Planning Options for Digital Switchover



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Consultation

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# Summary

- This consultation seeks views on which of the digital terrestrial television (DTT) 1.1 planning options set out in this document is best suited to the achievement of digital switchover in the UK. Although most households will be able to choose between digital terrestrial, satellite and cable services (and possibly other platforms) for their television viewing after switchover, the migration from analogue terrestrial television and the extension of the DTT network raise particular planning and regulatory issues.
- In large part, these issues were addressed in December 2004 when Ofcom issued 1.2 digital replacement licences (DRLs) to Channel 3, Channel 4, Channel 5 and Public Teletext. The licences include a date of 31 December 2012<sup>1</sup> by which all analogue transmissions must have ceased. The DRLs also require the licensees to adopt all current existing transmission sites in the UK (1154 over the whole of the UK) for digital terrestrial transmission, and separately 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. This consultation examines further the options for meeting these obligations.
- The Policy Statement which accompanied the DRLs on 29 November 2004 considered 1.3 the guestion of coverage in some detail when evaluating the costs and benefits of full nationwide roll-out of the DTT network. In summary, Ofcom's assessment was that there were compelling arguments in support of the full rollout of DTT such that, as far as possible, everyone who currently has access to analogue television would be covered by DTT signals post-switchover. These arguments reflect Ofcom's statutory duties and take account of the equity, affordability and communications advantages of seeking to ensure that DTT is available to all television households. Of course, where other means of delivering digital television are available, households will choose the most attractive proposition for them.
- 1.4 At present, the four nationally available analogue television services (BBC1, BBC2, ITV1 and Channel 4) can be viewed by 98.5 per cent of UK households. In comparison the existing coverage of these services (and the other services which the PSBs are able to provide 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 at which services are transmitted and the transmission mode<sup>2</sup> used will affect the coverage of signals.
- 1.5 However, while coverage can be improved by increasing power levels or by broadcasting at the most robust transmission mode, doing so may increase the cost and the implementation risk of digital switchover. A change in the transmission mode will also affect the capacity of the DTT network. As a result, there are important tradeoffs to be made in deciding on the most appropriate mix of these variables. This consultation considers, and seeks views on, those trade-offs.
- 1.6 At present, while the DRLs do contain a specific obligation with respect to the nationwide roll-out of the DTT network, they do not specify other inputs such as power

<sup>1</sup> Overall leadership of digital switchover continues to remain with Government, including any public announcement of the formal switchover date

Transmission mode is defined in the main body of this consultation

and mode. Instead, the licences require that DTT coverage matches analogue coverage, or is at least substantially the same as measured by reference to current analogue coverage. The Policy Statement issued alongside the DRLs recognised that this coverage obligation was not specific and proposed that Ofcom would consult further on this matter with the aim of resolving the issue by the end of March 2005.

- 1.7 On DTT coverage, this consultation considers five alternative combinations of sites, mode and power. Three of these appear to result in coverage levels which would match or even exceed existing analogue levels. However, each of them would entail different costs and other implications and Ofcom wishes to hear the views of respondents on their relative merits. In light of the limited data currently available to allow an objective evaluation, Ofcom is also particularly keen to receive further information or substantiated arguments in support of one or more options. Once Ofcom decides on a preferred option it will consider whether variations should be made to the DRLs to reflect that option.
- 1.8 This consultation also considers 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 (see Section 7).
- 1.9 The closing date of this consultation is 5pm on 21 March 2005. In view of the need to resolve the issues dealt with in this consultation quickly, respondents are asked to submit their comments as soon as possible, and certainly by no later than this deadline. Ofcom aims to amend DRLs as appropriate by the end of May 2005.
- 1.10 Ofcom is particularly keen to hear the views of the digital platform operators, terrestrial broadcasters, transmission companies and also consumer and viewer groups regarding the practicability and likely costs of each of the proposed options. It would also welcome alternative proposals, provided they are practical and properly costed and take due account of the interests of consumers and the duties of Ofcom and its licensees.

# Introduction and Background

- 2.1 The Communications Act 2003 required Ofcom to issue new licences to replace the existing Broadcasting Act licences held by the commercial public service broadcasters by the end of 2004. These digital replacement licences (DRLs) were anticipated to be the licences to take these broadcasters through digital switchover. Before issuing DRLs to Channel 3, Channel 4, Channel 5 and Public Teletext, Ofcom carried out a public consultation (the DRL Consultation) which closed on 25 October 2004. The DRLs were then offered to the relevant licensees on 29 November 2004 and all were granted by the statutory deadline of 28 December 2004.
- 2.2 Question 1: The DRL offers were accompanied by a Policy Statement from Ofcom (the DRL Statement) which set out the important points of interest raised by respondents to the consultation. It also explained why Ofcom had reached the various decisions it had in relation to the conditions included in the DRLs offered to Channel 3, Channel 5 and the Public Teletext licensees and the final draft DRL for Channel 4.
- 2.3 This consultation focuses on additional and different obligations and commitments Ofcom may wish to insert in the DRLs<sup>3</sup>. The position of the BBC services and multiplexes are obviously important issues in this debate especially as the BBC are expected to operate two of the three multiplexes carrying public service content at switchover<sup>4</sup>. With this in mind Ofcom is keen to hear the views of respondents about whether the coverage obligations being discussed in this consultation should apply equally to the BBC multiplexes, and more specifically whether all three public service multiplexes should be expected to achieve similar levels of coverage at switchover.

**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?

#### **Coverage obligations**

- 2.4 The Communications Act 2003 (the Act) requires that a DRL service must be one that appears to Ofcom "equivalent in all material respects" to the current analogue one. Ofcom considers the issue of coverage to be material to this requirement. However, the Act also gives Ofcom the specific additional power and discretion to grant a DRL to Channel 3 or Channel 5 to provide a service for an area which is "substantially the same".
- 2.5 The DRL Consultation and the subsequent DRL Policy Statement which accompanied the DRLs considered in some detail how these requirements should best be met. The conclusion of this process was that these requirements, and Ofcom's statutory duties overall were best served by requiring licensees to extend the DTT network from the current 80 transmission sites to all 1154 sites in the UK. The advantages and disadvantages of including the duty to roll-out to 1154 sites were discussed in depth in

<sup>3</sup> It should be noted that consequential changes may also be proposed for the digital multiplex licences carrying the DRL services

<sup>4</sup> Multiplexes are allocations of digital broadcasting capacity on which television channels are carried. There are six multiplexes in the UK. Three of these (Multiplexes 1, 2 and B) will carry public service channels at switchover. The other three (Multiplexes A, C and D) will carry commercial services. the Regulatory Impact Assessment (RIA) included in the DRL Consultation. This RIA was then reviewed in the DRL Policy Statement in the light of responses to the consultation. These arguments are not repeated here, but an extract from the Policy Statement is shown below.

#### Extract from Ofcom DRL Statement – 29 November 2004

- 135. [I]t is important to bear in mind that, as the original RIA made clear, Ofcom has considered the overall advantages and disadvantages of the different options for DTT rollout rather than focusing solely on what would be the most economically efficient approach. We did not justify our decision to require the roll-out of DTT to 1154 transmitters on the sole basis that it would be the least-cost option for all sites. As we said in the RIA (paragraph 185), in considering the appropriate mix between DTT and other TV platforms, Ofcom has taken into account all of its relevant duties, with particular importance being given to the following factors:
  - 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.
  - Any implications for the process of implementing switchover, including the provision of information on switchover.
  - The costs involved in deploying different TV platforms.
- 136. It was because Ofcom took into account all of these issues, rather than simply the costs involved, that we concluded in the RIA that any additional costs involved in rolling out DTT to all existing analogue transmitters are justified by the additional benefits which result. Ofcom continues to consider that all of these issues are relevant in considering the issue of DTT rollout.
- 2.6 A condition was therefore inserted in the DRLs requiring licensees to ensure that digital switchover shall take place in a sequence based on the conversion from analogue to digital television broadcasting of the current analogue transmitters listed in each licence. The regional sequence will be added to the DRLs by way of variation as soon as practicable.
- 2.7 Ofcom acknowledged in the DRL Policy Statement that it is desirable for licensees to have a reasonable level of certainty as regards future fulfilment of their licence conditions. There may not be sufficient clarity for example if a licence condition regarding the level of digital coverage from switchover was couched in terms of the geographic area or the percentage of households to be covered. Instead, Ofcom considered it preferable to place a duty on the licensee to procure coverage in digital terrestrial form of their service equivalent to, or substantially the same as, the analogue coverage currently achieved by transmission from a certain named number of stations, on certain frequencies and at certain power levels, as set out in Part 5 of the Annex (Part 4 in the Channel 5 DRL).
- 2.8 In the case of Channel 5 the coverage achieved by its current digital service already exceeds that of its analogue service. To avoid requiring Channel 5 to reduce this digital coverage at switchover Condition 2(2)(b) in the Channel 5 licence requires Channel 5 to "at least" match its current level of analogue coverage.
- 2.9 Some respondents to the DRL Consultation raised concerns that the proposed coverage and roll out conditions were too broad and left too much discretion in

Ofcom's hands. In particular they were concerned that a licensee might fulfil its duties to roll out to 1154 sites, but that coverage might not meet the desired level. They suggested that Ofcom could then rely on the duty to achieve equivalent or substantially the same coverage to force the licensee to build more DTT transmitters or alter other important transmission parameters.

- 2.10 In the DRL Statement Ofcom acknowledged these concerns. Ofcom therefore announced that it planned a public consultation on the issue of digital coverage. This would focus on how the statutory requirements for digital coverage could be translated into clearer obligations in the DRLs for licensees, including whether Ofcom should require any change of transmission mode. As appropriate, and informed by the results of the consultation, DRLs may be amended to give licensees more certainty. This consultation meets that commitment given in the DRL Statement<sup>5</sup>.
- 2.11 This consultation examines a number of options for achieving substantially the same digital terrestrial coverage as analogue in ways that could fulfil Ofcom's duties. Such options include various combinations of mode and power and are detailed below in sections 5 and 6.
- 2.12 Sections 3 and 4 set the context for the consideration of these options by providing an overview, respectively, of current levels of analogue terrestrial coverage in the UK, and of some of the main issues relevant to the planning of the digital terrestrial network.

# **Overview of Current Analogue Terrestrial** Coverage

- In May 2004, Ofcom published a review<sup>6</sup> (carried out by the SPG<sup>7</sup>) of how analogue 3.1 television coverage is predicted and the current levels of coverage achieved by the four main analogue television services (BBC1, BBC2, Channel 3 & Channel 4/S4C: the PSBs). The review defined three key elements affecting coverage predictions, these being: core coverage and marginal coverage.
- **Coverage**: Planners normally consider a single service<sup>8</sup> when carrying out a coverage 3.2 review. They first calculate the gross coverage (that is the maximum number of households able to receive the service via a fixed roof-top aerial) for each transmitter broadcasting that service and then, for a national total, count all households in the UK covered by at least one transmitter.
- 3.3 **Core coverage:** When considering who is covered by a particular group of the analogue or digital services (for instance all of the analogue PSBs) the planners carry out a coverage review for each individual service in that group and then assess how many households are covered by all of them. This is referred to as the Core Coverage and is the principal means used to assess and compare coverage of the analogue and digital services of the PSBs in the UK. The Core Coverage will always be lower than the coverage of individual services as it only includes those households who are able to receive all services, not just one or two.
- 3.4 Served and Marginal Coverage: When considering who is covered by a service the planners aim to ensure that householders should be capable of receiving services which meet internationally agreed standards of picture quality and reliability. When households are predicted to be able to receive a service of this quality they are deemed to be Served. However, it is known that a large number of householders live outside these Served areas but still receive adequate services. This is achieved either by installing higher gain receiving equipment or tolerating a slightly poorer level of quality or reliability. To allow for these households the planners also use a slightly more relaxed coverage criterion. Households within this area are referred to as being in Marginal Coverage.
- 3.5 The results of the analogue coverage review are summarised in Table 1 below.

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%

#### Table 1: Analogue Coverage

<sup>&</sup>lt;sup>6</sup> Ofcom analogue coverage report, 12 May 2004.

<sup>&</sup>lt;sup>7</sup> 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.

For example the analogue BBC 1 service or the Digital 3&4 multiplex service.

- 3.6 Table 1 shows that the Served analogue coverage of the main BBC 1 service in the UK reaches 97.9 per cent of households and a further 1.6 per cent of UK households are in the Marginal Coverage area of the BBC 1 service. Adding these figures together we arrive at the total for UK analogue coverage for BBC 1 of 99.5 per cent.
- 3.7 The ITV, BBC 2 and Channel 4/S4C analogue services are broadcast from the same sites and at the same power as the BBC 1 service. In general, therefore, they should achieve the same coverage as the BBC 1 service. However, due to slight differences in the characteristics of the transmission antennae for the different frequencies used and the differing levels of interference in the reception area, it has been found that the overall coverage of the main analogue channels does vary at the edge of the coverage area. The main areas affected by this variation are concentrated in the south (around Poole, Dover and in Sussex) and east (coastal areas of Suffolk) of England.
- 3.8 This means that the four channel core analogue coverage is slightly less than the BBC 1 coverage discussed above. The assessment predicts that the core Served Coverage of the four analogue public channels is 95.6 per cent and the Marginal coverage represents a further 2.9 per cent. This results in a total core analogue coverage of 98.5 per cent. The coverage predictions made by the planners for analogue coverage have been validated by extensive field surveys and other assessments carried out by the BBC and ITC/Ofcom.
- 3.9 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.

# Overview of Digital Terrestrial Television (DTT) Planning

#### Review of the current digital switchover plan

- 4.1 DTT services are currently broadcast from 80 transmission sites around the UK. Using these 80 sites, around 73 per cent of households are able to obtain coverage of all six DTT multiplexes<sup>9</sup>.
- 4.2 The SPG was asked by the Government<sup>10</sup> to develop a digital switchover (DSO) spectrum plan which assigned spectrum for the six DTT multiplexes at switchover whilst releasing some of the existing analogue TV broadcasting spectrum. The spectrum plan further assumed that the frequencies currently used to transmit analogue TV would be used for the three DTT multiplexes which contained public service broadcasting (PSB) channels. An outline of this plan was completed in December 2003 and work is continuing by the Joint Planning Project<sup>11</sup> (JPP) to optimise coverage.
- 4.3 The DSO plan assumed that three PSB multiplexes (which are currently expected to be multiplexes 1, 2 and B) will be broadcast from all of the current 1154 analogue sites and that the other three commercial multiplexes (expected to be A, c and D) will be broadcast from up to 200 of these sites (the exact number is to be decided by the commercial multiplex operators (see para. 6.38).
- 4.4 In addition to the number of sites, two other parameters can be varied to increase or decrease coverage. These are the power level adopted by each multiplex at a site, and the transmission mode adopted by that multiplex at each site. The transmission mode is a technical feature of the broadcast signal that can be changed to trade robustness and thus coverage of the signal, against the capacity of the signal to carry programmes. In other words, better signal coverage can be achieved by reducing the number of television services (channels) broadcast.
- 4.5 The coverage of this plan has been assessed for three different combinations of transmission mode. These are:

4.5.1 **16 QAM<sup>12</sup>** - A relatively robust transmission mode which maximises DTT coverage. The bit-rate is 18 Mb/sec<sup>13</sup> which is sufficient for between four and six television channels.

4.5.2 **64 QAM** – A less robust transmission mode which results in a lower coverage than 16QAM if used at the same power as 16 QAM. The bit-rate is 24 Mb/sec which is sufficient for between six and eight television channels.

<sup>&</sup>lt;sup>9</sup> In simple terms, a television multiplex combines a number of different TV, radio and data services on a single signal which is then transmitted to viewers.

<sup>&</sup>lt;sup>10</sup> <u>http://www.digitaltelevision.gov.uk/press/2003/dti\_p2003\_062.html</u>, Paving the way for a digital future, DTI press release 30 January 2003,

<sup>&</sup>lt;sup>11</sup> The Joint Planning Project is responsible for the planning of all new television assignments used within the UK and is chaired by Ofcom.

<sup>&</sup>lt;sup>12</sup> Quadrature Amplitude Modulation

<sup>&</sup>lt;sup>13</sup> Mbit/sec – relates to the capacity of the multiplex and is expressed in millions of bits per second.

4.5.3 **Mixed mode** – A hybrid option which allows for two particular multiplexes to operate at 16QAM (multiplexes 1 and B) and the third (multiplex 2) to operate at 64QAM, typically at twice the power of the other two to compensate partially for the reduced coverage.

- 4.6 The power level of each signal is typically expressed as a relative measure, namely the relative power level of the digital service compared to that of the current analogue transmissions. A digital power level of "-7dB (decibel)" is one fifth of the respective analogue level and a power level of " -10dB" is one tenth of the analogue level. It should be noted that all of the power levels being discussed for the digital services at switchover in this consultation are all below, and in some cases substantially below the levels currently used for the analogue services.
- 4.7 The choice of power level will have an impact on both the capital and operating costs of the new DTT transmission equipment. The original switchover plan was developed with the aim of minimising the costs of upgrading transmission sites from analogue to DTT. However, it should be noted that if relatively higher powers are adopted (for instance if more than two multiplexes are required to operate at -7dB or higher) some of the infrastructure currently in use may require significant structural improvements to cope with increased equipment weights. This could in principle have an impact on the time required to extend the DTT network to all 1154 sites.
- 4.8 Power levels and the potential levels of incoming interference on each frequency are also subject to international agreements on spectrum planning. The actual power and interference levels applying for switchover will only be finally confirmed at an international planning conference (known as the Regional Radio Conference RRC) being held in 2006. The detailed switchover plan may need to be adapted if international constraints require it, notably if this is the only way equitably of accommodating the equivalent digital plans of neighbouring countries as well as those of the UK. This may constrain power levels, and precisely which frequencies are used at which transmitter site, and whether interference levels might limit coverage more than assumed in planning. However, for the purposes of this consultation, respondents are asked to assume that the present switchover plan will not be significantly changed. In addition, respondents should assume that any additional transmitters required under options 2 and 3 (see Section 5) would be accommodated.

#### **United Kingdom Planning Model**

- 4.9 Ofcom has made use of the work of the SPG, JPP and its planning contractors in arriving at the coverage predictions used to inform this consultation. All of these groups make use of the UK Planning Model (UKPM) to plan digital terrestrial frequency assignments and to predict the coverage they are expected to achieve.
- 4.10 The UKPM was developed within the JPP and makes use of highly detailed and accurate terrain and clutter data (representing obstacles to the signal such as trees and buildings) to model the transmission characteristics of the radio waves used to carry the digital terrestrial signals. The planners take into account a wide range of factors when assessing coverage, these include the use of a highly accurate terrain database to enable them to take account of geographical features (e.g. hills and valleys) which are likely to affect reception. Account is also taken of local features such as trees or large buildings which can also affect reception of the signals to those households affected.
- 4.11 The planners also consider the impact of interference from other transmitters which use the same frequency. These are generally located a considerable distance from the

reception area but occasional atmospheric effects can result in their signals causing higher levels of interference over a larger area than would normally be expected. The period when reception of a service is free of these higher levels of interference is termed the "percentage of time for protection from interference". The UK planners have agreed that this is set at 99 per cent for UK digital planning purposes. The same level is also used for European coordination purposes.

- 4.12 The UKPM is probably the most accurate in current use in Europe. However, it should be noted that the UKPM is a computer model and therefore has limits to its accuracy, especially when being used to resolve highly complex and dynamic modelling issues. Ofcom is of the opinion that the model produces data which is reliable enough for it to help distinguish between the coverage produced for the options discussed below. Ofcom is therefore of the view that the difference in coverage predictions between options is sufficiently accurate to be relied on for the purposes of this consultation.
- 4.13 However, this does not guarantee that the coverage predicted for each option presented in this consultation can be taken as representing actual levels of coverage that will in fact be achieved at switchover. There is always a margin for error in such predictions, which for the UKPM is estimated to be between 0.2 and 0.4 per cent. The degree of accuracy and the working of the UKPM are such that any errors in the prediction are likely to be consistent. In other words they would not affect the relative ranking of the options considered in this consultation. This means that the potential degree of error will be in the same direction i.e. if coverage under Option 1 is 0.2 per cent lower the coverage for Options 2 and 3 (and analogue) under similar circumstances would also be 0.2 per cent lower.
- 4.14 The UKPM uses similar definitions of coverage as those used for the analogue coverage review, namely Core, Served and Marginal Coverage. However, in the current analysis for DTT a further category called Sub-marginal Coverage has been used by Ofcom. This relates to those households who would be exposed to greater periods of interference than would normally be allowed under the standard coverage criteria (see para. 3.4). The definitions for DTT Served and Marginal Coverage require that the reception of the service at households covered is protected against interference from other transmitters using the same frequency for 99 per cent of the time. For Sub-marginal Coverage this requirement is lowered to 95 per cent (the same as is currently used for analogue services). This means that any households affected would experience levels of interference which may cause their television services to be degraded or fail for up to 5 per cent of the time (about 19 days a year).
- 4.15 Ofcom has included an assessment of the number of households that would be included in the category of Sub-marginal Coverage for certain options considered in this consultation. This assessment is included only in those options where the predicted coverage falls short of the current levels served by analogue. Some of the households affected may regard this as inadequate reliability of service and would need to rely on other platforms.

# **Digital Switchover Options**

- 5.1 This section presents five different possible options for extending the public service DTT multiplexes. Each is the outcome of a different mix of planning inputs (power levels, transmission mode and sites) and each achieves a slightly different level, or combination (i.e. Served or Marginal) DTT coverage. Section 6 (Impact Assessment) considers some of the main trade-offs between these options.
- 5.2 Ofcom has prepared a series of planning options based on the work carried out by the SPG and JPP. These are mainly concerned with the power and transmission mode adopted by the three public service multiplexes carrying the BBC and the commercial public service broadcasters (comprising multiplexes 1, 2 and B). It is assumed that these multiplexes will be operating from the 1,154 transmission sites identified in the DRLs and currently used for analogue transmissions for certain options. A limited number of additional sites would be required under some options (2 and 3). The need for these additional sites is discussed more fully below.
- 5.3 It is further assumed that the remaining three commercial multiplexes (comprising Multiplexes A, C and D) will operate at a power of up to –10dB from the principal 200 transmission sites around the UK. The actual choice of sites, power and mode (beyond their continuing operations at the 80 sites currently in use) and therefore their coverage and capacity is a decision that will be taken by them in line with their own commercial interests and is generally not a matter for Ofcom. However, Ofcom has asked that the coverage plan they do adopt does not result in any of their current viewers losing coverage. This effectively means that the minimum core coverage that the three commercial multiplex operators would have to provide is the current 73 per cent of UK households. Ofcom believes that it would be helpful to assess respondents' views of the impact this decision would have on the overall process of switchover.

**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.

- 5.4 The three public service multiplexes are currently operated using mixed modes. The two BBC multiplexes (Multiplex 1 and B) are operated at 16 QAM enabling them to carry between four and six television services per multiplex. Multiplex 2, which is licensed to Digital 3&4 (an ITV/Channel 4 joint venture) is currently operated using 64QAM enabling it carry between six and eight television services.
- 5.5 The three commercial multiplexes are also currently operated using mixed modes. The two Crown Castle multiplexes (Multiplex C & D) are operated at 16 QAM enabling them to carry between four and six television services per multiplex. The SDN multiplex (A) is currently operated using 64QAM new encoding technology used by SDN means that they currently carry nine services.

# Option 1: Public service multiplexes adopt 16QAM at -10db and -7dB (at a limited number of sites<sup>14</sup>)

- 5.6 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 Multiplex 2 (Digital 3&4), this would imply a reduction in the available capacity of the multiplex by up to two television channels (assuming continued use of the current coding equipment and bitrate allocations).
- 5.7 The high levels of incoming interference on the south and east coasts of the UK mean that it would be necessary for a number of the main transmitters in these limited areas (the fourteen listed in the footnote above were used for the purposes of this analysis) to be operated at –7dB (twice the power at other sites).
- 5.8 The planning models available to Ofcom indicate that this option would allow DTT coverage to be at least as good as current analogue coverage levels. In fact, the model predicts that Option 1 (Served and Marginal) coverage would reach 98.7 per cent of households.

#### **Option 2 – Mixed mode at -10dB and -7 dB plus some new transmitter sites**

- 5.9 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. 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 (see Section 7).
- 5.10 It is predicted that the Option 2 coverage would be slightly lower than Option 1. However, the overall level of coverage predicted for this option (Served and Marginal) is still expected to match that of the current analogue services at 98.5 per cent.
- 5.11 In addition to the coverage impact of this option, the adoption of these additional sites would require the public service multiplex operators to incur some additional operating and capital costs. However, this option would allow all three PSB multiplexes to retain their current capacity.

#### Option 3 – 64 QAM at -7 dB plus some new sites

5.12 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). The additional sites proposed in Option 2 (with associated increases in operating and

<sup>14</sup> 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.

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 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.

- 5.13 It is predicted that the Option 3 coverage would be slightly lower than for Options 1 and 2 The coverage predicted for Option 3 is also expected to be lower than that of the current analogue at 98.3 per cent. This represents a reduction compared to current analogue coverage of 0.2 per cent (corresponding to around 50,000 households). These households would only be able to receive a Sub-marginal service (see para. 4.14).
- 5.14 It is possible to reduce the number of homes in the Sub-marginal areas by selectively adopting higher power levels at a number of sites in the south and east of England (similar to those outlined in Option 1). For example if the power at these sites was doubled (to -4dB) it is predicted that the overall coverage of Option 3 would reach 98.5 per cent thereby matching analogue coverage levels. However, it should be noted that operating these sites at higher powers would have to be agreed at the RRC. This option would therefore represent a higher risk for the UK digital switchover plan than Options 1 or 2.

#### Option 4 – Mixed Mode at -10dB and -7dB

- 5.15 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.
- 5.16 This option would allow all three multiplexes to retain their current capacity and it would also avoid the cost of extending the DTT network beyond 1154 sites.
- 5.17 It is predicted that Option 4 coverage would be lower than that of Options 1, 2 and 3 at around 98.1 per cent around 0.4 per cent below current analogue coverage (around 100,000 households). These households would receive a Sub-marginal service (see para. 4.14). A small number of these households may lose access to terrestrial services altogether.

#### **Option 5 – Mixed Mode at -10dB**

- 5.18 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.
- 5.19 This option would allow all three multiplexes to retain their current capacity and would not require any additional sites beyond 1154 to be adopted. However, this option would mean that the coverage of the three public service multiplexes would not match that of the current analogue services.
- 5.20 It is predicted that the Option 5 coverage would be lower than that of Options 1, 2, 3 and 4 at around 97.1 per cent, around 1.4 per cent below current analogue coverage (around 350,000 households). These households would receive a Sub-marginal service (see para. 4.14). A number of these households may lose access to terrestrial services altogether.

### Summary

- 5.21 The table below (Table 2) provides a summary of these five options in terms of the key inputs and the resulting impact both on coverage and also in terms of cost and capacity.
- 5.22 The attention of respondents has already been drawn to the fact that the levels of coverage resulting from the UK Planning Model for the five options above are predictions (see para. 4.9-4.15). The coverage predicted for each of the options above may therefore be smaller or larger than that in fact finally achieved. However, Ofcom believes that the relative coverage of each option and its relative comparison to the current analogue coverage is accurate enough for the purposes of this consultation. Respondents should take this into account when framing their answers to questions asked in this consultation.

#### Table 2: Summary of coverage options

Option	PSB Mode (Mux 1, B and 2)	Transmit power (relative to analogue)	Additional transmitters required?	Predicted Coverage
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
2	16 QAM 16 QAM 64 QAM	-10dB -10dB -7dB	Yes extra transmitters on South Coast	Matches analogue coverage – 98.5 per cent of households
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 households With high power (-4dB) adopted at selective sites, coverage predicted to match analogue 98.5 per cent of households
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 households. Some households may lose terrestrial reception

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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 households. Some households may lose terrestrial reception
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### Impact Assessment

- 6.1 The analysis presented in this section, when read in conjunction with the remainder of this document, represents an Impact Assessment (IA), as defined by section 7 of the Communications Act 2003. Respondents should send any comments on this IA to Ofcom as soon as possible and by no later than the closing date for this consultation. We will consider all comments before deciding whether to implement our proposals.
- 6.2 This IA considers the advantages and disadvantages of Options 1 to 5 as described in the previous section. However, before turning to the advantages and disadvantages of each, it is worth addressing a prior issue.

#### The benefits of clarifying obligations

- 6.3 The first relevant question is whether it is appropriate or necessary for Ofcom to seek to clarify the obligations relating to coverage in the DRLs, in particular by framing the obligations in terms of inputs (mode, power) rather than outputs (coverage). It would be possible in principle to leave the DRLs unamended and simply to retain the duty to adopt the 1,154 sites for DTT transmissions and 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.
- 6.4 The response of some broadcasters to the original DRL consultation was that the coverage obligation included in the DRL should be expressed in terms of input requirements (i.e. number of transmitter sites, power levels and mode) rather than a potentially uncertain measure gauged by both output and input requirements (matching or substantially matching analogue coverage or broadcasting from all current analogue sites). 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.
- 6.5 One further benefit which may accrue from such a change relates to the need for the transmission companies (and their suppliers) for greater certainty about the transmission requirements for switchover. Ofcom has already received comments from the industry that the overall timetable for switchover implementation is very tight. They report that any further delays in agreeing the scale and scope of the switchover plan will create further pressure on the critical path planning for implementation of switchover.
- 6.6 As discussed in the DRL Statement<sup>15</sup> Ofcom is sympathetic to the broadcasters request to define the obligations in terms of inputs as it will create greater certainty for the broadcasters and transmission companies in their planning for switchover and help ensure that decisions relating to the procurement and implementation of the transmission upgrade required for switchover can be made in good time with minimal risk for all parties. Nevertheless, Ofcom would like to hear the views of respondents on this issue and whether, for reasons such as flexibility, it would be preferable to leave the obligations as currently worded.

<sup>&</sup>lt;sup>15</sup> DRL Statement, para 50-51

**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 (ie 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?

### Weighing up options

- 6.7 We now move to the evaluation of options 1 to 5. In considering this issue, Ofcom has taken into account its relevant duties both to consumers and citizens, and to licensees, as well as its underlying responsibility for ensuring the efficient use of spectrum. Of particular importance have been the following factors:
  - The extent to which different TV platforms are affordable for all consumers
  - The extent to which different TV platforms are available to consumers
  - Any implications for the process of implementing switchover, including promoting the early completion of a successful switchover process
  - The availability of a wide range of television services
  - Proportionality in weighing up the advantages and disadvantages for different interested parties
- 6.8 These issues were addressed in detail in the DRL Consultation. As the DRL Statement made clear, Ofcom considered that the interests of citizens and consumers would be best served if all 1154 existing analogue transmitters are converted to DTT such that, as far as possible, DTT is available to a substantially equivalent set of households as currently receive analogue. Ofcom based its conclusions on a number of factors, but the following were particularly significant:
  - TV platforms other than DTT tend 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. DTT receiving equipment is currently at least
    £100 cheaper in terms of consumer costs than the alternatives of cable and
    satellite<sup>16</sup>.
  - Other TV platforms may not be available to consumers without DTT coverage. For example, cable networks currently only pass slightly over 50 per cent of all UK households. Television services over Digital Subscriber Line (DSL) technology remain in their infancy and at present appear unlikely to be available to all UK households in the medium term. Further, Ofcom has estimated<sup>17</sup> that digital satellite services are not in practice available to 4-6 per cent of households. Higher DTT coverage increases the probability that public service channels continue to be available after switchover to all those households who can currently receive them (see Section 3).
  - 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 while a range of services will be available to many households, DTT is an option which is available to all of them.

<sup>16</sup> DRL consultation, para. 138
 <sup>17</sup> ibid, para. 128 -131

- 6.9 Ofcom continues to place considerable emphasis on the benefits of seeking to ensure (as options 1, 2 and, in some circumstances, 3 are predicted to do) that DTT is available post-switchover to a substantially equivalent set of households as currently receive analogue services. Although each of the options presented achieves levels of DTT coverage very close to current analogue availability, the disadvantages of some tens or hundreds of thousands of households not being covered by DTT (or only enjoying a Sub-marginal service) are significant. Such an outcome would complicate the communication and implementation of switchover materially. In particular, for those households where no alternative digital platform is realistically available, the implication would be that some homes would risk losing access to television altogether. Given the sensitivity of digital switchover as a consumer issue, Ofcom regards the potential unreliability in reception of television post-switchover for even a small number of households as a serious matter.
- 6.10 Nevertheless, Ofcom recognises that in increasing DTT coverage levels towards availability that is substantially the same or matches analogue, the costs either in terms of capacity loss or network or equipment costs would increase. Ofcom will consider all relevant and available information on the costs involved for each of the options and one factor in its decision-making will be to determine in each case whether incurring such costs would be appropriate and proportionate.

#### Power levels & transmission mode

- 6.11 As section 5 sets out, there are two main options in terms of transmission mode: 16QAM or 64QAM. The use of the 16QAM transmission mode would result in a lower level of multiplex capacity and therefore in the number of TV, radio and interactive services available to viewers. The use of 64QAM allows the DTT multiplex to have higher capacity and carry more channels. It would, however, provide more limited geographic coverage than under 16QAM. The loss of capacity between the 64QAM and 16QAM modes is estimated at two or three channels per multiplex<sup>18</sup>. Fundamentally, the choice between 16QAM and 64QAM therefore involves a choice between loss of capacity (and services) for all consumers versus the potential loss of coverage for some consumers.
- 6.12 If a decision is taken to adopt the 16QAM mode those operators who are currently broadcasting using 64QAM (in practice, this mode change would only affect Digital 3&4) would in principle no longer have the capacity to carry all of the six standard television channels (plus Teletext) currently on Multiplex 2. Either some of these channels would need to be taken off-air or the channel owners would have to seek the carriage of these services on alternative multiplexes. It is expected that this would be one of the three commercial multiplexes which, because of the constraints of the overall switchover plan set out in section 4, are expected to operate at lower coverage levels than the PSBs. The channel operator would presumably have to pay the appropriate market rate for such carriage which may be higher than the cost of broadcasting the service on multiplex 2 today and will most likely result in reduced coverage for these channels.
- 6.13 There are two main options in terms of transmission power: -10dB (representing one tenth of the current analogue power levels) or -7dB (representing one fifth of the current analogue power levels). In general the higher power option (-7dB) will result in higher levels of coverage. However, this will also require the broadcasters to incur

<sup>18</sup> Whereas use of the 64QAM mode allows 6-8 channels to be transmitted per multiplex (depending on the amount of picture compression employed), using the 16QAM mode only allows 4-6 channels to be transmitted.

higher capital (the extra expense involved in procuring the higher specification equipment required) and operating costs (relating to cost of energy) which have to balanced against the overall benefit (in coverage or service reliability) that the higher power would yield. It is assumed that these increased costs would be accompanied by some compensating revenue benefits to commercial broadcasters from increased viewing in the additional households brought within DTT coverage. It should be noted that the overall power levels proposed for DTT transmissions post switchover are well below the levels currently used for the equivalent analogue services and therefore represent a reduction in the energy requirements for the transmission of television services.

- 6.14 The key question to be considered in this IA therefore is which option is most likely to enable Ofcom best to fulfil its various duties and objectives regarding DSO in the light of all the relevant circumstances and in particular the various advantages and disadvantages related to each option. The options described in Section 5 (DSO Options) above outlined how an input based approach could be implemented. The analysis below considers the different advantages and disadvantages of each option against the statutory requirement to achieve at least substantially the same coverage as analogue, the need to ensure that the obligations imposed on Licensees are reasonable.
- 6.15 In considering options that substantially achieve the same coverage as analogue, or ones that arguably may do so, and reaching a decision, Ofcom proposes to take account of all relevant facts and circumstances, including:
  - First, whether adoption of an option will involve some additional costs to DTT broadcasters or others either in the form of increased implementation or operating costs. Ofcom is seeking information regarding these from respondents.
  - Second, some options will result either in a loss or gain of capacity. For example, the loss of net capacity under Option 1 might raise additional relevant public policy considerations if it reduced the range of public services currently carried on the public service multiplexes. The increase in capacity under Option 3 would also have an impact on other multiplex operators and content providers.
  - Third, insofar as some options involve increased risks of delaying digital switchover the government CBA could be useful to assess these risks as it shows that delays will significantly reduce the benefit from switchover.
  - Fourth, any effects which could distort competition or compromise Ofcom's commitment to due technological neutrality in the process of switchover

#### **Consideration of options**

- 6.16 **Option 1** would require the three public service multiplex operators to adopt the 16QAM mode for their multiplexes at one tenth of the analogue service power level (-10dB). They would also adopt higher powers at a small number of those sites. This is predicted to result in the level of DTT PSB core coverage slightly exceeding that currently achieved by the analogue PSB services. Consequently, the option has considerable attraction from the perspective of coverage. The option is also attractive in that it would not require the adoption of any additional sites beyond 1154, and the overwhelming majority of sites would run at the lower power levels.
- 6.17 As outlined above, the adoption of Option 1 would result in the loss of capacity on the D3&4 multiplex (which currently operates using 64QAM), meaning that some of the services currently carried on this multiplex may lose carriage (unless technical enhancements to the multiplex capacity are made, for example through new coding

equipment) and would need to make alternative arrangements if they were to continue to be broadcast.

6.18 Ofcom acknowledges that this option would have significant disadvantages for the shareholders of Digital 3&4, and also for Teletext Limited. It is certain that Option 1 would result in a overall reduction in the capacity currently available on the three public service multiplexes. This might result in a loss of channel choice for consumers. Ofcom considers that in assessing the loss for consumers it should take due account of the fact that the value that consumers put on additional channels may decline as viewers already have a large number of channels to choose from. The key issue with respect to this option seems how to assess its advantages in terms of coverage, power and site adoption against the loss in capacity on multiplex 2.

**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 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.

- 6.19 **Option 2** has the benefit of allowing the three public service multiplex operators to retain their current transmission mode, thereby ensuring that their overall capacity remains the same as is currently used. However, in order to achieve coverage levels which continue to match current analogue levels, this option would require the use of higher power levels (-7dB) for the 64QAM multiplex (multiplex 2). The other two multiplexes could operate at -10dB and would not need to adopt the selective power increases proposed in Option 1.
- 6.20 Importantly, though this option would require extending the DTT network beyond 1154 sites through the adoption of a small number of additional transmitter sites<sup>19</sup> for the broadcasting of all three multiplexes. Ofcom does not have accurate figures regarding the likely cost of adopting this option but it estimates that the capital costs for these stations should not exceed £5m.
- 6.21 Overall, this option would lead to the broadcasters incurring extra costs to pay for the commissioning of the additional sites and the higher power rating used for the Digital 3&4 multiplex. From the broadcasters' viewpoint this would only be a net cost if the additional revenues are unlikely to cover such additional costs. As a result of adopting the additional transmission sites, the BBC would incur some additional costs but these may be balanced against the lower power requirements at the sites on the south and east coast compared to Option 1.
- 6.22 This option offers similar coverage benefits as outlined for Option 1 above in that its coverage is predicted to match that of analogue. The additional infrastructure and energy costs are expected to be substantial but there would also be some benefit for viewers and broadcasters from the additional capacity made available arising from the continued use of 64QAM for one multiplex. The main issue for Option 2 therefore is how much the higher power for multiplex 2 and the additional sites beyond 1154 sites

<sup>&</sup>lt;sup>19</sup> It is expected that up to ten additional low to medium power sites would be required

would cost and whether their adoption would raise the risk that switchover could not be completed by 2012.

**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.

- 6.23 **Option 3** goes further than option 2 by enabling all the public service multiplex operators to operate using the maximum capacity available whilst minimising any coverage reductions (compared to analogue) by adopting the new sites outlined in Option 2 and operating all sites at higher powers. This would correspond to a net increase in the capacity of multiplexes 1 and B of around 12 Mbit/sec over their current operating mode whilst multiplex 2 would retain its current capacity of 24 Mbit/sec.
- 6.24 Overall the additional capacity made available in this option is substantial (especially when compared to the lower capacity Option 1) and could be equivalent to an additional public service multiplex operating at the 16QAM mode. This would ensure that the public service broadcasters have some additional capacity at switchover thus enabling them to increase the number of services carried on their multiplexes or to consider operating some services at the higher bit rates required for High Definition Television. This in turn would give an advantage to the DTT platform as a whole.
- 6.25 All three public service multiplex operators would face increased costs compared with Option 1 due to the proposed adoption of new sites and higher powers. This option is predicted to result in a relatively small number (around 50,000) of analogue households being in Sub-marginal coverage areas.
- 6.26 Ofcom further considers that a further increase in power in a small number of sites (similar to those proposed in Option 1) would reduce the number of households adversely affected by this option, resulting in the overall level of coverage matching the current analogue level.
- 6.27 It is important to note that this option poses the most serious risk to fulfilling the overall switchover timetable since it involves the greatest construction of new infrastructure. This may include not just new sites but also substantial upgrades to some of the existing 1154 sites. Consequently, while it maximises capacity while also achieving Ofcom's coverage objective, the cost and complexity of this option may weigh against it. Ofcom is not fully informed about the detailed infrastructure implications of this option and would appreciate further detail about these important considerations.

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

**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 and (b) the potential risk to achieving DSO by 31 December 2012 that may be associated with the adoption of Option 3.

- 6.28 Option 4 would allow the three public service multiplex operators to retain their current transmission mode thereby ensuring that their overall capacity remains the same as at present. This option does require that higher power levels (-7dB) are used for the 64QAM multiplex (although the other two multiplexes would only have to operate at 10dB and not adopt the selective power increases proposed in Option 1). It does not require that any additional sites are adopted (see Option 2).
- 6.29 The overall capacity available is similar to that of Option 2 and therefore this option would represent the same benefit to broadcasters and viewers arising from the greater range of services available when compared to Option 1. The cost to all three public service multiplex operators is expected to be lower than Option 2.
- 6.30 The main disadvantage of this option is that it yields a lower level of coverage of the services in the south and east coast areas discussed in Option 2. It is predicted that around 100,000 households would either receive a Sub-marginal service or lose terrestrial services altogether.

**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.

- 6.31 **Option 5** would allow the three public service multiplex operators to retain their current transmission mode thereby ensuring that their overall capacity remains the same as is currently used. It does not require the adoption of either the higher power for the 64QAM multiplex or the additional sites serving predicted deficiencies on the south and east coasts. This option is predicted to result in the lowest level of DTT coverage of the options considered above, and is likely to lead to around 375,000 households (representing 1.5 per cent of UK households) receiving a Sub-marginal service or losing terrestrial coverage altogether.
- 6.32 Ofcom expects these households would be located both in the south and east of the UK (similar to Option 4) and otherwise generally scattered around the UK in areas currently in marginal analogue coverage areas.
- 6.33 Some of these households will have other digital TV platforms (at least on their primary TV set) but many will not. The large number of households who would be deprived of terrestrial coverage means that this option would risk compromising Ofcom's objectives in terms of service availability, affordability and information provision discussed earlier in this document and in the DRL Consultation and subsequent DRL Statement. The reduced energy costs are likely to be marginal when compared to the significant loss of coverage.

**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 Option 2, 3 and 4).

### Conclusions

- 6.34 Weighing up the relative costs and benefits of the options is necessarily complicated by the need to evaluate both economic and broader policy considerations. The process is made more difficult by the relative lack of data available.
- 6.35 When making its decision Ofcom will take into account the full range of relevant factors discussed in this consultation and all others brought to its attention as a result of this consultation. Two factors which Ofcom is especially concerned about are:
  - Whether the outcome ensures that all terrestrial analogue viewers have equal access to affordable digital television services at switchover. If there were a coverage shortfall, as a result of a particular option being adopted, it is likely that the viewers affected would be exposed to higher costs. The communication of switchover will also be made much more complex as different messages will be required to address the different categories of household. There would also be a likelihood that some viewers may lose access to television services entirely (if alternative platforms are not able to fill in all the gaps in coverage).
  - The increase in risk that switchover will not be completed by 2012. The implementation of switchover is expected to be a very complex infrastructure project. Ofcom is aware that such projects carry with them a degree of risk and one of the challenges that will face the transmission companies and broadcasters will be to manage this risk. An important consequence of adopting some of the options discussed above is to add to the project's risk profile and therefore make the challenge of meeting of the 2012 deadline harder. Ofcom believes that it is important to meet this deadline as the Government's own cost-benefit analysis of digital switchover has shown that the overall benefits to the UK of switchover diminish with every year the completion is delayed. Ofcom is therefore seeking reassurance from the broadcasters and transmission companies that any option they put forward understands the risks and quantifies how these will be managed.
- 6.36 On the basis of the information presently available Option 1 appears to offer a coverage level which exceeds current analogue availability. Whilst there are important capacity considerations to be taken into account it has relatively few other disadvantages in terms of power levels, infrastructure cost and timing concerns. However, it is also apparent that the potential benefits to consumers which may arise from the higher capacity options may be material, and that Option 3 in particular offers the broadcasters the means substantially to increase their capacity to a level corresponding in broad terms to the adoption of a further multiplex. One of the primary aims of this consultation is to gather further representations, arguments and, where possible, specific data to enable a final view to be reached. In particular, Options 2 and 3 both display some advantages and may merit adoption if the additional costs and implementation risk and other possible disadvantages associated with them can be shown to be reasonable and proportionate. At present, Options 4 and 5 do not appear particularly compelling, in large part because the predicted loss of coverage does not seem to be outweighed by other benefits. However, further evaluation of all the options will be required once this consultation is closed.
- 6.37 Ofcom would also welcome alternative proposals and options, provided they are practical, properly costed and take due account of the interests of consumers, Ofcom's duties and the obligations set out in the DRLs. Interested parties may submit these views in response to the final question below.

**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?

# **Other Matters**

#### Adoption of 8k format

- 7.1 Of the 1.5 per cent of UK households not currently covered by analogue for BBC1, BBC2. ITV1, and Channel 4 (see Section 3), approximately two thirds are clustered in areas of poor reception, mainly on the south and east coasts of England. With digital switchover it is possible to make use of single frequency network (SFN), where additional fill-in transmitters could use the same frequencies as the main transmitter, to improve coverage in these areas where alternative frequencies are not available. A fillin transmitter could serve up to an additional 25,000 homes. For this to be possible a change would be needed to the transmission characteristics of the main transmitters from the current 2k carriers to 8k carriers<sup>20</sup>.
- 7.2 The adoption of the 8k format is also expected to improve the reliability of set top reception as the 8k format is more robust against impulse interference (e.g. from washing machines and central heating controllers) which typically limit the use of set top aerials for DTT reception. However, it is known that some early types of DTT receiver, mainly those supplied by ITV Digital in the period up to May 2002 and also some early IDTV models, are not able to operate using the 8k format. A proportion of these receivers are still in use but it is expected that the number of these legacy receivers will fall over the next few years as they are replaced by newer 8k compatible receivers. It should also be noted that it is unlikely that any of these legacy products would be in use in areas newly converted to DTT such as for new relays or extension to the coverage areas of the current main stations.
- 7.3 A decision on whether to introduce 8k carriers for transmitters in the areas affected, or nationally, does need to be taken during 2005 to give viewers using these boxes sufficient time to make alternative arrangements.

**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?

#### **Current coverage deficiencies**

- 7.4 Of com<sup>21</sup> currently licenses a number of local communities to operate small scale terrestrial transmission sites to extend the coverage of the main analogue terrestrial services into small communities not served by the main broadcast network. In addition Ofcom offers similar licences to commercial organisations to enable them to replace coverage of the main analogue services which is lost through building work on new structures such as stadiums or large warehouses.
- 7.5 In addition to these small scale deficiencies a small number of larger communities have relied upon locally provided cable systems of very limited capacity and are not able to receive the terrestrial services. Communities living in Skelmersdale &

<sup>20</sup> 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).

This role was previously carried out by the Department for Culture Media

<sup>21</sup> This role was previously carried out by the Department for Culture Media and Sport (DCMS)

Broadstairs are currently affected by this issue. Ofcom is interested to hear from respondents about whether the local community licensing scheme should be extended to include DTT and whether the larger deficiency areas should be brought within this scheme, or whether these communities should be encouraged to use alternative means of receiving digital television services.

**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.

# **Responding to this Consultation**

#### How to respond

Ofcom invites written views and comments on the issues raised in this document, to be made by **5pm on Thursday 21 March 2005**. In view of the need to resolve the issues dealt with in this consultation quickly, respondents are asked to submit their comments as soon as possible, and certainly by no later than this deadline.

Ofcom strongly prefers to receive responses as e-mail attachments, in Microsoft Word format, 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 2), among other things to indicate whether or not there are confidentiality issues. The cover sheet can be downloaded from the 'Consultations' section of our website.

Please send your response by email to gregory.bensberg@ofcom.org.uk.

Responses may alternatively be posted or faxed to the address below, marked with the title of the consultation.

Gregory Bensberg Technology Group 6th Floor Ofcom Riverside House 2A Southwark Bridge Road London SE1 9HA

Fax: 020 7981 3406

Note that we do not need a hard copy in addition to an electronic version. Also note that Ofcom will not routinely acknowledge receipt of responses.

It would be helpful if your response could include direct answers to the questions asked in this document, which are listed together at Annex 3. It would also help if you can explain why you hold your views, and how Ofcom's proposals would impact on you.

#### **Further information**

If you want to discuss the issues and questions raised in this consultation, or need advice on the appropriate form of response, please contact Greg Bensberg on 020 7981 3734 or Trevor Barnes on 020 7783 4675.

#### Confidentiality

Ofcom thinks 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, <u>www.ofcom.org.uk</u> (when respondents confirm on their response cover sheet that this is acceptable).

All comments will be treated as non-confidential unless respondents specify that part or all of the response is confidential and should not be disclosed. Please place any confidential parts of a response in a separate annex, so that non-confidential parts may be published along with the respondent's identity.

Ofcom reserves its power to disclose certain confidential information where this is necessary to fulfil its functions, although in practice it would do so only in limited circumstances. Ofcom is also subject to duties to disclose certain information under the Freedom of Information Act.

Please also note that copyright and all other intellectual property in responses will be assumed to be assigned to Ofcom unless specifically retained.

#### **Next steps**

Following the end of the consultation period, Ofcom intends to publish a statement outlining its conclusions and then take any appropriate action to amend the DRLs by the end of May 2005 to clarify the digital coverage obligations.

Please note that you can register to get automatic notifications of when Ofcom documents are published, at <u>http://www.ofcom.org.uk/static/subscribe/select\_list.htm</u>.

#### **Ofcom's consultation processes**

Ofcom is keen to make responding to consultations easy, and has published some consultation principles (see Annex 1) which it seeks to follow, including on the length of consultations.

This consultation is shorter than Ofcom's standard 10 week period because Ofcom did not have the necessary information or resources to commence the consultation before the end of January 2005 at the earliest, but the requirements of the switchover timetable and of the reviews of financial terms mean that any clarificatory amendments to the DRLs need to be in place by the late spring of 2005.

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 <u>consult@ofcom.org.uk</u>. 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, whose views are less likely to be obtained in a formal consultation.

If you would like to discuss these issues, or Ofcom's consultation processes more generally, you can alternatively contact Philip Rutnam, Partner, Competition and Strategic Resources, who is Ofcom's consultation champion:

Philip Rutnam Ofcom Riverside House 2A Southwark Bridge Road London SE1 9HA Tel: 020 7981 3585 Fax: 020 7981 3333 E-mail: philip.rutnam@ofcom.org.uk

### Annex 1

# Ofcom's consultation principles

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

#### **Before the consultation**

A1.2 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**

- A1.3 We will be clear about who we are consulting, why, on what questions and for how long.
- A1.4 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.
- A1.5 We will normally allow ten weeks for responses to consultations on issues of general interest.
- A1.6 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 organisations 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.
- A1.7 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

A1.8 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 2

# Consultation response cover sheet

- A2.1 In the interests of transparency, we will publish all consultation responses in full on our website, <u>www.ofcom.org.uk</u>, unless a respondent specifies that all or part of their response is confidential. We will also refer to the contents of a response when explaining our decision, without disclosing the specific information that you wish to remain confidential.
- A2.2 We have produced a cover sheet for responses (see below) and would be very grateful if you could send one with your response. This will speed up our processing of responses, and help to maintain confidentiality by allowing you to state very clearly what you don't want to be published. We will keep your completed cover sheets confidential.
- A2.3 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 cover sheet in a way that allows Ofcom to publish their responses upon receipt, rather than waiting until the consultation period has ended.
- A2.4 We strongly prefer to receive responses in the form of a Microsoft Word attachment to an email. Our website therefore includes an electronic copy of this cover sheet, which you can download from the 'Consultations' section of our website.
- A2.5 Please put any confidential parts of your response in a separate annex to your response, so that they are clearly identified. 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: Planning Options for Digital Switchover			
To (Ofcom contact):			
Name of respondent:			
Representing (self or organisation/s):			
Address (if not received by email):			
CONFIDENTIALITY			
What do you want Ofcom to keep confidential?			
Nothing Name/contact details/job title			
Whole response Organisation			
Part of the response If there is no separate annex, which parts?			
If you want part of your response, your name or your organisation to be confidential, 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. It can be published in full on Ofcom's website, unless otherwise specified on this cover sheet, and I authorise Ofcom to make use of the information in this response to meet its legal requirements. 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:** 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?

**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.

**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 (ie 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?

**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.

**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 Option 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?

**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?

**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.

### Annex 5

# Glossary

DRL	Digital Replacement Licence – The new licences issued under the Communications Act 2003 by Ofcom to the commercial terrestrial television licences in 2004
DSO	Digital Switchover
DTT	Digital Terrestrial Television
IDTV	Integrated Digital Television – A television with a built in digital tuner.
JPP	Joint Planning Project – The group established to prepare detailed planning proposals for the UK use of the UHF band.
PSB	Public Service Broadcasting
QAM	Quadrature Amplitude Modulation – A method of carrying data on a transmitted frequency
RIA	Regulatory Impact Assessment
SFN	Single Frequency Network – A network of digital terrestrial transmitters all using the same frequency.
SPG	Spectrum Planning Group – A group established by the Digital Television Action Plan to advise on spectrum planning options for digital switchover.
UKPM	United Kingdom Planning Model - The computer model used for planning digital terrestrial frequency assignments, also used to make predictions about coverage.