



Planning Options for Digital Switchover

Statement

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Executive Summary

- S.1. Ofcom issued a consultation entitled “Planning Options for Digital Switchover” on 9 February 2005 (the Consultation). The Consultation closed on 21 March (with the exception of an extended consultation on Question 14 which closed on the 11 April). This Statement sets out Ofcom’s view on which of the digital terrestrial television (DTT) planning options set out in the Consultation is most appropriate.
- S.2. A number of different planning options were set out in the Consultation. These covered the power levels, use of new transmitters and transmission mode to be used after switchover for DTT signals.
- S.3. Different options have different coverage levels and costs associated with them. Some would also lead to higher levels of DTT capacity than others. In reaching its decisions on the various issues in this Consultation, Ofcom has carefully considered all of the consultation responses received and has also taken account of all of its relevant statutory duties as well as other relevant considerations.
- S.4. The responses to the questions raised by the Consultation and Ofcom’s analysis of the issues raised are discussed in more detail in Sections 3 and 4 of this Statement. Ofcom’s main conclusions arising from this analysis are as follows:
- It is appropriate that all three multiplexes which broadcast public service broadcasting channels should aim to achieve similar levels of coverage at all sites being operated for DTT by adopting the same mode and similar levels of power.
 - The commercial multiplex operators should be able to determine their own coverage objectives in the light of their particular commercial interests provided that they do not allow the coverage of any multiplexes to fall below its current level (i.e. 73 per cent of UK households should continue to receive coverage of all six DTT multiplexes). Ofcom also believes that, subject to their own commercial interests they should also aim to achieve similar levels of coverage to each other (it is expected that the maximum coverage that the commercial multiplexes could achieve will be around 90 per cent).
 - The impact assessment carried out in Section 3 indicates that a planning option which involves all three PSB multiplexes adopting the 64 QAM mode at switchover (Option 3 in the Consultation) has advantages over other options. In particular, allowing the use of 64QAM allows more channels to be made available to DTT viewers. Ofcom is in favour of the public service multiplex operators adopting Option 3 provided that steps are taken to ensure that:
 - predicted coverage of the nationally available terrestrial TV channels (BBC1, BBC2, ITV1 and Channel 4) continues to reach at least 98.5 per cent of UK households after switchover; and
 - digital switchover can be achieved between 2008 – 2012.

- S.5. Ofcom will work closely with the broadcasters over the next few months to develop the switchover plan further and will seek to obtain the necessary international clearance for this planning option. If such clearances cannot be obtained, however, Ofcom may have to revisit this issue next year.
- S.6. Another issue considered was the technical specification of DTT transmissions¹. The DTT transmissions currently use a variant of the DVB-T standard known as 2k. Ofcom consulted on whether there should be a UK wide adoption of an alternative variant known as 8k, which allows the use of single frequency operation. Having considered the consultation responses, Ofcom has decided that the adoption of the 8k format is essential in those areas where single frequency operation will be required. That is those areas where additional transmitters required by Option 3 are to be adopted. It therefore proposes that these areas (covering the Meridian and Anglia regions) will adopt the 8k format when they are converted to all digital operation. The rest of the UK will adopt the 8k format by the final digital switchover date of 2012, unless it can be shown to Ofcom's satisfaction that the impact of an earlier adoption would have minimal impact on viewers with 2k equipment.
- S.7. Ofcom proposes to defer any decision on the issue of self help schemes and current deficiencies in terrestrial TV coverage whilst further discussions are being held with those affected.
- S.8. Ofcom also wishes to emphasise two important issues. Firstly, the Consultation and this statement necessarily focus on terrestrial TV and the implications for this platform through switchover. Ofcom has specific responsibilities for the licensing and regulation of this platform, including the management of the radio spectrum used by terrestrial TV. However, DTT is only one of a range of options that most households will have for receiving TV after switchover. It is important that DTT is planned in the context of digital TV more generally, and that appropriate technological neutrality is maintained between different platforms. Ofcom is committed to achieving switchover in the UK to the agreed timetable on a multi-platform basis.
- S.9. Second, the figure of 98.5 per cent of UK households is an important benchmark in considering the future coverage of DTT since it represents the current percentage of households with predicted analogue TV coverage today. However, Ofcom is also concerned with the interests of the 1.5 per cent of households (around 375,000 households) who are currently not served by the four analogue public television services. We are currently undertaking further research on these households, considering if and how they are using TV at present and what options will be available to them after switchover. The aim of this work is to seek to ensure that the interests of all UK television households continue to be protected through switchover.

¹ The digital terrestrial television signals are broadcast using a standard called OFDM. This distributes the data being carried amongst a large number of sub-carriers (different frequencies). Two options are available: one using 2,000 carriers (2k) and one using 8,000 carriers (8k).

Section 1

Introduction

- 1.1. Ofcom issued a consultation entitled “Planning Options for Digital Switchover” in February 2005 (the Consultation). The Consultation closed on 21 March with the exception of responses to Question 14 which closed on 11 April. The Consultation sought views on which of the planning options set out in the document would be most appropriate for the digital terrestrial TV (DTT) platform after switchover.
- 1.2. In large part, the future of the DTT platform was addressed in December 2004 when Ofcom issued digital replacement licences (DRLs) to Channel 3, Channel 4, Channel 5 and Public Teletext. The licences include a date of 31 December 2012² by which all analogue transmissions must have ceased and a separate obligation to ensure that DTT signals have coverage that is equivalent to, or at least substantially the same, as that served by the existing analogue terrestrial services. Ofcom has also decided that DRLs should be amended at the appropriate time to require licensees to adopt all current existing transmission sites in the UK (1154 over the whole of the UK) for digital terrestrial transmission. The Consultation examined a more specific range of options for meeting these obligations, particularly with respect to coverage.
- 1.3. The wider developments on switchover since we issued the DRLs should also be borne in mind. A number of EU countries including Germany, Italy, Sweden and Finland currently plan to complete switchover by the end of 2010. The European Commission recently published a communication³ which urged EU Member States to complete digital switchover by 2012. In the US, the FCC currently plans to end terrestrial analogue TV broadcasting by 1 January 2009. Japan has announced that it intends to turn off analogue terrestrial broadcasts by the end of 2011 whilst South Korea says it will do so by the end of 2010.
- 1.4. The Policy Statement which accompanied the DRLs on 29 November 2004 (the DRL Statement) considered the question of coverage in some detail when evaluating the case for full nationwide roll-out of the DTT network. In summary, Ofcom’s assessment was that there were compelling arguments in support of the extension of DTT such that, as far as practicable, everyone who currently has access to analogue terrestrial television would be covered by DTT post-switchover. These arguments reflect Ofcom’s statutory duties and take into account in particular the equity, affordability and communications advantages of seeking to ensure that DTT is available to all television households. Of course, where more than one means of delivering digital television is available, households will be free to choose the most attractive proposition for them.

² Overall leadership of digital switchover continues to remain with Government, including any public announcement of the formal switchover date

³ Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions on accelerating the transition from analogue to digital broadcasting, COM(2005) 204, May 2005

- 1.5. In May 2004, Ofcom published a report⁴ (prepared by the SPG⁵) on how the level of analogue television coverage is predicted, and on the current levels of coverage achieved by the four main analogue public service television channels (BBC1, BBC2, ITV1 and Channel 4/S4C). The report concluded that these four terrestrial public service television channels achieve coverage of 98.5 per cent of UK households (known as analogue core coverage). Consequently, when examining the relative merits of different configurations of the DTT network in terms of predicted coverage, the coverage is evaluated against the core coverage of analogue television of 98.5 per cent of UK households.
- 1.6. In comparison, the existing coverage of these services (and the other services which are provided using digital transmission) from the 80 transmission sites from which DTT services are currently broadcast is around 73 per cent of households. Adopting all 1154 transmission sites for DTT will increase coverage significantly, but does not guarantee in itself that DTT availability will reach 98.5 per cent. Other important variables, such as the power of DTT transmissions and the transmission mode⁶ used, will affect the coverage of signals.
- 1.7. However, while coverage can be improved by increasing power levels or by broadcasting at the more robust transmission mode, doing so may affect the cost and the implementation risk of digital switchover. In addition, a change in the transmission mode will also affect the capacity of the DTT network. As a result, there are important trade-offs to be made in deciding on the most appropriate mix of these variables. The Consultation considered, and sought views on, those trade-offs.
- 1.8. While Ofcom decided in the DRL Statement that the DRLs should contain a specific obligation with respect to the nationwide roll-out of the DTT network, it did not specify other inputs such as power and mode. Instead, the licences required that DTT coverage at switchover matches current analogue coverage, or is at least substantially the same in Ofcom's judgement. The DRL Statement recognised that the present coverage obligation is not specific, by neither setting out a particular percentage of households to be covered nor a particular set of inputs (i.e. sites, power and transmission mode) which would guarantee fulfilment of the coverage duty. We proposed in the DRL Statement to consult further on these matters with the aim of resolving the issue as soon as possible in 2005.
- 1.9. On DTT coverage, the Consultation put forward five planning options (a summary of these can be found in Annex 2) which considered alternative combinations of sites, mode and power for the three "PSB multiplexes" (i.e. the three multiplexes which will carry public service broadcasting (PSB) channels). All, in Ofcom's opinion, could arguably provide coverage predicted to be at least "substantially the same" as current analogue coverage, so fulfilling Ofcom's statutory duty in this regard.

⁴ Ofcom analogue coverage report, 12 May 2004.

⁵ The Spectrum Planning Group (SPG) was part of the government's Digital Television Action Plan and was responsible for the preparation of the digital television switchover frequency plan.

⁶ Transmission mode relates to the type of modulation used by the digital multiplex. Two variants were considered in the consultation 64 QAM (less robust mode - high capacity/lower coverage) and 16QAM (more robust mode - lower capacity/higher coverage).

- 1.10. Three of these options were predicted to result in coverage levels which would match or exceed existing analogue levels (corresponding to core coverage of 98.5 per cent of UK households). As each of the options offered different advantages and disadvantages to broadcasters, viewers and the industry as a whole, Ofcom wished to hear the views of respondents on their relative merits. In light of the restricted amount of data then available to inform certain aspects of the evaluation, Ofcom also wished to hear from broadcasters and transmission companies about the likely range of costs and implementation constraints for each option.
- 1.11. The Consultation also considered two other related matters, the potential use of the 8k variant of the DTT standard and how current coverage deficiencies should be managed at switchover. As noted in paragraph 1.1 above Ofcom has extended the consultation period for the responses relating current deficiencies (Question 14) and will consider the issues arising from this matter in a separate statement later in the year.
- 1.12. Ofcom wishes to emphasise two important issues. Firstly, the Consultation and this statement necessarily focus on terrestrial TV and the implications for this platform through switchover. Ofcom has specific responsibilities for the licensing and regulation of this platform, including the management of the radio spectrum used by terrestrial TV. However, DTT is only one of a range of options that most households will have for receiving TV after switchover. It is important that DTT is planned in the context of digital TV more generally, and that appropriate technological neutrality is maintained between different platforms. Ofcom is committed to achieving switchover in the UK to the agreed timetable on a multi-platform basis.
- 1.13. Second, the figure of 98.5 per cent of UK households is an important benchmark in considering the future coverage of DTT since it represents the current percentage of households with predicted analogue TV coverage. However, Ofcom is also concerned with the 1.5 per cent of households (around 375,000 households) who are currently not served by all the analogue public television services. We are currently undertaking further research on these households, considering if and how they are using TV at present and what options will be available to them after switchover. The aim of this work is to seek to ensure that the interests of all UK television households continue to be protected through switchover.

Section 2

Summary of responses

- 2.1. The Consultation sought views on which of a range of DTT planning options would overall be best suited to the achievement of digital switchover in the UK. It asked a number of general questions relating to planning and licensing issues, and a number of specific questions relating to the five proposed planning options (a summary table of the planning options discussed in the Consultation is attached in Annex 2).
- 2.2. In total Ofcom received 77 responses to the Consultation. These came from a variety of sources which are summarised in the table below. A full list of the respondents who were happy for Ofcom to disclose their comments can be found in Annex 1 of this Statement. Non-confidential responses are published on the Ofcom website.

Table 1: Summary of number of responses

Type of response	Number of responses
Responses from private individuals	30
Responses relating to self-help or community television schemes	22
Responses from industry and consumer groups	9
Responses from local and regional government	4
Responses from Ofcom licensees	12

- 2.3. The rest of this section will summarise how the respondents replied to the general questions and issues raised in the consultation. Section 3 contains an impact assessment of the responses to specific questions about each option.

Question 1 Should all three public service multiplexes be required to achieve the same coverage at switchover throughout the United Kingdom? If so, should the coverage obligations being discussed for the commercial public service broadcasters be adopted by the BBC in its digital switchover planning?

- 2.4. The consensus amongst the respondents was that all three PSB multiplexes (post-switchover these will be multiplexes 1, 2 and B) should be expected to adopt similar transmission modes and operating powers in order that the coverage of each of their services is broadly similar. The terrestrial broadcasters, amongst others, noted in their response that it would not be possible to guarantee that they all achieved identical coverage.

Question 2 Ofcom seeks views on what level of coverage and capacity the commercial multiplexes could or should adopt at switchover and the effects this decision may have on the switchover process.

- 2.5. The responses broadly supported the proposition that the commercial multiplex operators (i.e. operators of multiplexes A, C and D) should make their own determination regarding post-switchover coverage. A number of respondents (including Which) also proposed that they should aim to match the coverage of the public service multiplexes and that their coverage should not be allowed to drop below that currently achieved.
- 2.6. There was general agreement that these multiplexes should be encouraged to maximise both coverage and capacity. A number of respondents noted that it was important to agree this issue at an early stage due to the effects on DSO planning and on the preparation of transmission contracts for the PSB broadcasters. One respondent argued strongly in favour of allowing commercial multiplexes to operate at different levels of coverage in order to better respond to demand.

Question 3 Is it appropriate to amend the DRLs to clarify licensees' obligations as regards DTT coverage?

Question 4 If so, is it appropriate for Ofcom to seek to increase clarity for DRL licensees about the digital coverage required by describing obligations in terms of key input parameters (i.e. sites, transmission mode and power), or the achievement of an explicit coverage output, or other criteria? How should these criteria be worded in the DRLs?

2.7. There was broad support that the coverage requirements be expressed in a more specific manner. The majority of respondents did not express a view whether this should be expressed in terms of inputs. A number did, however, express their view that inputs should not be used to allow the broadcaster to implement a service which delivered a lower coverage than that currently achieved by analogue broadcasts. Indeed some respondents (including the Royal National Institute for the Blind (RNIB)) proposed that the target should be raised to exceed that currently achieved by individual analogue broadcasters.

2.8. The BBC, ITV plc, Channel 4, Five, Teletext Limited, S4C, Crown Castle and SDN submitted a joint response to the Consultation. These broadcasters (as well as others, such as Intellect and the DTG) noted in their response that it was not possible accurately to define an explicit coverage level for each site for the PSBs to attain. Their strong preference was for Ofcom to specify the power, radio frequency, and number of sites that each broadcaster should adopt and use this to establish the main coverage requirements.

Questions 5 to 12: These questions and their responses are considered in the Impact Assessment (Section 3 below).

Question 13 It is proposed that the broadcasters should adopt the 8k variant at switchover to enable the adoption of single frequency networks at switchover. Should this be done on a nationwide or regionalised basis and over what timetable?

2.9. There was wide support for the adoption of the 8k variant at switchover. The only issues raised by respondents came from Five who noted that many receivers used by subscribers to Top Up TV (the pay TV service on DTT) were originally ITV Digital set top boxes that were in general 2k only. Five noted that in the long term these were likely to be replaced by 8k compatible models. It therefore felt that an

early adoption of 8k would have disproportionate impact on Top Up TV's business.

- 2.10. Intellect estimated that there are still a substantial number of 2k only integrated televisions in use in the UK (around 75,000). It urged Ofcom to consider whether the government should make compensation available to "resolve such market legacy issues".

Question 14 How should the current coverage deficiencies be managed after digital switchover? Should the current system of self-help licensing be continued or should these communities be encouraged to adopt alternative platforms such as digital satellite? Ofcom is keen to hear respondents' views about the relative costs and benefits for each of these approaches.

- 2.11. Ofcom has recently taken over responsibility for licensing the self-help scheme (this used to be carried out by the Department of Culture, Media and Sport). As part of this process Ofcom wrote to all registered self-help schemes (in February 2005) asking them to confirm that they were still in operation. In its letter Ofcom noted that it was also consulting on digital planning issues which may have an impact on the long term operation of self-help schemes and asked specifically that self-help schemes considered question 14.
- 2.12. In discussion with the self-help operators, it was agreed that Ofcom would allow a two week extension to the consultation period to allow the self-help community sufficient time to respond to the Consultation. Ofcom has received 22 replies from self-help schemes around the UK. The majority of these asked whether and how their scheme could adopt digital technology, or whether digital switchover would enable their community to receive television services directly from the normal broadcast network. A number of responses also raised concerns about the cost of upgrading their equipment to digital.
- 2.13. This question also asked about whether current deficiencies could be rectified through digital distribution (using terrestrial or satellite services) at or before switchover. Ofcom received a number of responses to this question including one from the West Lancashire District Council which expressed their concern that significant number of viewers in Skelmersdale (who are have up to now been using a community distribution scheme) may not get access to digital terrestrial television unless Ofcom agrees to extend the self help scheme to digital.
- 2.14. These responses raised a number of issues beyond the scope of the main issues being considered in this Statement. It is therefore proposed to consider this issue separately from the rest of the Consultation and a further paper will be prepared addressing these issues.

Section 3

Impact Assessment

- 3.1. The analysis presented in the section, when read in conjunction with the remainder of this Statement, represents an Impact Assessment (IA), as defined by Section 7 of the Communications Act 2003. This IA considers the advantages and disadvantages of options 1 to 5 described in the Consultation and related issues.

Rationale

- 3.2. The first question to be considered is whether it is appropriate or necessary for Ofcom to seek to clarify further the obligations relating to coverage in the DRLs. It would be possible in principle to leave the DRLs unamended apart from adding the regional DTT roll-out sequence and associated duty to adopt the 1,154 sites for DTT transmissions, and leave more general coverage obligations as they are. Alternatively, the DRLs could be amended in order to require the achievement of an explicit coverage output, such as the percentage of homes covered by good or marginal DTT signals.
- 3.3. The Consultation itself discussed this issue (as did the previous DRL consultation). The broadcaster respondents to the DRL consultation requested that Ofcom clarified these obligations with the objective of reducing uncertainty for them and their viewers. Ofcom concluded⁷ that “describing the obligation specifically in terms of these key inputs may have the dual benefit of removing ambiguity from the licence conditions – licensees would be in no doubt about the technical parameters required for the DTT network - while also clarifying Ofcom’s current opinion about the meaning of “substantially the same” DTT coverage”. The responses to the Consultation provided no reason to question these conclusions. The balance of advantage, in Ofcom’s opinion, lies in seeking to clarify the digital coverage obligations in the DRLs as far as possible and practicable.
- 3.4. For the reasons set out in paragraphs 6.3-6.6 of the Consultation (as discussed above) we consider that it is beneficial to clarify broadcasters’ obligations in terms of inputs (see section 4).

Key issues

- 3.5. This IA considers the advantages and disadvantages of the proposed planning options for DTT transmission set out in the Consultation and summarised in Annex 2. The objective is to assess which of the options considered is most likely to further the interests of consumers and citizens.
- 3.6. Of particular importance to Ofcom in considering the present issue have been the following factors:
- **Timing:** Different options may have different implications for the timing of switchover. As indicated by the Government’s cost-benefit analysis on digital

⁷ Ofcom consultation, “Planning Options for Digital Switchover” on the 9 February 2005, paragraph 6.4

switchover, the implementation of switchover sooner rather than later achieves higher net benefits for the UK⁸.

- **Coverage:** Different options considered have different implications for DTT coverage post-switchover. Ofcom has considered the pros and cons of extended DTT coverage as it did in reaching its decision on the inclusion of switchover-related conditions within the DRLs. Ofcom has also to consider each option against its duty to ensure digital coverage after switchover is “equivalent in all material respects” to current analogue coverage, or the exercise of its discretion to allow coverage which is “substantially the same”⁹.

In the DRL Statement¹⁰, Ofcom provided its analysis and views on the issues involved in DTT being made available to a large majority of UK households after switchover. These included: the costs of DTT roll-out; the extent to which different TV platforms are affordable for all consumers; issues of equity and the distribution of costs and benefits; the extent to which different TV platforms are available to consumers; and the implications for the process of implementing switchover, including the provision of information on switchover.

- **Capacity:** At present, multiplexes 1 and B (operated by the BBC) transmit using the 16QAM mode whereas multiplex 2 (the multiplex jointly operated by ITV and Channel 4) transmits using 64QAM. Using 64QAM creates additional capacity for new services equivalent to two to three TV channels per multiplex with associated benefits in terms of additional choice for viewers.
- **Cost:** Different planning options will give rise to different costs. Using higher powers and/or deploying additional transmitters, for example, would in general require additional costs to be incurred.

Summary of options

3.7. A summary of the various options is set out below and more fully summarised in Annex 2.

Option 1: Public service multiplexes adopt 16QAM at -10db and -7dB (at a limited number of sites¹¹)

3.8. This option maximises the overall coverage of the three public service multiplexes and represents the option that is most likely to ensure that all of the UK households currently covered by the analogue terrestrial services are covered to a similar degree of quality and reliability by the digital terrestrial public service multiplexes. The three public service multiplexes are all assumed to adopt the 16QAM mode and also to operate at -10dB at the majority of the 1,154 sites. For

⁸ Cost-benefit analysis of digital switchover, DTI and DCMS, February 2005

⁹ Section 215, Communications Act 2003

¹⁰ Ofcom Statement, “Digital replacement licences to be offered to channels 3, 4, 5 and public teletext”, Ofcom, November 2004.

¹¹ Power increases are expected to be required at a number of transmitter sites on the south and east coasts of the UK, namely: Margate, Bluebell Hill, Sudbury, Aldeburgh, Dover, Stockland Hill, Whitehawk, Belmont, Rowridge, Mendip, Tacolneston, Ramsgate, Rowridge VP, Crystal Palace.

Multiplex 2 (Digital 3&4), this would imply a reduction in the available capacity of the multiplex by up to two TV channels (assuming continued use of the current coding equipment and bit-rate allocations).

Option 2: Public service multiplexes adopt mixed mode at -10dB and -7 dB plus some new transmitter sites

- 3.9. Under this option, one public service multiplex would operate using the 64QAM mode, the remaining two multiplexes would operate using the 16QAM mode. The multiplex using 64QAM would operate at -7 dB whilst the 16QAM multiplexes would operate at -10dB. In order to improve further the coverage and minimise the impact on those viewers in marginal coverage areas, this option includes a small number of additional transmission sites to improve coverage in predicted deficiency areas on the south and east coasts of England. The exact numbers of these, their location and power are still to be finalised. But for the purposes of assessing this option, it is currently expected that there could be up to 10 additional low to medium power stations which would mainly operate using single frequency networks requiring the localised adoption of the 8k DVB-T variant.

Option 3: Public service multiplexes adopt 64 QAM at -7 dB (including some at -4dB) plus some new sites

- 3.10. Under this option all three public service multiplexes would operate using the 64 QAM mode at -7dB (implying additional power costs compared to Option 1 and 2). Additionally some sites would also operate at a higher power of -4dB. The additional sites proposed in Option 2 (with associated increases in operating and capital costs) would also be adopted. The main advantage of this option to DTT broadcasters, the DTT platform and consumers is in terms of capacity - it would allow an increase in public service multiplex capacity by 12 Mbit/sec, corresponding to around four to six additional television services over the current capacity of the public service multiplexes. It also represents an increase of 18Mbit/sec over the capacity offered by Option 1 above.

Option 4 – Mixed mode at -10dB and -7dB

- 3.11. Option 4 is a less costly variation of Option 2. One public service multiplex would operate using the 64QAM mode (at -7dB), the remaining two multiplexes would operate using the 16QAM mode (at -10dB). However, no additional sites are proposed under this option.

Option 5 – Mixed mode at -10dB

- 3.12. Option 5 is closest to the current DTT arrangements. One public service multiplex would operate using the 64QAM mode, the remaining two BBC multiplexes would operate using the 16QAM mode. All three multiplexes would broadcast at -10dB.

Overview of trade-offs

- 3.13. The use of the 16QAM transmission mode for all three PSB multiplexes would result in reduced DTT multiplex capacity, and therefore in the number of TV, radio and interactive services available to viewers, but higher coverage (assuming similar power levels). Conversely the use of 64QAM would result in higher DTT

multiplex capacity, and hence would allow the carriage of more TV, radio and interactive channels, but would provide more limited geographic coverage than under 16QAM.

- 3.14. It is possible to recover some or all of the coverage lost through a change of mode from 16QAM to 64QAM by adopting higher transmission powers or additional transmitters. Some of the coverage options therefore also proposed the use of higher power levels or additional transmitters, or both, but with additional financial costs and increased international co-ordination risks¹² for broadcasters.
- 3.15. Under the terms of International Telecommunications Union (ITU) agreements the UK is required to agree any new high power frequency assignment with its neighbouring countries. All European countries (plus others in Africa and the Middle East) have agreed to participate in a major international re-planning conference scheduled for 2006, the Regional Radiocommunications Conference (RRC). This is aiming to secure agreement for digital only use of the UHF and VHF frequency bands. UK switchover plans therefore have to be consistent with the outcome of this conference.
- 3.16. Ofcom's choice between the different coverage options therefore involves an appropriate trade-off between coverage, number of services, timing, international co-ordination and cost, together with other relevant factors, in the light of the regulator's statutory duties. In the Consultation a number of different options for coverage were set out and some of the advantages and disadvantages of each were described. The Consultation suggested that options 1 - 3, which are predicted to secure a level of DTT coverage at least equivalent to existing levels of analogue terrestrial transmission, would have a number of advantages for consumers and citizens:
- Digital TV platforms other than DTT tend at present to be more expensive for consumers, which potentially leads to concerns about the affordability of digital TV, especially for those consumers with the lowest incomes. For most consumers, DTT receiving equipment is around £100 cheaper than the alternatives of cable and satellite¹³ (although a minority of households – Ofcom's estimates suggest around 5 to 10 per cent - may need to upgrade their aerial installations after switchover).
 - Consumers in areas without DTT coverage would therefore be likely to face higher costs in order to receive digital TV as a result of switchover than those in areas with DTT coverage, giving rise to concerns about inequity between consumers in different areas.
 - Higher DTT coverage increases the probability that TV continues to be available to all UK households after switchover. Digital TV platforms other than DTT may not be available to consumers who are unable to receive DTT. For example, cable TV services only tend to be available to just over half of all

¹² i.e. the risk that a particular planning option may be affected by international decisions on radio spectrum.

¹³ "Digital replacement licences to be offered to channels 3, 4, 5 and public teletext", Ofcom, September 2004. Ofcom Statement, "Digital replacement licences to be offered to channels 3, 4, 5 and public teletext", Ofcom, November 2004.

households. Ofcom has also estimated¹⁴ that digital satellite services do not cover between 2 and 4 per cent of households¹⁵.

- The wider the availability of DTT, the easier it is to provide information to consumers about switchover, since it is possible to run nationwide marketing campaigns which inform consumers that DTT is an option which is available to them.

3.17. The Consultation further stated that options which helped achieve switchover at an early date also lead to benefits for UK citizens and consumers. One of the aims of the Consultation was to gather more information to enable a final view to be reached. The Consultation acknowledged that there was a shortage of information available particularly in terms of the costs of the different options and we asked respondents for further information which would be relevant in making a final decision. Some information was received regarding the cost of adopting the various options. This has helped Ofcom to carry out a more objective comparison between the costs of adopting different options with the predicted net benefits derived from the cost benefit and consumer research models used in this IA.

Summary of consultation responses

3.18. We asked stakeholders to respond to eight questions relating to this IA. The questions were published in the consultation document as follows:

Question 5. Ofcom seeks detailed responses (with appropriate supporting information) from any broadcasters and channel operators which may be affected by such a reduction in the number of services carried on Digital 3&4 due to the adoption of Option 1. Ofcom would be particularly interested in the impact such a change may have on their operating costs and revenues.

Question 6. Ofcom seeks views from respondents more generally about whether the capacity reductions implied by this option outweigh the other benefits. Again, Ofcom would welcome responses supported by detailed background information, including costs, to assist the regulator in assessing the benefits and disadvantages of this option.

Question 7. Ofcom seeks views from respondents about Option 2 in general and in particular their assessment of the scale of the proposed additional power and site adoption costs for Option 2 including whether this additional expenditure would generate net costs to the DTT broadcasters, the potential for increased risk to fulfilling the 2012 timetable and whether disadvantages related to this option are outweighed by the benefits that may arise due to the retention of public service multiplex capacity.

Question 8. Ofcom seeks respondents' views in general on Option 3.

¹⁴ Ofcom consultation, "Digital replacement licences to be offered to channels 3, 4, 5 and public teletext", Ofcom, September 2004. Ofcom Statement, "Digital replacement licences to be offered to channels 3, 4, 5 and public teletext", Ofcom, November 2004

¹⁵ Recent newspaper advertisements for BSkyB's Freesat service state that it provides coverage of 98% of the UK.

Question 9. Ofcom would also welcome comments (especially supported by background information) in particular on: (a) the proposal under this option to increase further the power levels of some transmitters (see paras. 5.7 and 6.16) in order to enable the DTT coverage to match that of analogue; (b) the potential risk to achieving DSO by 31 December 2012 that may be associated with the adoption of Option 3; and (c) whether adoption of this option may give any inappropriate advantage to the DTT platform.

Question 10. Ofcom seeks opinions on Option 4 generally, and in particular views on the impact that the loss of full coverage of the terrestrial services outlined in Option 4 would have on the households affected and what factors should be considered in their adoption of alternative platforms. It also seeks views from respondents about whether the coverage disadvantages discussed could be outweighed by the benefits that may arise due to the retention of the current level of public service multiplex capacity and lower costs for the broadcasters compared with the higher cost options.

Question 11. Ofcom seeks views on Option 5 in general, and in particular on the impact that the loss of full coverage of the terrestrial services outlined in Option 5 would have on the households affected and what factors should be considered in their adoption of alternative platforms. It also seeks views from respondents about whether the coverage disadvantages could be outweighed by the benefits that may arise due to the higher PSB capacity (compared with Option 1) and reduction in costs for the broadcasters (compared with Options 2, 3 and 4).

Question 12. Taking into account the coverage objectives, capacity considerations, relative power and infrastructure costs, the requirement to begin switchover as soon as is practicable and to complete the DSO process by 2012, the need for appropriate technological neutrality in achieving DSO, and all other relevant facts and circumstances, which DTT planning option should be adopted by the UK and Ofcom for switchover?

- 3.19. Respondents did not put forward options other than those considered as part of the Consultation. Respondents to the Consultation tended to favour options which achieved a high level of DTT coverage. None of the respondents supported Option 4 or 5 since it was considered that the cost savings which would result did not justify the resulting loss of coverage. Some respondents argued that the loss in coverage which would result from options 4 and 5 would have a major impact on the success of the DSO overall.
- 3.20. The BBC, ITV plc, Channel 4, Teletext Limited, S4C, Crown Castle and SDN put forward a joint response in which they expressed a preference for a version of Option 3 but appeared not to support the proposed extra transmitters and higher powers at certain sites, arguing that the greater capacity available under this option would be in the overall interests of viewers, despite the slight loss in predicted coverage compared to Options 1 and 2.
- 3.21. Consumer groups such as the RNIB, Which, Age Concern and the Ofcom Consumer Panel, supported Option 1. They considered that the interests of consumers would be best served by selecting the option with the highest level of

predicted coverage. This view was also supported by a number of other individual respondents.

- 3.22. Another respondent argued that Ofcom placed considerable weight on the desirability of 98.5 per cent predicted DTT coverage in deciding to mandate the rollout of DTT to all existing analogue transmitters. Whilst disagreeing with this decision, the respondent went on to argue that, in order to ensure consistency with this decision, Ofcom should mandate Option 1. This respondent also argued that Option 3 would have greater risks attached to it because it would require clearance from the RRC for the higher power levels. If such clearance were not obtained then it would not be possible for Option 3 to achieve a similar level of coverage to the analogue terrestrial service. The same respondent also suggested that of all the options proposed Option 3 may have the greatest potential to distort competition by favouring public service broadcasters and the DTT platform through providing extra capacity.
- 3.23. A number of parties provided useful information on a range of technical issues including timing and the costs of different options, and specifically the costs involved in upgrading to DTT under each of the different options.

Assessment of the options

- 3.24. Under Option 1, all of the PSB multiplexes would adopt the 16QAM mode and use a power level of -10dB (although a small number of sites would have to use -7dB to maximise coverage).
- 3.25. If Option 2 was implemented, one multiplex would operate using the 64QAM mode, the remaining two multiplexes would operate using the 16QAM mode. The multiplex using 64QAM would operate using -7 dB at all sites whilst the two 16QAM multiplexes would operate at -10dB. Option 2 would require the construction of a small number of additional transmission sites to improve coverage in the south and east of England
- 3.26. Option 3 would allow all the multiplexes which carried the current main terrestrial services to operate at 64QAM and at -7dB at all sites. A small number of sites would also use power levels of -4dB. This would allow the multiplexes operated by the BBC (multiplexes 1 and B), which currently use the 16QAM transmission mode, to use the 64QAM mode instead. Option 3 would also require the construction of a small number of additional transmission sites to improve coverage in the south and east of England.
- 3.27. Options 4 and 5 were discussed in detail in the Consultation, where the advantages and disadvantages of each were set out. We have not received further information from respondents which would lead us to amend the advantages and disadvantages set out in the Consultation or the preliminary conclusion we reached in the Consultation that the benefits of these options in terms of lower costs would outweigh the disadvantages of lower coverage. Furthermore, options 4 and 5 were not favoured by any respondent to the Consultation because of the lower predicted coverage which would result under them.

- 3.28. Ofcom considers that these lower levels of estimated coverage would be an important disadvantage of these options. Specifically, the significant number of households who currently are covered by analogue terrestrial TV but would not be able to receive DTT after switchover would lead to concerns about availability, affordability and equity referred to earlier. We have not, therefore, considered options 4 and 5 in greater detail in this IA.
- 3.29. Options 1, 2 and 3 are discussed against the main criteria of coverage, cost, capacity and timing below.

Coverage

- 3.30. **Option 1:** Option 1 is predicted to result in core PSB coverage (i.e. the number of households receiving DTT coverage of all three PSB multiplexes) exceeding the current analogue core coverage of 98.5 per cent of households by 0.2 per cent (98.7 per cent). This would ensure that at least the same number of households who currently receive analogue terrestrial TV would also be predicted to have the option of receiving the public service channels through DTT after switchover.
- 3.31. **Option 2:** Predicted coverage under Option 2 would be slightly lower than under Option 1. However, the overall level of coverage predicted for this option is still expected to be the same as for current analogue coverage, i.e. 98.5 per cent of households. This option is therefore predicted to be able to ensure that at least the same number of households with existing analogue coverage is likely to be able to continue watching TV after switchover.
- 3.32. **Option 3:** Under Option 3, predicted core coverage would be 98.5% of households, i.e. the same as Option 2 but lower than under Option 1. This option is therefore predicted to be able to ensure that at least the same number of households with existing analogue coverage is likely to be able to continue watching TV after switchover.

Assessment

- 3.33. Ofcom's preliminary view was that all five of the options consulted on could be argued to provide at least "substantially the same" digital coverage as is presently provided on analogue. If Ofcom exercises its discretion to allow such coverage, adoption of any of the proposed options would therefore enable Ofcom to fulfil this particular statutory duty.
- 3.34. Options 2 and 3 allow DTT coverage to reach 98.5% of UK households. They do, however, achieve slightly lower predicted coverage than Option 1. Using the core PSB coverage figure, the UK planning model predicts that around 50,000 households are likely to have a less reliable DTT service, or none at all, compared with Option 1.
- 3.35. The number may be less than this in practice since the households affected already currently fall outside the predicted definition of analogue coverage area. Households in this area may well have taken steps to increase improve their analogue reception, with a corresponding higher chance of receiving DTT

coverage. The exact number of households affected as a consequence of the predicted difference of 0.2 per cent in coverage between options 1 and 2 is therefore difficult to judge.

- 3.36. As part of its work on digital switchover, Ofcom has recently undertaken research (see Annex 3) to examine how those households, in both good and marginal coverage areas, perceive their reception quality and to ascertain what steps they have in fact taken to improve their analogue reception. The research has shown that viewers are in general aware that they are in a marginal reception area and that they are more likely to have either already adopted digital television (mainly satellite) than the national average or have upgraded their receiving installations. The research also confirms that significant numbers of households are able to receive television services at a higher quality or reliability than the coverage predictions would suggest. These results suggest that the number of households that would be affected by a decision to adopt Option 2 (or Option 3) would be significantly less than the 50,000 suggested by the coverage predictions.
- 3.37. Although the numbers affected by the slightly lower level of coverage under options 2 and 3 are likely to be small, however, there are still likely to be around 20,000-30,000 households who are predicted to have a worse level of service under the choice of either of these options compared with Option 1. It is important to note that these households are not currently predicted to be covered by analogue television services. However, this is of course not to imply that Ofcom is unconcerned about their television reception. The households affected would be predominantly located on the south and east coasts of England, and they would suffer less reliable DTT coverage than the rest of the country as a result of incoming, time-limited interference from continental transmissions. This would mean that those households affected would suffer from high levels of incoming interference for up to 5 per cent of the time.
- 3.38. We have based our assessment of the different options on the level of coverage predicted by the UK planning model. Using predicted coverage in this way leads to risks if DTT coverage in reality varies significantly from the levels of predicted coverage. But this risk is likely to apply to all of the options to an equal degree. Hence Ofcom does not consider that the risk of coverage varying significantly from predicted levels should be a major consideration in the decision between the different options. Ofcom plans further work on the issue of coverage and reception (see Annex 3 for more details). This will consider a number of issues, including attempting to derive a more accurate understanding of viewers reported experience of reception quality and reliability in comparison with the coverage predictions made by the UK planning model.

Cost

- 3.39. **Option 1:** Option 1 requires the use of power levels of -7dB at some transmitter sites, but significantly fewer than other options. In addition, there would be no need for the construction of additional transmitter sites. There would hence be lower costs for broadcasters than other options since they would need to use fewer transmitters and/or lower power levels than under other options.

- 3.40. **Option 2:** Option 2 would require the construction of a small number of additional transmission sites to improve coverage in the south and east of England where it is predicted that the coverage would be affected by time-limited interference from neighbouring countries¹⁶. The exact numbers of the additional transmitters, their location and the power levels used are still to be finalised. But initial estimates made by Ofcom in the Consultation suggest that around 10 additional low to medium power stations using single frequency networks would be required. The figure is unlikely to exceed 20 transmitters. Option 2 would also require one of the three PSB multiplexes to use a power level of -7dB at all transmitter sites rather than at the limited number of transmission sites under Option 1. These additional requirements compared with Option 1 would require broadcasters to incur some additional operating and capital costs.
- 3.41. **Option 3:** Option 3 requires the use of higher power levels at all transmitter sites for all three PSB multiplexes as well as the adoption of a similar number of additional sites as Option 2. This would require broadcasters to incur some additional operating and capital costs compared with both Option 1 and Option 2.

Assessment

- 3.42. At the time of the publication of the consultation document, we did not have information on the likely cost of the different planning options. During the consultation process, Ofcom obtained information on the likely costs involved of using higher power levels and installing more transmitters. The respondent asked us not to disclose this information for reasons of commercial confidentiality (negotiations between broadcasters and transmission companies on the cost to broadcasters of the switchover programme have yet to take place).
- 3.43. Nevertheless, using these estimates (which we consider to be reasonable on the basis of information presently available) it is possible for Ofcom to conclude that the costs involved of deploying more transmitters and using higher power levels are relatively minor in the context of the overall switchover programme. Ofcom's estimates indicate that for each multiplex, the additional costs for Option 3, compared to Option 1, of deploying and operating the additional transmitters and using higher power would add between 5 and 10 per cent to the annual operating costs for each multiplex operator post-switchover.
- 3.44. It is also important to note that the additional costs to broadcasters arising from the use of either Option 2 or 3 is less than the cost of purchasing the extra DTT capacity under these options from other multiplex operators. In the course of its regulatory activities, Ofcom has obtained information on the costs to broadcasters of multiplex capacity. The information we have received is consistent with published reports¹⁷ which indicate that the wholesale price for capacity for one channel on a DTT multiplex is now several million pounds per year.

¹⁶ The planning model normally assumes that any such predicted interference is limited to less than 1 per cent of time. It is predicted that interference under this option would exceed that amount unless some additional sites were adopted.

¹⁷ "More Freeview slots up for grabs", The Guardian, April 12 2005

Capacity

- 3.45. Using 16QAM rather than 64QAM leads to a reduction in DTT capacity equivalent to 2-3 TV channels per multiplex. The effects on total DTT capacity in terms of the different options considered is set out and assessed below.
- 3.46. **Option 1:** Under Option 1, there would be a total of 4-6 channels available on each of the 3 PSB multiplexes. The move to using 16QAM on multiplex 2 would lead to a reduction in capacity on that multiplex equivalent to the loss of 2-3 channels compared with the current situation.
- 3.47. **Option 2:** Under this option, there would be 4-6 channels available on multiplex 1 and B and capacity for 6-9 channels available on multiplex 2. Hence, there would be the same number of services available to viewers as is currently the case. There would also be at least 2 more TV services available to viewers under this option than under Option 1.
- 3.48. **Option 3:** In comparison to both Options 1 and 2, Option 3 creates the potential for more TV, radio and interactive services to be available to consumers. The scope for the introduction of high-definition television services (HDTV) would also be enhanced. Compared with Option 1 this option would allow the equivalent of 6-9 additional TV channels. Compared with Option 2, around 4 - 6 additional TV services could be available to consumers as a result of a move to 64QAM on all three PSB multiplexes rather than just one.

Assessment

- 3.49. Option 1 therefore allows 2-3 fewer channels to be broadcast on DTT than Option 2 and 6-9 fewer channels than Option 3. In order to assess the impact of these differences in capacity, Ofcom has attempted to measure how much consumers value extra TV services available through DTT. It is difficult to draw precise conclusions on these issues since a wide range of assumptions will be relevant. But such assessments can be useful in giving a sense of scale and proportionality and in allowing judgements to be reached on the sensitivity to changes in assumptions.
- 3.50. Ofcom has used both published data such as the Government's cost benefit analysis of digital switchover¹⁸ and unpublished consumer research carried out for the Radiocommunications Agency which has since been updated by the Department of Trade and Industry (DTI). This research provided information on how much consumers are willing to pay for additional TV services. However, not all households will be using DTT (at least for their primary TV set) post-switchover. An estimate was thus derived for the value of one additional DTT channel based on the assumption that 53% of all households used DTT¹⁹.
- 3.51. Our estimates suggest that Option 2 leads to greater consumer benefits of a minimum of around £340m in net present value (npv) terms compared with Option 1. They further suggest that Option 3 would lead to greater consumer benefits of

¹⁸ Cost-benefit analysis of digital switchover, DTI and DCMS, February 2005

¹⁹ This is consistent with the projections set out in Ofcom's report, Driving Digital Switchover, April 2004.

at least £550m compared to Option 2 and additional consumer benefits of a minimum of just under £900m compared to Option 1.

- 3.52. The figures given above represent the lower bound of a range of figures derived from the analysis. Clearly, the precise estimate of the value of the additional DTT channels will depend on the exact assumptions used. But even if large variations in the level of consumer benefits are assumed (for example, 20 per cent) there is still a substantial difference in the overall level of consumer benefit between Options 1, 2 and 3. Ofcom is satisfied therefore that the benefits of additional DTT channels are substantial and that these benefits are sufficiently robust to changes in assumptions to allow the relevant issues in this decision to be considered.
- 3.53. Furthermore, the estimates we have made are consistent with other published analysis, such as the Government's cost-benefit analysis on switchover²⁰. This undertook similar analysis and the published results also demonstrate that the benefits to consumers of additional DTT services are considerable.

Timing

- 3.54. **Option 1:** Under Option 1 broadcasters would be required to convert all existing analogue transmitters but would not need to build new transmitters. Unlike options 2 and 3, therefore, Option 1 does not involve the construction of additional transmitters. Hence, there are likely to be fewer timing risks associated with this option.
- 3.55. **Option 2:** Option 2 would involve the construction of 10-20 transmitters on the south coast of England in order to compensate for coverage deficiencies caused by the use of 64QAM by one multiplex. This possibly gives rise to timing risks as a result of the fact that clearance will be needed from the RRC and associated bilateral negotiations.
- 3.56. **Option 3:** Like Option 2, Option 3 would involve the construction of 10-20 transmitters on the south coast of England. This would need international clearance, as would the use of power levels of -4dB at certain transmitter sites.

Assessment

- 3.57. All of the options considered will need to be cleared in international negotiations and the RRC. But the need for higher powers and additional sites resulting from options 2 and 3 will give rise to a slightly higher risk that these negotiations will not deliver all the clearances requested. The consultation responses we have received, however, do not indicate that choosing any of the proposed planning options would delay switchover beyond the current proposed timetable of 2008-12.
- 3.58. In the consultation document we suggested that on the basis of information then available, Option 3 was more likely to put at risk the achievement of switchover before the end of 2012. But during the consultation process, a number of respondents put forward information that indicated that that this was not in fact the

²⁰ Cost-benefit analysis of digital switchover, DTI and DCMS, February 2005

case. These submissions indicated that the number of transmitter sites which would need to be replaced in order to transmit at higher powers was considerably fewer than Ofcom's initial estimates and that this was not, therefore, a major risk to the switchover programme. Hence, we do not consider that any of the options discussed above is likely to have greater timing risks attached to it.

Other issues

- 3.59. Options which lead to higher DTT capacity may lead to some competition benefits as a result of the availability of additional DTT channels, e.g. increased competition between different DTT services, thereby benefiting viewers.
- 3.60. Ofcom does not consider that there are likely to be significant negative effects on competition between different digital TV platforms, or that there would be any inappropriate lack of technological neutrality, as a result of the capacity being made available on DTT through Option 3. Other digital TV platforms will continue to have higher capacity and a wider range of available services than DTT regardless of which planning option is chosen – cable, satellite and digital subscriber line TV platforms are all capable of offering hundreds of separate TV, radio and pay-per-view services. To the extent that the DTT platform competes with other digital TV platforms, the increased range of services available on DTT as a result of the use of 64QAM under options 2 and 3 is likely to increase inter-platform competition to the benefit of consumers. It is important to note that regardless of which planning option is chosen, consumers will be able to choose TV platforms other than DTT (provided such alternatives are available to them).

Conclusion

- 3.61. Each of the different options discussed above leads to a different level of predicted DTT coverage and involves different levels of costs and risk as can be seen in the table below.

Table 2: Summary of cost and capacity implications (comparison with Option 1)

Option	Predicted 3PSB coverage	Capacity implications	Transmission costs	Risks
1	98.7%	4-6 channels available on each multiplex	Use of -7db at some sites will cost more than if -10dB is used	Lowest co-ordination risk of three options being considered
2	98.5%	Capacity for 2 - 3 additional television channels, or other services, than under Option 1	Additional costs as a result of higher power levels and additional transmitters for one multiplex	More difficult to secure international co-ordination than Option 1
3	98.5%	Capacity for 6 - 9 additional television channels, or other services, than under Option 1	Additional costs as a result of higher power levels and additional transmitters for all multiplexes	More difficult to secure international co-ordination than Option 1 and Option 2

3.62. All three of the options set out in the table above allow predicted DTT coverage of the main analogue terrestrial services to match or exceed the predicted existing analogue coverage. All therefore can be predicted to provide coverage which is “equivalent in all material respects” or “substantially the same” as current analogue, and so enable Ofcom to fulfil its statutory duty as regards the issue of digital coverage. Options 2 and 3, however, lead to slightly reduced coverage compared with Option 1 and also involve higher costs. Both of these options, however, lead to higher levels of DTT capacity compared with Option 1. Having considered the responses submitted to our consultation, Ofcom considers that the issue of timing is of less relevance since it was indicated by respondents that none of the options is likely to lead to a delay the completion of switchover past the timetable included within the DRLs.

3.63. There is a trade-off, therefore, between these issues of cost, coverage and capacity. Ofcom has obtained as much information as possible on the different values associated with these factors.

3.64. On cost, the information we have available indicates that although Options 2 and 3 leads to higher transmission costs to broadcasters, there are corresponding benefits to them in terms of reduced need to purchase additional capacity from other multiplex operators. The fact that broadcasters have indicated their preference for Option 3 rather than options 1 and 2 provides supporting evidence for this.

3.65. The major issue we have had to consider is the trade-off between extended DTT coverage for a small number of households and extra channels for the vast majority of households. We have attempted to make this trade-off by estimating the value of the additional channels to viewers. The information we have obtained

indicates that the value to consumers of the additional capacity available under both options 2 and 3 is substantial. Specifically, the evidence suggests that the additional capacity would yield significant net benefits to consumers (and to a lesser extent to broadcasters).

- 3.66. The disadvantage of options 2 and 3, however, is that it results in slightly lower levels of predicted DTT coverage compared with Option 1. The households affected, however, are likely to lack analogue coverage currently and research we have undertaken has indicated that many of them have taken steps to improve their terrestrial reception or to obtain alternative TV platforms (see Annex 3). We estimate, therefore, that under options 2 or 3, around 20,000-30,000 households would have a less reliable DTT service than under Option 1.
- 3.67. Although Option 3 involves higher costs than options 1 and 2, Ofcom considers that the benefits to viewers in terms of extra channels and additional choice which would result are likely to exceed these extra costs and the disbenefit of DTT not being available to 20 – 30,000 households who would be covered by Option 1 (although these households are not actually predicted to be currently covered by analogue PSB services). This is based on the estimates we have of both the additional costs and the benefits to consumers of the extra TV services. We have also taken account of the fact that broadcasters are prepared to pay prices for multiplex capacity which are higher than the additional costs involved in choosing Option 3 over options 1 and 2.
- 3.68. A risk of Option 3, however, is that it is not possible to be certain that the predicted coverage levels will be secured until the RRC and associated bilateral negotiations have progressed further. Ofcom has had to consider how best to manage this risk. Ofcom considers that the best means of doing this is to obtain greater clarity about the whether Option 3 can be implemented before this option is confirmed in the form of licence obligations. This delay will also allow further work to be done on assessing the likely coverage levels available under Option 3 (see Annex 3). Such a delay would not, in Ofcom's view, delay the achievement of switchover beyond the end of 2012.
- 3.69. On balance, therefore, taking into account Ofcom's statutory duties and the various advantages and disadvantages of the various options and all other relevant factors, Option 3 is preferable to other options – provided coverage under this option can be predicted to be equivalent to the level of current analogue coverage.

Section 4

Summary of Conclusions & Next Steps

4. 1 In reaching its decisions on these issues, Ofcom has taken into account all the responses to the Consultation, its relevant duties and other relevant considerations, including the need not to distort competition and to demonstrate appropriate neutrality as between different digital TV platforms.

Q1: Should all public service multiplexes be required to achieve the same coverage?

4. 2 Ofcom has concluded that it would be appropriate that all three public service multiplexes should aim to achieve similar levels of coverage at all sites being operated for DTT by adopting the same mode and similar levels of power. Ofcom will discuss its conclusions on this matter with the DCMS in order that they can consider whether the BBC should be expected to adopt similar obligations relating the transmission mode, power and coverage for Multiplex 1. (The Multiplex B licence held by the BBC is granted by Ofcom).

Q2: What level of coverage & capacity should the commercial multiplexes be required to achieve?

4. 3 Ofcom has concluded that this should be primarily a matter for the commercial multiplex operators to determine in the light of their particular commercial interests. However, Ofcom will have to make a judgement regarding the maximum power levels and number of sites that operators will be offered in line with its overall policy objectives for the future use of the UHF band and the balance of requirements that it will be negotiating for the UK in the RRC.
4. 4 In line with the objectives being set for the public service multiplex multiplexes to achieve similar levels of coverage Ofcom believes that the commercial multiplex operators should also be encouraged to agree on a common approach to any extension to their coverage as a result of switchover and will therefore ask that they submit joint proposals to Ofcom if they wish to adopt any further sites beyond the current 80.
4. 5 Ofcom is also concerned to ensure that the overall coverage of any multiplex should not drop below its current level as a result of switchover. It has therefore concluded that each commercial multiplex must at minimum match its present level of coverage at switchover. This would require that the six multiplex core coverage of the DTT network at switchover must at least match its current 73 per cent of UK households. The predicted coverage of individual multiplexes at switchover must therefore not fall below their current level of coverage.

Q3 & Q4: Should DRL coverage requirements be expressed in terms of coverage (outputs) or transmission specification (inputs)?

4. 6 The DRLs require the broadcasters to have coverage that is equivalent to (in all material respects), or at least substantially the same, as that provided by the existing analogue terrestrial services. Ofcom has previously stated (see paragraph

1.5) that analogue coverage can be predicted using the UK planning model and that this estimates that the analogue PSB services cover 98.5 per cent of UK households. In order to provide an objective basis for judging whether the DRL coverage duty has been met, Ofcom has also stated that it will use the UK planning model to predict the coverage of the digital public service multiplexes. As these figures are the result of computer models, Ofcom does not consider it possible to conclude definitely at present that the predicted coverage of any option being considered meets the requirement to match analogue in all material respects. Ofcom has therefore decided that it should exercise its discretion, and that the DRL coverage obligation must currently be read as requiring that the coverage is “substantially the same as analogue”. How this obligation must be fulfilled in the context of a particular planning option is discussed below.

4. 7 Ofcom is sympathetic to the requests by the broadcasters for the adoption of input based requirements alone in their licences. Ofcom therefore proposes to vary the DRLs and multiplex licences in due course. However, it has concluded that it will not be possible to finalise any such requirements until the results of the RRC are more fully known and understood. Ofcom’s detailed proposals for managing this issue are discussed in more detail in the following paragraphs.

Q5 to 12: Which planning option (of five put forward) should be adopted by the public service multiplex operators?

4. 8 Ofcom considers that there are four issues which are particularly relevant to this decision, these being timing, coverage, capacity, and cost. The impact assessment carried out in Section 3 considered each of these issues in detail. The relative merits and disadvantages of each of the three options under detailed consideration were considered in the light of each issue. Ofcom has also taken account of all other relevant considerations.
4. 9 Ofcom’s conclusion is that although Option 3 involves higher costs than Options 1 and 2, Ofcom considers that the benefits to viewers in terms of extra channels and additional choice which would result are likely to exceed these extra costs and the disbenefit of DTT not being fully available to 20 – 30,000 households who would be covered by Option 1 (although these households are not actually predicted to be currently covered by analogue PSB services). This is based on the estimates we have of both the additional costs and the benefits to consumers of the extra TV services (see paragraphs 3.50-3.53). We have also taken account of the fact that broadcasters are prepared to pay prices for multiplex capacity that are higher than the additional costs involved in choosing Option 3 over Options 1 and 2.
4. 10 Ofcom is therefore in favour of the public service multiplex operators adopting Option 3 provided that the necessary steps are taken to ensure that:
- predicted coverage of the nationally available terrestrial TV channels (BBC1, BBC2, ITV1 and Channel 4) continues to reach at least 98.5 per cent of UK households after switchover; and
 - digital switchover can be achieved between 2008 – 2012.

International clearance and licence amendments

4. 11 It is not possible to be certain at this time that the UK will secure all of the necessary international clearances required for Option 3. The most important future event affecting these is the RRC which is due to take place in the spring and early summer of 2006.
4. 12 Ofcom, on behalf of the UK Government's Spectrum Strategy Committee and in conjunction with the broadcasters and transmission companies, will negotiate with our international neighbours through a series of bilateral meetings and in the RRC in Geneva in May/June 2006 in support of Option 3. However, in doing so, Ofcom will not:
 - a) substantially compromise the 112MHz of spectrum to be released through switchover and hence risk undermining the primary economic benefit of switchover; or
 - b) depress the realistically achievable coverage of the 3 commercial multiplexes below 90% of UK households.
4. 13 There remains a risk that the UK will not be able to secure agreement at the RRC and subsequent bilateral meetings to these proposed assignments associated with Option 3. In the event of such an outcome compromising the coverage objective set out above Ofcom will reserve the right as soon as practicable to review whether Option 3, or a variant of it, can or should be adopted by the broadcasters. In such circumstances Ofcom may consult again to review the obligations to be placed upon the broadcasters in DRLs.
4. 14 Therefore, while Option 3 is to be pursued, Ofcom does not consider that it can or should be implemented through immediate amendments to the DRLs and multiplex licences. Rather than altering broadcasting licence obligations at this stage to implement Option 3, Ofcom will work closely with broadcasters over the coming months to develop the switchover plan further. This work will focus on seeking to ensure that the likely levels of coverage under Option 3 match the predicted core coverage of the current terrestrial analogue public service channels.

Further spectrum planning

4. 15 Ofcom's current view is that the predicted coverage of Option 3 can reach 98.5 per cent of UK households if the full Option 3 is adopted along with a number of refinements to the frequency plan. For this reason and the reasons set out in the IA we consider that broadcasters should adopt the full Option 3. In addition to broadcasters adopting higher powers (-7dB) for the three PSB multiplexes at all UK sites, these would require possible adoption of a small number of new sites (using single frequency networks, SFNs) and some further power increases at other sites in parts of south and east England.
4. 16 Further work will now be required by the Joint Planning Project (JPP) to develop these proposals and complete the specification of the UK switchover plan for the three public service multiplexes and the three commercial multiplexes, taking into account of course the outcome of the RRC. When all this work has been

completed Ofcom will then be able to amend the DRLs and multiplex licences to add all the appropriate assignments to them.

4. 17 Ofcom will therefore work with the broadcasters and multiplex operators to optimise the technical details of Option 3 in order to: enable the public service multiplex operators to adopt 64QAM at switchover; ensure that the predicted coverage of the nationally available terrestrial TV channels matches existing analogue core coverage; ensure that a switchover timetable of 2008 -12 remains possible to achieve; and to allow these objectives to be achieved at a reasonable and proportionate cost. The outcome of the RRC and subsequent bilateral meetings will also have to be taken fully into account.

Coverage and reception Issues

4. 18 With respect to coverage, the switchover plan must provide for DTT coverage of the nationally available terrestrial TV channels to be predicted to at least match current analogue levels using the UK planning model (i.e. 98.5 per cent of UK households). Ofcom recognises the existence of residual uncertainty both about current levels of analogue coverage and also future levels of DTT. Ofcom will undertake further spectrum planning work, and also a comprehensive regional study of actual coverage and household behaviour. An initial report of this work will be completed (and published by Ofcom) by July 2006 (see Annex 3 for further details). It is expected that this will help establish greater clarity about how analogue and digital television services are received in UK households and the impact that switchover will have on viewers' reception arrangements.

Capacity gains

4. 19 The adoption of Option 3 will result in an increase in the capacity for the BBC multiplexes at switchover. The Green Paper on the future of the BBC²¹ proposes that any plans by the BBC to launch new services should be reviewed by Ofcom in a market impact assessment. However, on multiplex B, which unlike multiplex 1 is licensed by Ofcom, the BBC will remain under its existing requirement to ensure that the allocation of capacity, or the refusal to allocate capacity, complies with guidelines on fair, reasonable and non-discriminatory allocation which it is obliged to publish.

Use of the 8k format

4. 20 The response to the proposal to adopt the 8k format at switchover has been positive and Ofcom believes that this would serve the best interests of the UK. However, some concerns were raised regarding the continued use of 2k only equipment and whether this would have ceased to be a significant factor by the time switchover is implemented, especially given that the first regions are scheduled to be converted in less than three years time.
4. 21 Ofcom believes that the adoption of the 8k format is essential in those areas where single frequency operation will be required in order to allow the additional transmitters required by Option 3 to be adopted. It therefore proposes that these areas (covering the Meridian and Anglia regions) will adopt the 8k format when they are converted to all digital operation. The rest of the UK will adopt the 8k

²¹ Review of the BBC's Royal Charter, DCMS, March 2005

format by the final digital switchover date of 2012, unless it can be shown to Ofcom's satisfaction that the impact of an earlier adoption would have minimal impact on viewers with 2k equipment.

4. 22 Ofcom will ask SwitchCo to provide it with regular reports on the number of operational 2k only receivers in order that a judgement can be made on the exact timing of this transition. Ofcom would expect that users of such equipment would be given at least two years notice of a transmission in their particular area.
4. 23 Ofcom is not convinced by Intellect's argument that the Government (or any other agency) should be expected to provide compensation to those viewers who are still using 2k only products at switchover. It notes that the government has written to all manufacturers a number of times over the last five years noting that 8k compliant systems would future-proof products against just such an adoption of the 8k transmission standard.

Current deficiencies and self-help schemes

4. 24 As noted in Section 1 Ofcom intends to defer consideration of this issue as it raises distinct and separate issues from the main consultation and these will require further discussion with the self-help communities and other interested parties such as government (national, devolved & local).

Annex 1: Summary of responses received

Private responses – 30 received in total (19 confidential)

Date	Name/Organisation	Confidential Y/N
9 Feb	Mike Boyle	N
9 Feb	Andrew Woodthorpe	N
10 Feb	J Guillebaud	N
11 Feb	J Whatley	N
11 Feb	Peter Sanders	N
1 March	-	No name
6 March	M Chare	N
8 March	-	No Name
15 March	Peter Barham	N
20 March	Brian Smith	N
21 March	Peter Jackson	N

Self-help Responses – 22 received in total (21 confidential)

Date	Name/Organisation	Confidential Y/N
1 April	Jim Boyd	N

Industry and Consumer Groups - 9 Responses (0 confidential)

Date	Name/Organisation	Confidential Y/N
11 Feb	Which	N
15 March	National Council on Aging	N
17 March	TAG	N
18 March	RNIB	N
21 March	Ofcom Consumer Panel	No form
21 March	DTG	N
21 March	IEE	N
21 March	Chelmsford A Radio	N
21 March	Intellect	N

Local and Regional Government - 4 Responses

Date	Name/Organisation	Confidential Y/N
10 Feb	Isle of Man Comm's Commission	No Form
15 March	West Lancashire District Council	No Form
21 March	Scottish Executive	No form
21 March	Welsh Assembly	No form

Ofcom Licensees – 12 Responses (10 confidential)

Date	Name/Organisation	Confidential Y/N
21 March	Five	N
22 March	PSB joint	N

Annex 2: Summary of coverage options

Option	PSB Mode	Transmit power (relative to analogue)	Additional transmitters required?	Predicted Coverage	Impact	Potential impact on timing risk
1	16 QAM 16 QAM 16 QAM	-10dB (some @ -7dB) -10dB (some @ -7dB) -10dB (some @ -7dB)	No	Exceeds analogue coverage - 98.7 per cent of households (HHs)	Low cost option, but net loss of around 6 Mbit/s capacity	Low
2	16 QAM 16 QAM 64 QAM	-10dB -10dB -7dB	yes extra transmitters on South Coast	Matches analogue coverage – 98.5 per cent of HHs	Medium/high cost option, no loss of capacity, may require some mast upgrade + new sites	Medium
3	64 QAM 64 QAM 64 QAM	-7dB -7dB -7dB	yes extra transmitters on South Coast	Coverage falls 0.2 per cent short of analogue – 98.3 per cent of HHs With high power (-4dB) adopted at selective sites, coverage predicted to match analogue 98.5 per cent of HHs	High cost option, but net increase of 12 Mbit/sec in capacity, may require some mast upgrade + new sites	Medium to high
4	16 QAM 16 QAM 64 QAM	-10dB -10dB -7dB	no	Coverage falls 0.4 per cent short of analogue – 98.1 per cent of HHs. Some HHs may lose terrestrial reception	Medium cost option, no loss of capacity, may require some mast upgrades	Medium
5	16 QAM 16 QAM 64 QAM	-10dB -10dB -10dB	no	Coverage falls 1.5 per cent short of analogue – 97.1 per cent of HHs. Some HHs may lose terrestrial reception	Minimum cost option, no loss of capacity	Low

Annex 3: Further consideration of coverage and reception issues

Analogue coverage predictions

- A3.1. Ofcom considers that, in order to further the interests of citizens and consumers, it is important that as far as practicable viewers who currently receive analogue television services should be able to receive them in digital form at switchover. In order to do this, Ofcom has sought to identify which households currently receive analogue terrestrial services and has then tried to ensure that as far as possible all of those households will also be able to receive digital services from at least one of the digital platforms at switchover.
- A3.2. The Consultation (Section 3) outlined how the current level of analogue coverage has been assessed using the UK Planning Model (UKPM) and the concepts of Served, Marginal and Core coverage. This concluded that the core coverage of UK analogue television services is predicted to be 98.5 per cent of UK households. The table below summarises these results.

Table A3.1: Analogue Coverage

Network	Reception	BBC1	BBC2	ITV	C4	Core
1154 Analogue Sites	Served	97.9%	96.9%	96.7%	96.9%	95.6%
1154 Analogue Sites	Marginal	1.6%	2.3%	2.3%	2.3%	2.9%
1154 Analogue Sites	Served + Marginal	99.5%	99.2%	99.0%	99.2%	98.5%

Coverage of analogue terrestrial services

- A3.3. The coverage predictions given in the Consultation for each of the five options were produced for the three PSB core multiplex coverage, that is the number of UK homes which were predicted to be covered by all three DTT multiplexes which will carry PSB TV channels. This was compared with a figure of 98.5 per cent of households who are predicted by the current planning model to receive coverage of all the main analogue terrestrial services – BBC1, BBC2, ITV1 and Channel 4/S4C.
- A3.4. At the time of publishing the Consultation Ofcom did not have the relevant coverage figures for those who would receive all of the nationally available analogue terrestrial services through DTT. These services are currently carried on two of the three PSB multiplexes (multiplexes 1 and 2). Coverage of these two PSB multiplexes (2 PSB below) at switchover is estimated to be higher than that predicted for coverage of all three PSB multiplexes (3 PSB below). The differences between the two sets of figures can be seen in Table A3.2 below.

Table A3.2: Predicted DTT Core Coverage

	2 PSB core coverage	3 PSB core coverage
Option 1	99.0%	98.7%
Option 2	98.7%	98.5%
Option 3	98.5%, 98.7% with -4dB power	98.3% 98.5% with -4dB power

A3.5. Under each option, the number of households which are predicted to be covered by the 2 PSBs (carrying the 4 main analogue terrestrial services) is higher than the number of households who are likely to receive all three PSB multiplexes. Using the 2 PSB coverage figures therefore allows a more direct comparison between the coverage of existing analogue channels and coverage of these channels through DTT, and is a useful tool to aid consideration of coverage issues to supplement the predicted coverage for 3 PSB multiplexes.

Marginal reception research

A3.6. Ofcom has commissioned research on terrestrial reception issues. This looked at viewers who used fixed aerials for the reception of their current set of services. Ofcom will publish the results of this work in the near future. However as these results were relevant to the issues being discussed in this consultation it was felt that it would be helpful to provide an early summary of the insights gained.

A3.7. The baseline research on television reception and usage using fixed aerials was conducted in areas where analogue terrestrial reception was predicted to be of marginal quality. In this case “marginal” means where reception is predicted to result in a slightly poorer level of quality or reliability of service. This work is the first part of a longer term project whose ultimate aim is to build a better understanding of television reception and usage in areas of good, marginal and poor quality coverage.

A3.8. The baseline study looked at around 1000 homes that were predicted to be marginal reception areas. The study also looked at a comparison sample of households which were predicted to be good reception areas. Initial analysis of the results has confirmed that people living in areas predicted to have marginal coverage do have more difficulty in receiving analogue television; are more likely to have taken steps to improve reception quality; and are more likely to have completely adopted multi-channel television (and hence not be reliant on analogue terrestrial television transmissions). They are also more likely to cite poor picture quality as a reason for adopting multi-channel television.