Before turning to Ofcom's specific powers to vary licence conditions, it is appropriate to deal briefly with Ofcom's statutory duties in exercising these powers.

Statutory duties

General duty

- A6.8 Under section 3(1) of the CA03, Ofcom's principal duty, in carrying out its functions, is to further the interests of citizens and to further the interests of consumers in

⁴⁴ In addition, Schedule 1 to the CA03 (to which its section 2 refers) sets out a number of functions of the Independent Television Commission that have been transferred to Ofcom, such as the granting and awarding of licences under Part 1 of the BA90 and Part 1 of the BA96.

⁴⁵ According to section 362(3) of the CA03, the provision of a service by the BBC does not include its provision by a BBC company, which means a body corporate which is controlled by the BBC or a body corporate in which the BBC or a body corporate controlled by the BBC is (to any extent) a participant (see section 362(1)).

⁴⁶ Section 198(9) defines the term "the BBC's services" as such of the services provided by the BBC (excluding the services comprised in the World Service) as are of a description of service which, if provided by a BBC company, would fall to be regulated by Ofcom by virtue of section 211 or 245.

⁴⁷ This Part deals with Ofcom's functions under competition legislation as well as media mergers.

markets for any of the services, facilities, apparatus or directories in relation to which Ofcom has functions, where appropriate by promoting competition.

Specific objectives

A6.9 In discharging its principal duty, Ofcom is required to secure a number of specific objectives set out in section 3(2) of the CA03. For reasons set out in Section 3 of this consultation document, Ofcom considers that the following objectives are particularly relevant to this consultation:

- to secure the optimal use for wireless telegraphy of the electro-magnetic spectrum;
- to secure the availability throughout the UK of a wide range of TV and radio services which (taken as a whole) are both of high quality and calculated to appeal to a variety of tastes and interests;

A6.10 In addition, in carrying out its spectrum functions, Ofcom is specifically required by section 3 of the WTA to have regard, in particular, to the efficient management and use of the spectrum. Pursuant to section 7 of the WTA, Ofcom has a further special duty to ensure that sufficient capacity is made available on the reserved frequencies for ensuring, in the case of every licensed television multiplex service, that the qualifying services are broadcast by means of that multiplex service.

Other relevant matters

A6.11 Section 3(3) of the CA03 goes on to require that Ofcom apply certain regulatory principles in all cases. Specifically, in performing its principal duty, Ofcom must have regard to the principles under which regulatory activity should be transparent, accountable, proportionate, consistent and targeted only where such action is needed, as well as to any other principles appearing to Ofcom to be best regulatory practice.

A6.12 In this regard, Ofcom's own regulatory principles⁴⁸ make it clear that Ofcom will operate with a bias against intervention but with a willingness to intervene firmly, promptly and effectively where required; and, further, that it will intervene where there is a specific statutory duty to work towards a public policy goal that markets alone cannot achieve. If a case for intervention can be made, Ofcom is committed to choosing the least intrusive means.

A6.13 In performing these duties, Ofcom will also have regard to its own regulatory principles as well as the interest of consumers in respect of choice, price, quality of service and value for money. Pursuant to section 3(4) of the CA03, Ofcom may also, where it appears to Ofcom to be relevant, have regard to the desirability of promoting the fulfilment of the purposes of PSB in the UK.

A6.14 However, there is no hierarchy in the legislation between the two components of the principal duty in section 3(1), or between the objectives in section 3(2), or between the matters in section 3(4), of the CA03. Rather, Parliament has recognised that Ofcom's duties require it to pursue a range of objectives while taking a variety of matters into consideration and that this was likely to present Ofcom with a need to resolve conflicts between these duties and matters.

⁴⁸ <http://www.ofcom.org.uk/about/sdrp/>

A6.15 Therefore, Ofcom is given a wide measure of discretion in such circumstances within an overall framework set out in the CA03. Thus, in making its present proposals, Ofcom has taken account of its principal duty, the specific objectives and some additional matters in order to arrive at a judgement on the most appropriate options going forwards by weighing the technological as well as economic considerations presently before it, as set out in this consultation document.

Impact assessment

A6.16 Indeed, as Ofcom recognises the importance of its proposals, it has further informed its judgement by carrying out an impact assessment to assess different potential options for regulation and showing why the preferred option has been chosen.

A6.17 Ofcom has published its Impact Assessment by setting it out in Annex 7 to this consultation document.

A6.18 In light of the above, the remainder of this Annex focuses on Ofcom's specific powers to vary conditions attached to multiplex licences and DRLs.

Television multiplex services

A6.19 Broadly speaking, the way in which Ofcom may vary conditions in the multiplex licences depends on (and is prescribed under) the related enabling power under which the condition in question may be imposed.

A6.20 In particular, section 3(4) of the BA96 provides that the licence holder's consent is required to vary the period for which a licence having effect for a specific period is to continue in force. However, in the case of any other variation, Ofcom may vary a licence if the licence holder has been given a reasonable opportunity of making representations to Ofcom about the variation. In this context, it is to be noted that Ofcom has broad⁴⁹ powers to include conditions under section 4 of the BA96, such as where they appear to Ofcom to be appropriate having regard to any duties which are or may be imposed on it, or on the licence holder, by or under the CA03, the BA90 or the BA96.

A6.21 In relation to the more specific conditions that Ofcom may attach to multiplex licences under section 12 of the BA96, section 12(2) makes it clear that Ofcom would require the consent of the licence holder where conditions are imposed pursuant to section 12(1)(a) and (b). These conditions relate to the licensed service as well as certain other proposals submitted by the licence holder under section 7(4) of the BA96. In addition, the licence holder has certain rights to apply to Ofcom for variation of a condition imposed under section 12(1)(b) that relates to the characteristics of any digital programme services or digital sound programme services to be broadcast under the licence.

A6.22 While the above-mentioned powers of variation are reflected in Condition 17 of each of the multiplex licences, Ofcom may have further powers to impose conditions in multiplex licences, provided that an order has been made to that effect by the Secretary of State under Section 243 of the CA03. Such an order may

⁴⁹ The general nature of this power is expressly clear from section 4(6) of the BA96, which provides that nothing in Part 1 of the BA96 (such as section 12) which authorises or requires the inclusion in a licence of conditions relating to any particular matter or having effect for any particular purpose shall be taken as derogating from the generality of section 4(1).

specify modifications⁵⁰ to sections 7 to 16 and sections 18 and 19 of the BA96 and that these modifications may have effect in place of any or all of those provisions. The requirement mentioned above to obtain the licensee's consent under section 12(2) is something that falls within the range of modification measures that may be covered by such an order.

- A6.23 Furthermore, it is a power that applies to both existing and new licences on reserved frequencies. Specifically, section 243(2) of the CA03 provides that this power may be exercised by the Secretary of State in relation to licences under Part 1 of the BA96 and the awarding and grant of such licences, in a case in which the licence is, or is to be, a licence to provide a service for broadcasting on any one or more reserved frequencies⁵¹.
- A6.24 As regards the question of reserved frequencies, Ofcom considers that the procedural matter of Ofcom determining the frequencies in question as having been reserved for the broadcasting of TV multiplex services is something as may be deemed already duly done⁵² and is therefore not a matter which needs to be done over again for present purposes.
- A6.25 In relation to licence conditions that relate to payments for capacity specifically reserved for the use by certain broadcasters, section 243(4), by virtue of section 243(3), of the CA03 makes express provision for the Secretary of State by order to require Ofcom to include such conditions.
- A6.26 As regards the BBC, it is providing a television multiplex service under Multiplex 1, which is unlicensed by Ofcom. However, the BBC Trust is under a duty under clause 42 of the BBC Agreement to secure the efficient use of the spectrum that is available for use by the BBC or its contractors.
- A6.27 Furthermore, the Secretary of State may direct the BBC to grant to any PSB the right to use any capacity on a television multiplex service that is under the BBC's control (subject, where applicable, to compliance with any need to obtain a new or revised licence from Ofcom for that purpose), that is to say Multiplex 1 as well as Multiplex B (which is granted to BBC Free to View Ltd). Such direction may be given in writing⁵³, in particular, where it appears to the Secretary of State appropriate to do so in the interests of PSB in the UK.

Digital replacement licences

- A6.28 Ofcom has powers to vary conditions attached to DRLs. Generally, it has a broad power under section 3(4) of the BA90 to vary these licences similar to the one under section 3(4) of the BA90 mentioned above for television multiplex licences.

⁵⁰ Section 405(1) of the CA03 provides that "In this Act, except in so far as the context otherwise requires— ... "modification" includes omissions, alterations and additions, and cognate expressions are to be construed accordingly;"

⁵¹ Section 243(6) of the CA03 defines a "reserved frequency" as one as respects which Ofcom has made a determination, in exercise of its functions under the enactments relating to the management of the radio spectrum, that the frequency should be reserved for the broadcasting of television multiplex services.

⁵² By Notice of Assignment of Frequencies of 5 November 1996 by the Secretary of State, the frequencies between 470MHz and 582MHz as well as 614MHz and 854MHz were assigned for multiplex services. Also, under the UK's Plan for Frequency Authorisation published by Ofcom, the frequency range between 470MHz and 854MHz has been allocated for the purposes of "Terrestrial TV Broadcast Transmission (UHF Analogue and Digital)".

⁵³ Clause 96(2) of the BBC Agreement.

A6.29 Ofcom may therefore vary a licence by a notice served on the licence holder if the licence holder consents, in the case of a variation of the period for which the licence is to continue in force, or the licence holder has been given a reasonable opportunity of making representations to Ofcom about the variation, in the case of any other variation.

Annex 7

Impact Assessment

Introduction

- A7.1 The analysis presented in this annex represents an impact assessment, as defined in section 7 of the CA03.
- A7.2 You should send any comments on this impact assessment to us by the closing date for this consultation. We will consider all comments before deciding whether to implement our proposals.
- A7.3 Impact assessments provide a valuable way of assessing different options for regulation and showing why the preferred option was chosen. They form part of best practice policy-making. This is reflected in section 7 of the CA03, which means that generally we have to carry out impact assessments where our proposals would be likely to have a significant effect on businesses or the general public, or when there is a major change in Ofcom's activities. However, as a matter of policy Ofcom is committed to carrying out and publishing impact assessments in relation to the great majority of our policy decisions. For further information about our approach to impact assessments, see the guidelines, Better policy-making: Ofcom's approach to impact assessment, which are on our website:
http://www.ofcom.org.uk/consult/policy_making/guidelines.pdf

The citizen and/or consumer interest

- A7.4 The completion of DSO will result in an increase in the coverage of all services on the DTT platform, and also has the potential to increase the capacity of some multiplexes through changes in the transmission mode. These improvements in both coverage and capacity will be of great benefit to UK citizens and consumers. However, we believe that there are greater improvements in capacity and efficiency that can be made due to recent advances in technology, in particular MPEG-4 and DVB-T2 technologies, but there are a variety of factors potentially preventing the platform from taking advantage of them in an efficient manner.
- A7.5 At DSO, it is possible to restructure the DTT platform in order to take advantage of these technical advances without requiring a reduction in the number of services available to existing viewers. This could significantly benefit consumers and citizens by facilitating greater efficiency in the use of valuable broadcasting spectrum, potentially more than doubling platform capacity over time; enabling the DTT platform to continue to develop; and allowing the introduction of new services. However, the adoption of the new technologies will require those consumers who wish to receive the new services to purchase new receivers as they will not be compatible with existing STBs.
- A7.6 Therefore, the way in which the new technologies are introduced to the platform will affect consumers and citizens alike, and hence the upgrade should be carried out in such a way that, wherever possible, access to the existing services by the current range of digital receivers is maintained and that a new STB is only required if the viewer wishes to access new (rather than existing) services.

Ofcom's policy objectives

A7.7 We have a number of key policy objectives that are relevant in this case:

- Ensuring the optimal use of the spectrum;
- Ensuring the availability of a wide range of TV and radio services of high quality and wide appeal; and
- Promoting the purposes of public service broadcasting (PSB) in the UK.

A7.8 In addition to this, our duties in relation to furthering the interests of consumers and citizens are particularly relevant in this consultation as the benefits of a technology upgrade to both of these groups is potentially significant. As a result of these objectives and duties, we have a strong interest in the commercial and technical development and status of the entire DTT platform, with a particular interest in the PSB multiplexes.

Options considered

A7.9 There is a sequence of issues that needs to be addressed, with a number of options on how each of them can be dealt with in order to achieve our policy objectives. The issues that need to be addressed are:

- a) Do we need to intervene to bring about the technical upgrade of the DTT platform to MPEG-4 and DVB-T2? Then if we do choose to intervene:
 - i) Which multiplex do we upgrade and what is the impact of the reorganisation process?
 - ii) Do we need to intervene in the allocation of capacity on the cleared and upgraded multiplex?
 - iii) If we intervene in the allocation of capacity, how do we do it?
 - iv) What are the justifications for the selection criteria and what impact will these have?
- b) Do we need to intervene to ensure a mode change to 64 QAM?

A7.10 These issues are assessed in order in the remainder of this impact assessment.

Analysis of the different issues

Do we need to intervene to bring about the technical upgrade of the DTT platform to MPEG-4 and DVB-T2?

A7.11 Section 5 discusses the need for a technological upgrade of the DTT platform and the benefits it would generate. In particular, it notes the benefits of a technological upgrade to MPEG-4 and DVB-T2 within the timeframe of the DSO. Firstly, we believe that an earlier adoption of these technologies could bring forward the availability of new services such as HD on the DTT platform, and would bring forward the more efficient use of the valuable spectrum already allocated to DTT use. Secondly, the earlier the new technologies can be introduced, the more consumers who will have a choice when their region undertakes switchover

between standard and DVB-T2 MPEG-4 compatible STBs. Finally, we think there are incremental benefits to be gained from the combined adoption of MPEG-4 and DVB-T2 in line with DSO for the reasons described below.

- Simultaneous adoption minimises the number of times consumers have to upgrade their reception equipment in order to receive new services which also reduces consumer confusion. Timing this simultaneous upgrade with DSO may increase the number of consumers who have compatible STBs early in the upgrade process, as a significant number of STBs will be purchased throughout DSO, and therefore adopting this timeline is likely to increase the number of potential viewers of new services delivered by this technology.
- Platform adoption of DVB-T2 may be significantly delayed or not happen at all unless the upgrade is carried out in the medium to short term in line with DSO. This is due to the opportunity provided by the mode change at DSO, which allows an upgrade of the first multiplex to DVB-T2 without requiring a reduction in the number of services offered to existing viewers.

A7.12 We believe that the additional benefits associated with the simultaneous adoption of both technologies in line with DSO outweigh any incremental costs of implementing two new technologies compared to MPEG-4 on its own. As such we believe our proposal to upgrade both technologies simultaneously provides the best opportunity to generate the benefits the upgrade can bring and allows us to achieve our key objectives. Therefore, for the purpose of the consultation, we only consider the combined introduction of DVB-T2 and MPEG-4 on the DTT platform.

A7.13 We have considered three options to achieve this upgrade, these are discussed in Section 5. These different options each have varying costs and benefits which are summarised in Table 6 below.

Table 6: Summary of costs and benefits of intervention options

Option	Benefits	Costs	Assessment of magnitude
No intervention	<ul style="list-style-type: none"> • Reduces risk of regulatory failure owing to inappropriate intervention (eg requiring the upgrade to proceed too early) 	<ul style="list-style-type: none"> • Unlikely to lead to upgrade within DSO timeframe due to market failure issues detailed in Section 5, therefore benefits of early adoption may be lost 	<ul style="list-style-type: none"> • Costs outweigh benefit as market failure risk is significant, as is the magnitude of the benefits which may be lost without early adoption
Deregulation	<ul style="list-style-type: none"> • May bring about the upgrade, but there are still risks that the upgrade would be significantly slower 	<ul style="list-style-type: none"> • Huge policy, legal and regulatory changes required for any deregulatory option which has the potential to address the problem 	<ul style="list-style-type: none"> • Costs are substantially higher relative to the smaller scale and uncertainty of the benefits.
Intervention	<ul style="list-style-type: none"> • Improvement to spectrum efficiency and the benefits of a technology upgrade accrue to 	<ul style="list-style-type: none"> • Risk of regulatory failure detailed in Section 5 	<ul style="list-style-type: none"> • Whilst the regulatory failures described in Section 5 are possible in theory, they are likely to be significantly lower in scale than the prospective

	stakeholders		benefits of the technology upgrade, especially as they can potentially be addressed in the design of the intervention.
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A7.14 Considering the substantial benefits of a technology upgrade, it appears that the risk that the platform will not upgrade on its own within the DSO timeframe due to market failures is greater than the regulatory failure risk of direct intervention. Deregulation is not a viable option due to the significant policy and legal changes required for any kind of deregulation that may encourage the upgrade. As a result, we take the view that the benefits of our direct intervention and early adoption of the technology will significantly outweigh the costs.

A7.15 Given this, we now go on to consider the issues which are raised by this decision.

Which multiplex do we upgrade?

A7.16 There is a necessity to select a multiplex to be upgraded as it is unlikely an operator will volunteer their own to be the first. Section 5 details two key criteria that all multiplexes were considered against: how many SD services the multiplex carries, and whether the multiplex has universal coverage. These criteria attempt to reduce the risk of regulatory failure as they promote the selection of the multiplex that will incur the lowest costs for consumers and broadcasters.

Which carries the lowest number of services?

A7.17 This is important due to the desire for displaced services to be accommodated elsewhere. The lower this is, the lower the reorganisation costs incurred as there are fewer services moving between multiplexes.

A7.18 Under this criteria, Multiplex B carries the fewest SD services and Multiplex C carries the second fewest.

Which has the highest coverage?

A7.19 This criteria is particularly important as it aims to minimise consumer confusion around DSO, reduce the potential for the creation of a digital divide, and promote the faster uptake of new STBs.

A7.20 To choose between Multiplex B and C, this second criteria indicates that Multiplex B is the most appropriate multiplex to upgrade as it has universal coverage which we believe is beneficial due to the reasons above.

A7.21 Therefore this implies multiplex B should be cleared due to the benefits it will generate because of its universal coverage characteristic, and by carrying the fewest number of SD services at present, which means that the costs are low compared to those incurred if another multiplex was upgraded. However there is an opportunity cost associated with the upgrade as it will significantly reduce the number of potential viewers able to receive services on the upgraded multiplex due to the technology change until compatible STB penetration increases. It is important to note that this effect is relatively short term, would be the case if any multiplex was upgraded, and the PSB services currently carried on Multiplex B will

be carried on other universal multiplexes so there will be no reduction in the PSB services consumers can receive.

What is the impact of a proposed reorganisation involving the upgrade of Multiplex B on relevant parties?

- A7.22 Section 6 proposes a reorganisation process that would result in the clearing of Multiplex B and relies upon a number of technical assumptions and requirements, including the carriage of nine video services on Multiplex 2. The detail of the reorganisation process is set out in Section 6. The impact this reorganisation will have is summarised below:
- Multiplex 1 carries three additional video and ten additional radio services transferred from Multiplex B;
 - Multiplex 2 will carry Five, transferred from Multiplex A, in order to achieve universal service coverage for this service;
 - Multiplex 2 will carry one national BBC video service, transferred from Multiplex B;
 - Multiplex 2 will carry three national services in their respective nations (S4C, GDS and TG4); and
 - Multiplex 2 will lose two existing services in order to accommodate these displaced services from Multiplex B – one nationwide service, and one service in Wales, Scotland and Northern Ireland. The accommodation of these displaced services on an alternative multiplex is to be determined by the operators themselves.
- A7.23 There is the potential for one of the displaced channels from Multiplex 2 to be broadcast in England while the national services are broadcasting in their respective nations, and returning to universal coverage when they are not. This would reduce the negative impact as a result of the reorganisation process. Ofcom proposes that Channel 4 should be the party which has access to this channel in England, given that ITV has the potential to use the slot vacated by Five on Multiplex A (operated by SDN, ultimately controlled by ITV plc) for the carriage of a nationwide ITV plc service displaced from Multiplex 2.
- A7.24 This reorganisation process may result in a loss for certain broadcasters due to the change in coverage when moving between certain multiplexes and the carriage contract negotiations that are necessary for displaced services. However, it is worth noting that whilst not insignificant, any loss experienced by broadcasters as a result of the reorganisation is a short term loss, and the benefits the technology upgrade may generate are likely to significantly outweigh these in the long run. Furthermore, the submission of alternative proposals that may alter this impact are invited in response to this consultation.
- A7.25 Whilst any reduction in coverage for certain services as a result of transferring from a universal to a commercial multiplex is going to have a detrimental effect on those consumers who are no longer able to receive them, the proposed reorganisation ensures all core PSB services continue to be delivered on a universal coverage multiplex. This remains consistent with our objectives relating to PSB, and ensures the negative impact on consumers is reduced.

- A7.26 Additionally, whilst there is a risk that problems will arise as a result of enforced contract negotiation, if broadcasters have had capacity reserved for them by us and DCMS and cannot agree carriage price with the multiplex operator, the issue can be referred to us and we can determine a carriage fee which reflects market conditions. Therefore, although we expect that commercial agreements will be made between relevant parties, there is a back-up should this not be the case.
- A7.27 The criteria for multiplex selection clearly identify Multiplex B and consideration of the impact on the affected broadcasters further supports this choice. Whilst there is an opportunity cost involved with this option, this is relatively short term as when the new STBs become more widespread, the audience able to receive the services will increase. Therefore the longer term benefits of this are likely to significantly outweigh this cost.

Do we need to intervene in the allocation of capacity on the cleared and upgraded multiplex?

- A7.28 The existence of market failures that are likely to prevent an upgrade of the technology of the platform within the timeframe of the DSO without intervention raise a further question as to whether there is the need for us to intervene in the allocation of the capacity. There are three potential options detailed in Section 7: no intervention, revoke and re-award the licence, and an Ofcom-led direct allocation process. These three options are assessed below.

No intervention

- A7.29 The main benefit of no intervention is the avoidance of regulatory failure, but there are substantially more costs involved.

Costs
<ul style="list-style-type: none"> • Spectrum efficiency – the incentives the BBC has to make the capacity available to others are likely to be less than those which would be experienced by a profit making entity. The vertically integrated nature of the BBC means that it may limit or favour its own content, and capacity could be, as a result, left unused which has social cost implications due to the valuable nature of the capacity. This is evident historically as to date, the BBC has not opened up its multiplex capacity to non-BBC services. • Any limits on the choice and range of services offered on the multiplex may impact on the uptake of STBs, which impacts on the speed at which the benefits of the upgrade are realised. This has the potential to lead to a sub-optimal outcome, both for the range and diversity of services on the multiplex, and in terms of spectrum efficiency. • The functions and role of the BBC Trust are limited to the BBC, and therefore their focus and remit are significantly narrower than that of Ofcom. • No way of ensuring access to capacity for new services for other broadcasters.

- A7.30 As a result, we believe these costs and risks associated with leaving the allocation of capacity with the BBC or the BBC Trust may not result in the optimal outcome for citizens and consumers, or the most efficient use of spectrum.

Revoke and re-award the BBC licence of Multiplex B

A7.31 This option appears to be disproportionate compared to other potential options. It would require that the BBC had breached the terms of its licence, which is not the case, and in the absence of this, a revocation could be made on the grounds of spectrum efficiency. However, there appear to be other options available which could be as effective at promoting spectrum efficiency whilst considering our objectives, but which are less interventionist and therefore more proportionate than revocation.

Ofcom and DCMS assess which organisations get access to the capacity in an administrative process

A7.32 The impact this will have on stakeholders very much depends on the outcome of the allocation process, but follows very general theories.

Benefits

- More proportionate response than licence revocation as the multiplex licence can be left with the BBC
- Likely to give more certainty sooner to STB manufacturers and consumers thus aiding the uptake process
- Potentially greater variety in providers of new content which benefits consumers and increases STB uptake
- Avoids market failure risk preventing efficient capacity allocation
- Avoids issue of favouring own services in the use of capacity
- Participants will have a mechanism through which they can refer disputes to Ofcom, which would not be available if there was no intervention
- Can help achieve our objectives through design of allocation process

Costs

- Risk of regulatory failure as less market involvement than other options. Ofcom and DCMS have a limited opportunity to use the views of the market to determine the allocation

A7.33 Market failure risk justifies intervention in the technology upgrade, and it is similar failures that provide a rationale for intervention in the allocation of the capacity. The complicated nature of BBC incentives stemming from the different institutional and regulatory barriers they face means that they may favour their own services, thus creating a risk of lower spectrum efficiency. This market failure risk and the resulting reduction in the rate at which the benefits are realised significantly outweigh the regulatory failure risk of DCMS and Ofcom intervention, particularly with the extra benefits this approach can generate. This is especially true as regulatory failure risk can be considered and to some degree addressed in the design of the allocation process. Therefore we believe that direct intervention by Ofcom and DCMS constitutes the most appropriate approach for the benefits of the technology upgrade to be realised, and is more likely to result in an optimal outcome.

How do we allocate capacity?

A7.34 There are three options for allocation described in greater detail in Section 7. These are: direct allocation now after a consultation; a comparative selection process where proposals are assessed against pre-defined criteria; and an allocation decision is an output of the PSB Review. The benefits and costs of each of these options are summarised in Table 7 below.

A7.35 We set out in Section 7 that PSB organisations are the organisations that can benefit from the allocation of capacity on Multiplex B.

Table 7: Options for allocation of Multiplex B capacity

Options	Benefits	Costs	Assessment of Magnitude
1. Direct Allocation Now	<ul style="list-style-type: none"> • Faster process – earlier certainty in capacity access for STB manufacturers, broadcasters and consumers • Consistent with STBs being on sale well in advance of events likely to drive uptake 	<ul style="list-style-type: none"> • Not a fair, open or transparent process • Less structured capacity allocation – greater reliance on regulatory judgement (risk of regulatory failure) 	<ul style="list-style-type: none"> • Benefits are certain but the costs are significant and highly likely to outweigh any benefits
2. Comparative Selection Process	<ul style="list-style-type: none"> • More open and transparent than direct allocation • Structured process to create competition among potential holders – creates information to inform allocation • Greater competition for capacity as PSBs could submit applications for more than one of the initial slots • Greater ability to convert broadcaster commitments from allocation process into obligations 	<ul style="list-style-type: none"> • More complex process than option 1 • Slower process than direct allocation (though some information / certainty provided by definition of criteria) 	<ul style="list-style-type: none"> • Benefits are certain and costs are relatively low compared to other options and can be addressed in design, therefore the outcome is likely to be positive
3. Decision as Output of PSB Review	<ul style="list-style-type: none"> • Decision is made with greater information than option 1 • Allows allocation to 	<ul style="list-style-type: none"> • More significant delay – might take over a year to achieve • Unclear whether it 	<ul style="list-style-type: none"> • Benefits can be better achieved with a comparative selection process and the costs are

	<p>take place in wider context of the other decisions being taken in the review</p> <ul style="list-style-type: none"> • More open and transparent than direct allocation (though less so than comparative selection process) 	<p>would be possible to create any element of competition for capacity</p> <ul style="list-style-type: none"> • Still less information than option 2 as there is no specific request for information on the potential use of this capacity from the market as part of the PSB review 	<p>significantly higher under the PSB Review</p>
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A7.36 Based on the impact each of these options will have on the various stakeholders, a comparative selection process enables us to achieve our policy objectives, and appears to be the best option available for doing so. It reduces the risk of regulatory failure due to the interaction the market will have throughout the process, and has the potential to include a competitive element between broadcasters. It also fosters some early level of certainty as to the outcome as the early announcement of selection criteria enables consumers and STB manufacturers to make their own decisions regarding potential outcomes whilst still retaining a comparatively shorter time scale before a confirmed decision.

A7.37 This means the benefits of the reorganisation are likely to accrue to stakeholders earlier as the scale and timing of the benefits partly depend on certainty among STB manufacturers and consumers to generate faster uptake of the STBs. A comparative selection process is also arguably a more equitable approach as it sets a list of common criteria which all parties are judged against and all have the opportunity to provide any relevant information to Ofcom for the process.

What are the justifications for the selection criteria and what impact will these have?

- There is a description of the proposed selection criteria in Section 7 that have been summarised below.
- Efficiency of use of spectrum, as reflected in use of multiplex and in plans for promotion of rapid and widespread adoption of DVB-T2 MPEG-4 consumer reception equipment.
- Contribution to the purposes and characteristics of public service broadcasting in the UK.
- Contribution to the range and diversity of television services available on DTT (both between and within individual services).

A7.38 As there are no alternatives proposed to these criteria and the consultation is requesting views on them, we set out in Section 7 the justification for these criteria. The main focus of this justification is around our key objectives that relate to this issue as set out at the beginning of this Impact Assessment.

- A7.39 The packaging of the capacity for allocation is proposed to be in slots large enough to carry one HD channel, but Ofcom does not propose to specify whether the use of the capacity should be for SD or HD services. This is to allow either use of the capacity, so HD or SD services could be provided on Multiplex B, which will allow greater involvement from the broadcasters in deciding which services are provided, potentially reducing the risk of regulatory failure. It will also allow a mixture of SD and HD services to be provided within any block of capacity rather than just HD or just SD, which should help lead to an optimal outcome, particularly for consumers .
- A7.40 We have set out these criteria which aim to produce the highest value outcome for citizens and consumers from this process, and welcome views from respondents to this consultation on whether these criteria are appropriate to further our objectives as set out above.

Do we need to intervene to ensure a mode change to 64 QAM?

- A7.41 Four out of the six multiplexes on the DTT platform currently operate at 16 QAM, but will have the opportunity to upgrade to 64 QAM at DSO, a mode presently used by the remaining two multiplexes. This increases the capacity on each multiplex by 6Mbits/s which is equivalent to adding more than an additional multiplex on the DTT platform, and would therefore enable the spectrum to be used much more efficiently. As a result, we fully support and also anticipate a mode change for all multiplexes.
- A7.42 Generally, we believe that the multiplex operators are likely to have incentives to introduce mode change. However, Section 5 highlights that there are certain situations when this may not be the case, and as a result mode change may not occur or alternatively may be delayed.
- A7.43 The costs of failing to ensure a mode change across the platform at DSO extend far beyond the extra capacity and spectrum efficiency gains lost. This is because it would make it significantly harder for the DTT platform to upgrade to DVB-T2 technology as the capacity created by mode change allows this upgrade to occur with requiring a loss of services to existing viewers.
- A7.44 Therefore, although we believe multiplex operators will generally have the incentives to change mode, there is a small risk that they will not, and whilst this risk is relatively small, the impact it could have is significantly large. As a result we believe such a mode change should be a requirement rather than an option. This is because whilst the impact of such a requirement is not necessarily going to be large (due to the incentives for multiplex operators to change anyway), the impact of a failure to upgrade on the DTT platform is large. Therefore we propose to require all multiplex operators to change mode at switchover, as this ensures that consumers and citizens can gain the maximum benefit from the valuable spectrum already allocated to broadcasting as it will be used as efficiently as possible. We expect that this proposal would mitigate against the small risk of a significantly negative impact on the platform if the mode change did not occur.

Conclusion

- A7.45 Following each of the preferred options, the overall outcome will be an upgraded Multiplex B with capacity allocated by a comparative selection process controlled by Ofcom and DCMS. It is important to consider the impact this overall outcome will have on key stakeholders as well as the impact of the counterfactual – a state of the world without intervention where there is slow

adoption of MPEG-4 and DVB-T2 technologies. This refers to Scenario 2 in Section 5 where one multiplex is eventually cleared to upgrade to DVB-T2 but take up of STBs remains slow in the early years. The wider context of this intervention is also important as it is likely to impact upon the ongoing DSO process.

A7.46 Our modelling has considered a number of hypotheses and has produced estimates of financial impacts on consumers and broadcasters (based upon these and further assumptions), summarised in Table 6 below.

Table 8: Estimated financial impact of intervention on key stakeholders, expressed in NPV over 2008-2032.

	Incremental benefits of preferred intervention path over the counterfactual
Additional consumer surplus from preferred intervention path	£3bn to £5bn
Additional producer benefit on the DTT platform	£225m - £725m

A7.47 The reorganisation and upgrade is therefore likely to bring financial benefits to broadcasters; the financial benefits from higher revenues (relative to the counterfactual) are likely to outweigh the quantifiable costs of reorganisation. Also, for consumers, the modelling analysis suggests that the benefits arising from the availability of new services exceeds the costs of acquiring new reception equipment (relative to the counterfactual).

A7.48 There are also several non-quantifiable costs and benefits of both the preferred intervention path and the counterfactual state of the world.

Counterfactual – Delayed Adoption of Technology Upgrades	Preferred Intervention Path
<p>Benefits</p> <ul style="list-style-type: none"> • At least one universal HD service which is positive for consumers • No reorganisation costs • No risk of new regulatory failure <p><u>Related to DSO</u></p> <ul style="list-style-type: none"> • Maintain the current status quo for the programme • Avoid the costs associated with the intervention 	<p>Benefits</p> <ul style="list-style-type: none"> • Greater spectrum efficiency by unlocking additional capacity on the platform • Potential for a greater quantity and variety of (universal) content • Strengthen the future competitive position of the DTT platform through improved quality and mix of content and services whilst maintaining universal coverage, making it more attractive to consumers • Increased share of viewers for individual broadcasters as a result of the new services which in turn increases revenues • Design of entire upgrade process aims to increase the uptake speed of STBs which

	<p>should encourage economies of scale in their production so the price becomes comparable with DVB-T boxes, increasing viewer numbers and thus realising greater benefits sooner.</p> <ul style="list-style-type: none"> • If the capacity is to be used for HD services, it will promote UK production of HD services rather than upconverting of SD services. This will further UK competitiveness in the international programme making market. • May lead to a technology upgrade for other multiplexes on the platform, providing the potential for a greater quantity and variety of new services, benefiting those consumers who have upgraded • Overcomes risk of market failure preventing platform upgrade in DSO timeframe <p><u>Related to DSO</u></p> <ul style="list-style-type: none"> • More choice of services early on in DSO programme strengthens the overall benefits viewers can receive. • Opportunity to communicate the changes at the same time as switchover messaging – also the Help Scheme could inform vulnerable groups. • Many consumers will be able to avoid a double upgrade later on by buying a DVB-T2 & MPEG-4 box at switchover.
<p>Costs</p> <ul style="list-style-type: none"> • If an upgrade of the entire platform technology occurs at all, it is likely to be incomplete and substantially slower. Therefore, if it fails to coincide with DSO, the benefits of early adoption of the new technology may be lost • Without the benefits of a DSO-timed upgrade, the ability of the DTT platform to compete with other platforms in the future may be restricted, both in terms of viewer numbers (which affects advertising revenues of commercial broadcasters) and for quality content. • Lower quantity and variety of new services 	<p>Costs</p> <ul style="list-style-type: none"> • More channels may reduce viewer shares for some channels, potentially impacting advertising revenues for certain players (though note that the overall viewing on the platform as a whole is expected to be improved by this intervention) • The costs of the upgrade process including reorganisation cost and those incurred due to the allocation process (however these are a short term, one-off) • Some potential changes to the coverage of existing services on the platform • Risk of regulatory failure throughout the process (however this can be addressed in the design of the allocation process) • May not be as great a variety in content

<p><u>Related to DSO</u></p> <ul style="list-style-type: none"> • Would forgo the benefits of the intervention 	<p>and providers as expected as PSBs are able to apply for more than one of the three capacity slots</p> <p><u>Related to DSO</u></p> <ul style="list-style-type: none"> • Need to inform those who have already switched over of options • Information on the technical upgrade option would need to be included in the Help Scheme
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Assessment of risks

- A7.49 The DSO-related costs and benefits included above relate to the implementation of the intervention process in 2009. Implementing the policy after DSO has completed would bring the benefit that there is a clear message to deliver to consumers and thus reduced risk of confusion. However there would be no infrastructure in place to deliver the new information consumers need and there are significant costs of putting such a system in place. Additionally, by delaying until after switchover it is likely that there will be a much higher number of STBs that need upgrading, imposing additional costs on consumers who choose to convert to DVB-T2, and potentially placing an environmental impact via the large number of boxes that may be discarded earlier than expected in their lifecycle.
- A7.50 There is a risk with the intervention that the other multiplexes do not follow the upgrade path and therefore the efficiency gains in the use of the spectrum are not as high as they could potentially be. This risk is partially related to the uptake of the new STBs as the greater this is, the higher the potential viewer numbers for any service delivered by the new technology, and therefore the greater the benefit of upgrading and improving spectrum efficiency. In turn, the penetration of new STBs is dependent on content and the type of services delivered by the new technologies as it is this that will provide the incentives for consumers to buy new receivers, and this can be addressed in the allocation process.
- A7.51 The significance of this risk partly depends upon the impact it will have on key stakeholders. Overall, spectrum efficiency will still have increased, even if not to its full potential. The upgrade of a single multiplex may still generate net benefits for consumers as they will still have access to new services provided on the multiplex if they choose to upgrade their STBs, and the costs are relatively low for them. Whether the individual broadcasters would benefit if this event occurred depends upon the additional revenue they can generate from the new technology on the single multiplex (which depends upon the STB uptake), and how this compares to the one-off costs. However, the outcome is more likely to be net beneficial for broadcasters if the multiplexes share the one-off costs between them, given that in the longer term there are potential benefits for all of them.
- A7.52 This risk can be reduced through the proposals for the comparative selection process. Included in the criteria is the need for the applicant to demonstrate how they will promote the rapid and widespread adoption of DVB-T2 MPEG-4 consumer reception equipment. There are also content related criteria that applicants will be assessed under, in that they must contribute to the range and diversity of television

services available on DTT, which should ensure there are services provided that are attractive to consumers. By including such obligations in the licence terms, the viewer numbers of the new technology services should increase at a faster pace, thus providing the incentives for other multiplex operators to upgrade to the more efficient technologies sooner, increasing the overall benefits of the process even further.

A7.53 Therefore, whilst this risk could result in a negative outcome for broadcasters, it is a relatively low risk, especially considering the criteria included in the comparative selection process to promote STB uptake and those related to content. As such, the risks that other multiplexes do not follow the upgrade path and that STB uptake is slower than expected, are less significant.

A7.54 There are further risks that relate to the DSO process, and are shown below with methods to potentially mitigate them.

<p>Risks</p>	<ul style="list-style-type: none"> • Help Scheme comes under pressure to change its policy on help-scheme boxes to include DVB-T2 technology with potential associated cost increases. • Increased confusion for consumers when communicating the new choices. • Potentially de-stabilises confidence in DSO and DTT platform which causes reduction in audience share – people defer decisions to upgrade to digital. • Volume production of DVB-T2 STBs is late and benefits of early launch cannot be realised. Could be due to delays in standards, manufacturing delays or lack of scale in UK market alone to justify volume production. • Engineers unable to implement the DSO timetable if some re-tasked to DTT capacity work
<p>Risk Mitigation</p>	<ul style="list-style-type: none"> • Communicate with consumers – explain that no existing services are being required to be lost, but they have the option to obtain even more services if they want to, through purchase of a new set top box to receive new services. Also it is not a mandatory change for consumers – existing equipment will still provide existing TV services. This is addressed in the allocation criteria as proposals have to demonstrate how they will reduce consumer confusion surrounding this. • Early and prompt decision to provide certainty to manufacturers, which the comparative selection process should help • Possibility of running a pilot scheme for the new services to test how consumers behave and the information they really need • Continue efforts in international fora to lobby for adoption of DVB-T2

A7.55 The majority of the risks identified in paragraph A7.54 above would be irrelevant under the counterfactual (ie if there was no intervention), and to some degree under implementing the policy straight after DSO has been completed. Under the counterfactual, the current status quo of the programme would be maintained, and therefore the net effect is likely to be neutral. However, there are benefits that can accrue to the DSO process as a result of intervention, and therefore the net effect of

intervention compared to the counterfactual depends upon the ability of the risk mitigation options to limit the identified risks and their impact upon the net benefits of the process. Therefore, with the right actions in place, this intervention may well have a net positive effect on the DSO process.

- A7.56 Multiplexes 1 and 2 are expected to remain with the standard technology for the foreseeable future to continue the universal coverage of PSB services for all UK citizens. This is beneficial for consumers as it means that access to the new services is a choice to be opted into, and by choosing not to upgrade their STB they will not be losing existing core PSB services. This follows our key objectives in terms of promoting PSB purposes.

The preferred option

- A7.57 Our preferred option is to intervene in the technological upgrade of the DTT platform as despite this improving spectrum efficiency and potentially proving net beneficial to broadcasters, it is highly unlikely that it will happen on the optimal timeframe without intervention due to incentive-based market failure issues. The intervention will involve the clearing of Multiplex B which will then be upgraded, and the allocation of this capacity will be made through a comparative selection process.
- A7.58 This is more interventionist than the other proposed options and so carries with it a degree of regulatory failure risk and an opportunity cost in terms of lower viewership of Multiplex B while DVB-T2 MPEG-4 set top box penetration is growing. However, the existence of market failure risks without intervention significantly outweighs these, particularly as the design of the comparative selection process can be used to minimise regulatory failure where possible.
- A7.59 The benefits of the upgrade are potentially significant for all stakeholders compared to the net outcome without an upgrade (the most likely outcome without intervention) and as such, they are most likely to far exceed the comparative costs and risks involved.
- A7.60 Therefore, we believe that our proposals provide the best opportunity to upgrade the platform and achieve our policy objectives in a way that generates the highest possible level of net benefits to key stakeholders.

Question 22: Do you agree with Ofcom's impact assessment?

Question 23: Do you agree with Ofcom's assessment of the potential benefits, risks and mitigations strategies relating to the impact of these proposals on the DSO programme?

Annex 8

Services currently operating on DTT

DTT channel list November 2007 Crystal Palace

Mux	Service	Service type		Mux	Service	Service type
Mux 1	BBC 1	SD		Mux A	Five	SD
BBC	BBC 2	SD		SDN	QVC	SD
	BBC3/CBBC	SD			Bid tv	SD
	BBC News 24	SD			Price-drop tv	SD
	BBCi MHEG (4 streams)	Text			Five Life / TVX	SD
	Total SD	4			Five US	SD
Mux 2	ITV1/GMTV	SD			Setanta sports	SD
Digital 3&4	ITV2/GMTV2	SD			UKTV Gold (TUTV)	SD
	ITV3	SD			Nuts TV	SD
	ITV4/CITV	SD			Teletext Holidays (more audio than text)	Text
	C4	SD			Teletext Games	Text
	E4	SD			Various MHEG (QVC, EMAP, TUTV etc)	Text
	More 4	SD			Radio x 2	2R
	Channel 4 + 1	SD			Total SD	9
	Teletext	Text		Mux C	Sky 3	SD
	Teletext Cars	Text		NGW	Sky News	SD
	Teletext on 4	Text			Sky Sports News	SD
	Radio x 2	2R			E4 +1	SD
	Total SD	8			Dave	SD
Mux B	BBC4 / Cbeebies	SD			Sky Text	Text
BBC	BBC Parliament	SD			Various MHEG (Sky/UKTV/Virgin/TVTV)	Text
	BBCi 301 video / Community	Red Button			Radio x 4	4R
	BBCi 302 video / Community	Red Button			Total SD	5
	BBCi 305 (news multiscreen video)	Red Button		Mux D	The Hits	SD
	Associated BBCi (4 streams)	Text			The Music Factory (TMF)	SD
	Radio x 10	10R			ITV2+1	SD
	Total SD	2 + 3 red button			Ideal World	SD
					Virgin 1/UKTV History	SD
					Film Four/Gems TV	SD
					Radio x 9	9R
					Total SD	6

Key: ■ New services which have recently replaced other existing services.

Note: Four of the BBC radio services shown on Multiplex B recently migrated to Multiplex B from Multiplex A

Annex 9

Modelling

A9.1 This modelling annex sets out the approach taken to the economic modelling work and some key assumptions made.

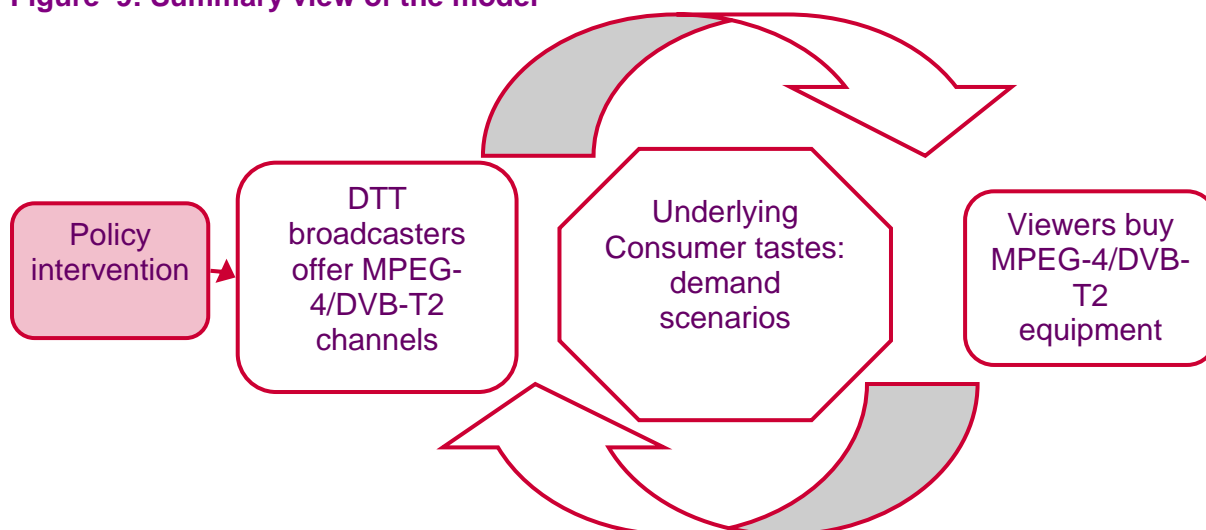
Modelling approach

A9.2 In the marketplace, decisions by consumers influence decisions by broadcasters and vice-versa. This is especially true during the launch of new technologies. For instance, consumers will be more interested in buying a MPEG-4/DVB-T2 box if there is something attractive to watch using the new box. Broadcasters will be keener on launching channels using MPEG-4/DVB-T2 capacity if there are many consumers who are capable of receiving the signals.

A9.3 Our model aimed to capture in a simplified way these complex relationships. The diagram below shows the main elements we captured:

- Decisions by DTT broadcasters (which can be influenced by policy intervention)
- Decisions by viewers
- Consumer tastes (which influence both of the above)

Figure 9: Summary view of the model



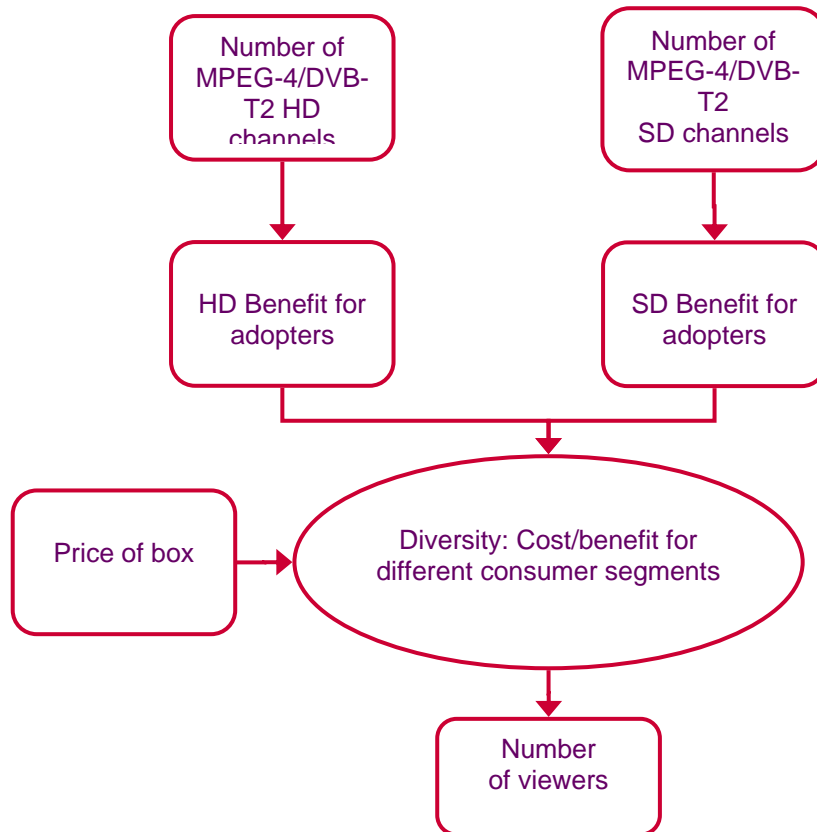
A9.4 The approach used to modelling decisions made by DTT broadcasters is as follows:

- 9.4.1 It is assumed that the broadcasters will push for slots on a converted MPEG-4/DVB-T2 multiplex if they believe that there will be additional revenue to be generated from offering new services on this multiplex compared to them offering services using the old technology (where the additional revenue is derived from the gain in viewership).

9.4.2 It is assumed that the multiplex operators will be more likely to upgrade to cater for broadcasters demands. It is therefore assumed that they will upgrade if there is sufficient demand for the slots on the upgraded multiplex, and if upgrading is expected to result in additional revenues.

A9.5 The decisions by viewers are modelled using the following general approach.

Figure 10: Summary view of the viewers' decision-making process as modelled



Modelling scenarios

A9.6 The scenarios we have considered are set out below.

- **Scenario 1 – no DVB-T2, limited MPEG-4:** under this scenario, the DTT platform does not convert to DVB-T2 technology. MPEG-4 is adopted for a small number of channels only, and as a result, customer uptake of compatible set top boxes is relatively low.
- **Scenario 2 – slow adoption of DVB-T2 and MPEG-4:** under this scenario, MPEG-4 capable boxes begin appearing on the market but take-up is held back by the lack of content utilising the new technologies. Eventually the commercial attractiveness of using new technologies reaches a level where one multiplex is cleared for DVB-T2. In this scenario, the new content on the cleared multiplex is sufficient to encourage a higher uptake of DVB-T2 set top boxes. However, take-up remains slow in the early years.

- **Scenario 3 – fast adoption of DVB-T2 and MPEG-4:** this scenario is similar to scenario 2, but initial intervention eliminates the delay in the adoption of DVB-T2. As a result of the earlier technology upgrade and corresponding content, customer uptake of set top boxes is quicker. As the penetration of DVB-T2 capable equipment increases faster than in scenario 2 above, further multiplexes move more quickly to adopt DVB-T2 and this correspondingly increases the uptake of boxes. Multiplex conversion to DVB-T2 starts 5-10 years⁵⁴ earlier than in scenario 2, depending on demand for new services. This period of delay is followed by a period of around a further 5 years during which the delay scenario catches-up until the two scenarios converge.

A9.7 These stylised scenarios were chosen as we judged that a comparison between scenario 1 and 3 would provide an illustration of the potential size of the gains from the combined upgrade to DVB-T2 and MPEG4. In addition, a comparison between scenarios 2 and 3 would provide a reasonable illustration of the potential effect of a delay in the upgrade process.

A9.8 As noted earlier in this document, Ofcom proposes that multiplexes providing core PSB content should not adopt DVB-T2 or MPEG-4 for the foreseeable future. Hence the modelling assumes that 2 of the 6 multiplexes remain operating with DVB-T and MPEG-2 for the entire period modelled (which is 25 years).

Key modelling assumptions

A9.9 In order to model these stylised scenarios we have necessarily made a number of assumptions about the likely demand for new capacity on the DTT platform. For example, the modelling has assumed that if the new service which is used to drive take-up is an HD channel, these are assumed to be simulcasts of existing content available on the platform. Given the level of uncertainty we have modelled a number of different potential outcomes for each of the stylised scenarios. Some key assumptions used in our modelling include:

- 9.9.1 The number of viewers upgrading their DTT boxes increases with the benefit they derive from the boxes. The benefit depends on the number of extra channels and the quality and value of these channels.
- 9.9.2 Consumers gain additional benefit from a channel when it is upgraded from SD to HD. In general, picture quality seems to be positively correlated with consumer willingness to pay: better quality TV sets are more expensive than lower quality TV sets; DVDs attract a premium over VHS; films in a cinema attract higher prices than on pay-per-view TV; IMAX cinemas charge more than normal cinemas. It is hard to quantify this benefit, to reflect this uncertainty we assumed that the incremental consumer gain from HD ranged from 15% to 25% on average.
- 9.9.3 The model assumes that, at least in the shorter term, HD versions of popular content may be a particularly effective way of convincing viewers to upgrade equipment. The DTT platform already has many SD channels, and a simple increase in the total number of channels may not provide as compelling a consumer proposition at first. In the longer term, as more

⁵⁴ Given the nature of the start-up problem faced by the DTT platform we believe that a delay of around 5-10 years in the introduction of the new technology absent intervention is not unreasonable. However, our modelling work suggests that even if the delay was only around 2 years the incremental consumer benefit of reducing delay would still be significant.

multiplexes upgrade, SD channels are more likely to be part of the mix of services provided on the upgraded multiplexes.

- 9.9.4 The behaviour of consumers and broadcasters are linked to each other in a virtuous circle. Consumers need content to buy boxes, as explained above. Conversely, broadcasters offer more and/or better content if they expect more viewers to have the necessary equipment.
- 9.9.5 Consumer take-up depends upon both the level of HD demand and the cost of the upgrade to consumers. We assume that new set-top boxes would sell initially for a premium, but fall rapidly following a similar trajectory to Freeview boxes. Adoption of HDTV sets is assumed to carry on its current trajectory of rapid take-up, which means the set-top box becomes the “missing link” in HD reception very quickly.
- 9.9.6 Broadcasters attract some additional viewership if they show content in HD rather than SD, all other variables being the same. This is related to the consumer benefit from the better quality picture. If this was not true, there would be no motivation in our model for free-to-air broadcasters to offer HD.
- 9.9.7 The gain for broadcasters described above is assumed to be small relative to the share of viewership they would have in SD. We have made conservative assumptions as it is very hard to predict what the audience gain might be. We also model this gain decreasing as the amount of competition in HD grows.
- 9.9.8 Fairly responsive multiplex switching: as broadcasters demand more capacity, multiplexes respond by providing it, with small amounts of delay. This is a conservative assumption. If we assume the platform as less responsive, the value of intervention grows.
- 9.9.9 The overall amount of money that advertisers spend on TV is roughly constant in real terms year-by-year. However, the split between platforms and between individual broadcasters changes depending on viewership of platforms and channels.
- 9.9.10 The DTT share as a platform will continue to increase, as viewers respond to the digital switchover process. After 2012, its share peaks at around 50% and then shows a gentle decline if there is intervention, or a more marked decline if not.
- 9.9.11 Our modelling work has assessed the value to consumers and producers over 25 years.

A9.10 We believe our modelling approach is reasonable because:

- The modelling is based on there being an initial compelling consumer proposition which kick-starts a virtuous circle. This type of behaviour has been proved in DTT's own history (with the advent of Freeview which resulted in a significant uplift in take-up), and more generally in most markets that are subject to some type of network effects. Given the nature of the start-up problem faced by the

DTT platform we believe that a delay of around 5-10 years in the introduction of the new technology absent intervention is not unreasonable.⁵⁵

- We used conservative assumptions on gains for consumers and broadcasters from the new services, and whilst we have also made conservative assumptions about the responsiveness of the platform (which are reflected in the period of delay which results absent intervention, and hence the more conservative these assumptions are the greater the benefit of intervention), we believe these are reasonable given the barriers to adoption discussed earlier in this section.
- Additionally, in order to arrive at a conservative estimate of the potential costs of delay, Scenario 2 was chosen as the base case (ie the outcome for the platform in the absence of any intervention) and Scenario 3 the case arising from intervention to facilitate the move to DVB-T2. This is conservative as it assumes that the platform is able to move to the new technologies, just over a longer time period. If we were to assume that the scale of the adoption also varied, the magnitude of the cost of delay would have been greater.

Results

- A9.11 In order to arrive at a conservative estimate of the potential costs of delay, Scenario 2 was chosen as the base case (ie the outcome for the platform in the absence of any intervention) and Scenario 3 the case arising from intervention to facilitate the move to DVB-T2. This comparison was made under two different underlying cases for the demand for HD services, one where there is moderate initial demand, and one where initial demand is greater. When demand for HD services is greater then broadcasters will have greater incentives to expand capacity more quickly than if demand is more modest.
- A9.12 As a sense check, we have also compared Scenario 3 to Scenario 1, to quantify the benefits deriving from the upgrade *per se*. We offer this comparison for completeness, as we think it is unlikely that the platform will take no action in the absence of intervention when it is in their benefit to do so. However, if that was the case, our model estimates consumer benefits from the upgrade in the order of £10bn-£18bn. The producer benefits of the upgrade as a whole are hard to quantify, as they depend upon the impact of the upgrade on the DTT platform's market share, which will depend (at least in part) on the behaviour of other platforms.
- A9.13 However, in order to illustrate the possible scale of the producer benefits, if we were to assume that the upgrade would only boost the platform's share by in the region of 2%-4% (this is relative to a counterfactual in which the platform does not upgrade and hence is capacity constrained and struggles to offer new services such as HDTV), this alone could result in producer benefits or in the region of £500m (NPV over a 25 year period). This assumption seems relatively modest compared to other estimates of the potential effects of this. For example, in their work for the BBC Indepen⁵⁶ estimated that if the DTT platform were unable to offer new services such as HDTV, its share could fall by an estimated 25%, or alternatively, that it would be reasonable to assume in this situation that the viewing share of the PSB services call fall by to 5%-20%.

⁵⁵ However, our modelling work suggests that even if the delay was only around 2 years the incremental consumer benefit of reducing delay would still be significant.

⁵⁶ This is available at <http://www.ofcom.org.uk/consult/condocs/ddr/responses/ab/bbcannex.pdf>

A9.14 Table 9 below shows the additional benefits that arise for consumers from Scenario 3 (intervention) over Scenario 2 (no intervention).

Table 9: Incremental consumer benefit of intervention (scenario 3 v scenario 2)

25 year NPV	High initial demand	Moderate initial demand
NPV of additional consumer surplus	£3bn	£5bn

A9.15 Most of the benefit is derived from HD channels being offered earlier than they would be without intervention. We assume that benefit for the average consumer from watching HD channels is 15%-25% of their willingness to pay for that channel in SD. The benefits for the adopters in the first few years are above that, as early adopters of the technology are a self-selected group who derive above average benefits from HD.

A9.16 Note that the incremental benefits of the upgrade are lower in a high initial demand scenario. While this may seem counter-intuitive, it reflects a reasonable hypothesis: that, if demand for HD is high, broadcasters and network operators will be quicker to act, in their own interest, to start the process of upgrading the platform. If demand is somewhat lower, it becomes more plausible to think that the industry response could be much slower, and therefore action from the regulator becomes more relevant. We believe that these timing effects are likely to outweigh the lower benefit per viewer in the moderate initial demand scenario.

A9.17 Table 10 below shows the producer benefit generated by the DTT platform under Scenario 3 as opposed to Scenario 2.

Table 10: Incremental producer benefit generated by DTT platform (scenario 3 v scenario 2)

NPV of additional revenues (£m)	High initial demand	Moderate initial demand
2% platform boost	£325m	£225m
4% platform boost	£725m	£650m

A9.18 These additional benefits, which take into account the costs of moving to the new technologies and any relevant incremental costs involved in the production of new services, arise from the increased attractiveness of the DTT platform as a result of the extra HD and SD content available under Scenario 3. The overall viewing share of the platform is modelled as being 4% higher under Scenario 3 than in Scenario 2. As a sensitivity Table 12 above includes values for platform income if this increase is only 2%.

A9.19 The 4% additional platform share, is relative to a counterfactual in which the platform share is declining, hence this is in reality a 4% reduction in the decline of the platform relative to the counterfactual. As mentioned above, this assumption

seems relatively modest compared to other estimates of the potential effects of this, for example that used in the Indepen⁵⁷ work for the BBC.

- A9.20 From this modelling, it is clear that there is substantial potential benefit to consumers and the DTT platform as a whole resulting from the increase in capacity brought about by a rapid technology upgrade to DVB-T2 and MPEG-4 – the cost of a delayed uptake would appear to be between £4bn and £6bn⁵⁸ (over a 25 year period).

⁵⁷ This is available at <http://www.ofcom.org.uk/consult/condocs/ddr/responses/ab/bbcannex.pdf>

⁵⁸ The £4 to £6bn includes the incremental producer value on the DTT platform. From a total welfare perspective, much of the producer benefit may be a transfer of value from other platforms rather than an increase in overall producer value. Hence, to assess the incremental welfare effect of the change this value should be excluded. However, even if all of the producer benefit is excluded, the overall benefit of reducing delay is clearly still significant as the consumer benefit amounts to £3 to £5bn.