CONSULTATION ON SPECTRUM PLANNING

Executive summary

- Whatever the current problems of ITV Digital, it is essential that DTT not only survives, but *thrives*, because:
  - without DTT, there will be no universal coverage of DTV;
  - there remain millions of consumers who are not attracted by pay-TV services and who cannot, or will not, adopt satellite or cable; and
  - DTT is the most "plug and play" platform – and the simplest means of delivering DTV to second and third sets.

- Unless it thrives, DTT will be unable to play the essential role necessary to drive switchover and switchover will be extremely unlikely within any timescale the Government's could plan for now. The UK would then be left with both analogue TV and DTT for the foreseeable future, with the result that:
  - broadcasters would be left with the expense of simulcasting;
  - DTT would continue to be inefficiently broadcast;
  - no spectrum would be released for re-use; and
  - we would fail to tackle the existing considerable social inequalities (the "digital divide"), as effectively as we could.

- But the BBC is convinced that switchover is achievable, and the process could still be achieved within the Government's current 2006-2010 window. For this, DTT needs:
  - a strong range of free-to-view linear and interactive services; and
  - improved coverage and robustness of reception.

- There is already a strong range of free-to-view linear services available on DTT. And this will be even stronger if BBC THREE is approved and if additional bandwidth for interactive services on DTT could be found.

- But broadcasters cannot invest to achieve the much-needed improvements to DTT coverage and robustness of reception without greater certainty from Government over its intentions on spectrum allocation and re-use. To invest without this certainty is to risk building in network inefficiencies requiring infrastructure to be thrown away later – well before the need of its life.

- To avoid this, greater certainty is needed from the Government in respect of:
  - a commitment to implementing "analogue conversions" for all three public service multiplexes; and
  - how much spectrum should the broadcasters plan to release and where?

- Implementing analogue conversions enables DTT, at switchover, to re-use the released analogue frequencies for digital transmission and to significantly increase the transmission power. This would:
  - greatly increase coverage and robustness of reception - analogue conversions are the only practical way of achieving universal coverage by DTT;
  - make portable DTT reception far more likely;
  - minimise consumer investment in new aerials; and
  - bring forward switchover, especially if combined with a Government commitment to a "rolling" (i.e. region-by-region) switchover programme.

- Committing to analogue conversions for all three public service multiplexes would increase the availability of the free-to-air services which would drive switchover and release 12 channels for re-use, including channels adjacent to the existing GSM band.

- The current uncertainty about the future of DTT makes it more essential, not less, that the Government makes these spectrum decisions soon.

- With this certainty, there are some "quick wins" in DTT coverage improvements which broadcasters can invest now to achieve. And the spectrum planning for the next tranche of transmitters is currently being undertaken as part of the Digital Action Plan.

- But If the Government delays:
  - consumer confidence in DTT will ebb, just as affordable receivers reach the market in volume for the first time;
  - switchover and spectrum release will be delayed into the long-term; and
  - the digital divide will continue to increase.

- This need not happen. We have a window of opportunity in which the Government, regulators and market players can work together to secure the digital future for the UK.

Introduction

1. The BBC welcomes the consultation for its recognition that the UK stands at a crossroads in its adoption of digital TV and that a strategy which has the backing of the market needs to be implemented soon to push forward towards digital switchover.

2. Thanks to a combination of far-sightedness on the part of governments and regulators, and risk-taking investment by market players, the UK is the World leader in digital TV. Yet, despite the rapid adoption of digital TV so far, digital switchover in the short- to medium-term cannot be taken for granted.

3. If we fail to achieve this, we will be left with a worst-case outcome where digital TV penetration stalls far below any level at which switching off analogue could be seriously contemplated by Ministers, with the result that:
    - broadcasters would be left with the expense of simulcasting analogue TV and Digital Terrestrial Television (DTT) for the foreseeable future;
    - DTT continued to be inefficiently broadcast because of an ongoing requirement to protect reception of analogue TV, both here and abroad;
    - no spectrum was released for re-use because all 44 channels continued to be utilised by television broadcasts interspersed with use for radio-mikes, sound links, wireless electronic news gathering etc using locally spare frequencies; and
    - the existing considerable social inequalities, where the UK is divided into digital haves and have-nots, would continue.

4. The BBC believes this can be avoided. Switchover is achievable, and the process could still be achieved within the Government's current 2006-2010 window. But there is no panacea. Hard decisions will have to be taken. If the right decisions are taken now by the Government, regulators and market players collaboratively, then we can implement a strategy which:
    - offers more than just more linear TV to consumers;
    - convinces consumers that switchover will happen;
    - delivers switchover in a manner which minimises cost to consumers and existing users of the spectrum; and
    - increases the efficiency with which the spectrum is used.

5. We are coming to the end of the first stage of digital TV adoption, where penetration has been driven by the pay-TV offerings and their associated marketing and receiver subsidies. We are now entering the second stage, where increasing digital TV penetration must be driven by consumers who have hitherto rejected pay-TV.

6. Such consumers are likely to prefer to own their receivers and be attracted principally to DTT as their platform of choice (the price differential between DTT and satellite receivers/installation for those not wishing to pay a subscription will also help steer such consumers towards DTT).

7. If this second stage is to maintain the momentum of digital TV adoption we will need:
    1) a wide and diverse range of free-to-view services, particularly on DTT, to attract these consumers to digital TV;
    2) a range of affordable receivers with different specifications to be available to purchase from most consumer electronics retailers;
    3) clearer, objective consumer information on adopting digital TV to be widely available; and
    4) greater coverage and robustness of reception for DTT.

8. The first of these is coming into place, with the launch of some of the planned new services from the BBC (although still, as yet, with BBC THREE incomplete), a greater commitment to ITV2 and the launch of the ITN News Channel; although the lack of available bandwidth on DTT currently constrains the interactive offering in comparison to that available on satellite and, increasingly, on cable.

9. The second goal should be achieved later this year as a wide range of affordable receivers, developed with the retail market rather than pay-TV operators' specifications in mind, becomes available. This has already begun with the recent launch of the Pace digital TV adapter priced at £99, and there is a host of other companies intending to launch competing products soon.

10. The third goal, the availability of better consumer information, is already being addressed by co-operation, led by the BBC, between broadcasters, consumer electronics retailers and aerial installers.

11. However, the fourth goal will be harder to achieve. The open nature of the DTT platform, and the resulting necessity to reach agreements on planning and cost-sharing before there can be improvements to coverage and robustness of reception which are worth having, builds in delays. The horizontal nature of the DTT receiver market (where there is no single market player dictating receiver specifications), which is another strength of the platform, spreads responsibility for improving receiver performance (and hence robustness of reception, which could be increased at little additional cost per receiver) widely.

12. Yet improvements to DTT's coverage and robustness of reception will be essential if switchover is to be achievable, not just because of DTT's attraction to free-to-view households, and because of DTT's inherent ability to deliver digital TV to second and third TV sets far more easily than satellite or cable (although this is not intended to downplay the difficulty of ensuring satisfactory reception on portable TV sets) but, crucially, because no single digital platform, not even satellite, can ensure universal coverage - DTT will be needed to fill the gaps.

13. For all of these reasons, and to maximise consumer choice and the benefits of competition, **it is essential that DTT not only survives, whatever its future as a pay-TV platform, but thrives with improved coverage and robustness of reception and sufficient spectrum allocated to it to ensure that Ministers will be able to depend upon DTT to play the essential rôle within the UK's digital switchover strategy of achieving universality**.

14. As affordable DTT receivers reach the market in volume for the first time, Government, regulators and market players must work together to ensure that consumer confidence in DTT is not undermined.

15. When DTT was launched in 1998 from 80 transmitters, only 77 per cent of households could receive the three multiplexes carrying the public services, while only 56 per cent of households could receive all six multiplexes (often referred to as "core coverage")[1]. The wide differences in coverage between the different multiplexes created consumer confusion. And, because spare frequencies for DTT multiplexes could not always be found "in group"[2], over one fifth of those households require a wideband aerial to obtain satisfactory reception of all 6 multiplexes (in some cases, a wideband aerial is necessary just to receive the 3 multiplexes carrying the public services).

16. Broadcasters have since considerably improved this situation as a result of:
    - undertaking research to improve DTT coverage maps, so consumers can invest in digital TV with increasing confidence;
    - the equalisation programme[3], where transmitters are modified to equalise the coverage between the multiplexes; and
    - power increase trials, which are principally about increasing robustness of reception.

17. Now 80[4] per cent of households can receive the three multiplexes carrying the public services, while 68 per cent of households can receive all six multiplexes.

18. There is still more which can be done to improve coverage and robustness of reception from the current transmitters. Completing the equalisation programme[5] would increase coverage of the three multiplexes carrying the public services to 82 per cent with core coverage of 73 per cent of households. The power increases could be implemented network-wide (although this may not be cost-effective), bringing perhaps a further 1 per cent of households into coverage, although replacing the necessary

[1] These coverage figures do not take account of the specifications or quality of households' aerials.
[2] Analogue TV channels were planned in groups of 4 channels using frequencies reasonably close to each other. To save costs, many consumers' TV aerials are not "wideband", but are only suitable for receiving the local group of channels. DTT multiplexes have often had to be placed "out of group" such that many consumers would have to replace their aerial to have satisfactory reception of them.
[3] Full equalisation is not possible because this could result in up to 5 per cent of households losing their analogue TV reception.
[4] DTT coverage forecasts are subject to revision by the Digital Action Plan Spectrum Planning Group.
[5] The South East, North and Midlands packages.

equipment would be expensive and it would not be an efficient use of resources for broadcasters to commit to such investment until the maximum power from each transmitter has been established.

19 But to extend coverage beyond this while analogue TV is still being broadcast (and protected to the current extent) will require the building of more transmitters. The BBC believes that building a further 10-20 transmitters in the short-term would bring worthwhile and cost-effective improvements, taking coverage for the three multiplexes carrying the public services to about 84 per cent of households.

20. However, again, it would not be an efficient use of resources if the multiplex operators undertook the spectrum planning for, and committed to build, additional transmitters if the resulting DTT frequencies or power allocations were to be changed later by the Government. Any change in frequencies and power allocations would result in some of the investment made in the DTT networks prior to switchover having to be written off as redundant equipment (which may otherwise have many years' operational life in it) would be thrown away[6].

21. We recognise that, at switchover, to make the most efficient use of spectrum and other resources and to reduce consumer investment, a process of "analogue conversion"[7] needs to be implemented and that this in itself will result in a degree of wasted investment. But the gains from implementing analogue conversions would be considerable. Increasing DTT coverage to anything like universality is only achievable if we have analogue conversions. If we could plan for them now, we could minimise any resulting wasted investment.

22. To achieve this, it is essential that a sufficient degree of certainty be provided in respect of:
    - a commitment to implementing analogue conversions, and ideally which multiplexes should benefit from this; and
    - how much spectrum should the broadcasters plan to release and where?

23. Certainty about both of these is within the gift of the Government. **The longer the current uncertainty is allowed to last, the longer the current "planning blight" will continue and the further away switchover, and the resulting benefits to UK plc, becomes**. The current recession in television advertising rates hardly encourages the commercial broadcasters to back such "speculative" investment either.

24. The BBC would urge the Government to determine its position on these matters as soon as possible after the responses to this consultation and the Review of Radio Spectrum Management have been submitted and studied.

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[6] There is likely to be minimal scope for re-using this equipment elsewhere within the DTT networks.

[7] When analogue signals are switched off, released frequencies could then be utilised for carrying DTT instead. These DTT broadcasts then inherit the international power assignments from the former analogue signals and so can increase the power of their transmissions considerably, greatly increasing coverage and robustness of reception. In addition, those DTT broadcasts are now "in group" for local aerials.

Only when this has been achieved will it be at all relevant to consider developing and implementing the most appropriate ”route map” to achieving switchover, or what uses released spectrum could be put to and how much revenue its auction might achieve. Indeed, the success of the entire Digital Action Plan hinges upon this.

25. While the BBC recognises that such decisions relating to the future use of television broadcast spectrum should not be taken lightly, we do not believe that they would be too “heroic” in the short-term either.

26. Mass availability of satisfactory DTT reception is a precursor of digital switchover. The only way to achieve this without building in inefficiencies is to implement analogue conversions.

27. Although implementing analogue conversions will have implications for spectrum release (i.e. for the maximum amount of spectrum released and which channels), this does not argue against an early commitment to such conversions. **Without analogue conversions, there will be no switchover anytime soon, and no spectrum would be released for re-use within any timeframe which could be realistically planned for today**.

28. Once it is accepted that analogue conversions must be implemented, they must be implemented in such a manner that they have the desired effect of encouraging digital take-up. For this, consumers’ access to satisfactory DTT reception must be of a wide and diverse enough range of compelling content, including non-linear services, available free-to-view, to make investing in digital receivers sufficiently attractive to them.

29. Maximising spectrum release must therefore not drive the decision on implementing analogue conversions. The Government needs to find a balance between, on the one hand, ensuring that it does not place obstacles in the path of achieving the necessary consumer access to free-to-view services and, on the other, anticipating spectrum release.

30. Currently the public services are carried on three multiplexes - those of the BBC, Digital 3&4 and SDN – with the latter two multiplexes currently also offering some pay-TV services. Unless consumers benefited from satisfactory reception of all three multiplexes, even £99 receivers may prove unattractive for many.

31. At the very least, the BBC and Digital 3&4 multiplexes must benefit from conversions. But there is a strong argument for also committing to converting the SDN multiplex. In Wales, SDN carries S4C and S4C-2 (and S4C has also expressed a desire to launch a Welsh youth channel when it has the resources) and in Scotland it carries the Gaelic programming of Tele-G. The Government’s public policy objectives alone would argue for the conversion of this multiplex at switchover in those two nations. But SDN also carries Channel 5 UK-wide which, to the many households which cannot receive it in analogue, is a major attraction of digital TV.

32. As the capacity on multiplexes 1 and 2 is already substantially used to carry the linear public services, converting the SDN multiplex as well would increase broadcasters' flexibility to offer DTT viewers more of the enhanced TV and interactive services which broadcasters can provide more easily on satellite. Digital TV is about more than just access to more linear services. As viewers become more familiar with these services, they come to value their availability. Unless the Government commits to converting three multiplexes, there is a strong likelihood that many DTT viewers would not have access to the non-linear services, while those who adopted an alternative platform would.

33. Maximising the availability of these services on DTT by converting three multiplexes therefore will increase the attraction to consumers of affordable receivers, drive digital take-up, bring forward switchover and spread the social benefits of access to the full range of what digital TV can offer more widely.

34. The Government could commit to allowing analogue conversions for the BBC and Digital 3&4 multiplexes and 14 channels could be released with UK-wide availability for re-use. A commitment to implementing analogue conversions for all three multiplexes carrying public services would still release 12 channels UK-wide, the reduction occurring in release of channels in Band IV with relatively low economic value.

35. This reduction of two channels released would have limited financial impact. Analysis of the potential alternative uses of released spectrum clearly indicates that only an auction for 3G wireless use of released spectrum would be likely to produce a Net Present Value (NPV) for that spectrum greater than the costs of clearing a contiguous block of spectrum (3G could not use interleaved spectrum).

36. Yet television is specifically optimised to utilise Bands IV and V (the spectrum utilised for TV), while cellular telephony is not. Consideration of the possible utilisation of any of this spectrum by 3G indicates that only the top of Band V, which is contiguous with existing 2G (GSM) usage, would be likely to be valued highly by 3G operators. And this assumes that the necessary international agreement for non-broadcasting use of this spectrum could be obtained.

37. Unless a radical re-plan were adopted, which would maximise the consumer costs of migrating analogue-only households at switchover and also introduce new aerial costs for consumers who had already adopted DTT, it would not be practical for all of the released spectrum to be located in a contiguous block at the top of Band V. Whether two or three analogue conversions were pursued, the potential reduction in the number of channels released would be of much lower-value channels in Band IV, rather than of high-value channels likely to prove attractive to 3G operators (and this only after the immediately-available 2.6GHz band had been considered).

38. Implementing analogue conversions for all three multiplexes, rather than just two, carrying the public services would reduce the NPV of released spectrum by very little, but would contribute strongly to bringing forward switchover.

39. Whatever spectrum the Government requires broadcasters to release in Band IV, research does not suggest that any of the channels in this band have a noticeably higher value than others. So, given the costs (for consumers and broadcasters) of clearing spectrum at the bottom of Band IV (where it is heavily used, including by Crystal Palace), channels to be released in Band IV should be released at the top of that band.

40. The implication of all of this is that, with a Government commitment to three analogue conversions, and taking into consideration their value for alternative use, the cost and complexity to broadcasters of clearing them, and the costs and confusion/annoyance to consumers of their clearing, the optimum 12 channels to be released would be six (i.e. 48MHz) at the top of Band V (channels 63-68) and six at the top of Band IV (channels 31-37[8]).

41. While we recognise that the Government may be unwilling in the short-term to agree to all of this, to end the current "planning blight" the BBC hopes that, at the very least, the Government would be able to commit soon to:
    - three analogue conversions;
    - with 12 channels released; and
    - acceptance that, under any switchover scenario, eight of those channels would be numbers 35, 37 and 63-68.

42. Unless this is forthcoming, the ability of broadcasters to plan the necessary investment required to improve the coverage and robustness of reception of DTT and, hence, to drive digital take-up and switchover, will be compromised.

[8] This does not take account of channel 36, which currently has limited use for radar, which the Government may also wish to clear for re-use. It also needs to be recognised that it would become progressively more difficult for the broadcasters to clear channels lower down Band IV (in particular, below channel 33).

Answers to the questions

Q1. Our working assumption is that planning will continue for six multiplexes, as today. However we would also be interested in views on the costs and benefits of a more radical re-planning. This could be either reducing or increasing the number of multiplexes by one. Do you have views on this?

43. The DTT platform has suffered from a severe lack of bandwidth. If the platform continues to be a mixture of free-to-view and pay-TV, primarily linear but with a degree of interactivity, the BBC believes that decreasing the number of multiplexes makes no sense at all. Indeed, with increasing consumer penetration of DVD-video, with its high quality images, and plasma screen TV sets, broadcasters may come under pressure to assign additional bandwidth to their existing DTT services to increase their picture quality.

44. What is needed to drive penetration beyond its current levels is a stronger range of free-to-view services, preferably with more scope for the interactivity which digital viewers will increasingly expect. This would also enable the BBC to offer DTT viewers more of its interactive services which are available on satellite.

45. With the current six multiplexes, and the current transmission mode, there ought to be sufficient bandwidth to strengthen the free-to-view offering while, if pay-TV continued to be offered on DTT, still retaining sufficient bandwidth for a smaller range of pay services (a “pay lite” offering) which would provide an additional inducement for some consumers to upgrade from analogue sooner rather than later.

46. While there is no scope for introducing a new UK-wide full-capacity multiplex prior to switchover, and there are inherent problems with the idea of introducing any “mini muxes”, there is a strong argument for making available frequencies for additional multiplexes after switchover.

47. Additional new services, such as mobile or broadcast data services, are different kinds of animals from television services and, if implemented, should be accommodated in the spectrum which has been cleared following the switch-off of analogue services. See the answer to question 5 for more detail on this.

Q2. What do you see as the costs and the benefits of maintaining the current basis for network configuration compared with those for adopting a configuration using fewer frequency channels?

48. It is essential that maximising spectrum release is not the key driver in determining how much, and which, spectrum DTT should be planned to inhabit post-switchover. Achieving switchover will depend, to a large degree, on promoting greater take-up of DTT which, in turn, will depend upon the attractiveness of the DTT offering, including the number and range of services. There is necessarily a trade-off between the overall attractiveness of the DTT platform to the consumer and the amount of spectrum required to deliver it. The Government therefore needs to take a balanced view in approaching this question. It would be a false efficiency, undermining the entire switchover process, if the Government were to approach spectrum planning simply from the position of "How little spectrum could we get away with allocating to DTT?".

49. For switchover to be well under way within the 2006-2010 window, broadcasters must plan to be able to deliver near UK-wide coverage of a wide and diverse range of free-to-view services with acceptable reception quality. If consumers are to adopt digital TV, they must be able to do so with confidence of this. This means DTT must be allocated sufficient spectrum to achieve this and there must be a Government commitment to three analogue conversions (which has implications for specific frequencies).

50. If the Government requires the broadcasters to undertake a costly, complete reconfiguration of their networks, this would undermine the primary objective of achieving switchover by diverting resources from the services needed to drive digital TV adoption and, as the consultation itself makes clear, it would also require many additional households to invest in new aerials to access out of group DTT signals which, with analogue conversions, would have been unnecessary. In addition, analyses suggest that released UHF spectrum is likely to have fewer alternative, practical uses and (other than the top of Band V for 3G use) be worth rather less than was originally believed.

51. As digital TV penetration rises, and the Government needs to increasingly consider how to convert those consumers who are perfectly content with access to 4 or 5 analogue public services, unnecessarily increasing the complexity of adoption would be self-defeating. Consumers face enough confusion about digital TV as it is and, for those adopting it principally for free-to-view services, minimising cost and complexity of installation is paramount.

52. The only practical basis for planning spectrum usage consistent with early switchover is for DTT to be allocated sufficient spectrum to be able to achieve near-national coverage for the three multiplexes carrying the public services and to allow for non-national coverage of an acceptable level for the remaining three multiplexes.

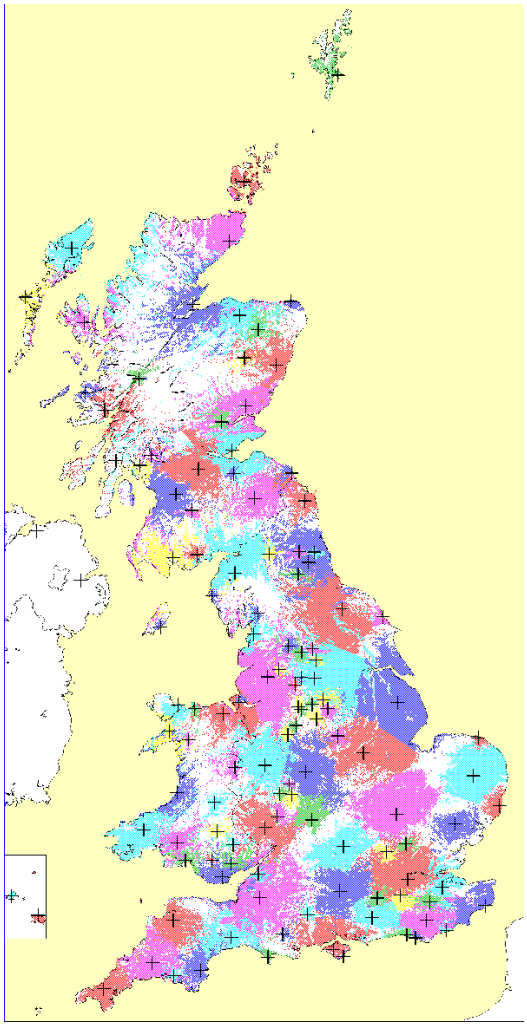
53. While we would need to develop full network plans (which would need to fit in with European plans) to know precisely how many, and which, channels would be needed for this, studies by BBC Research & Development have indicated that, continuing to utilise Multi-Frequency Networks (MFNs)[9], a minimum of 5 channels are required per multiplex for a non-national coverage of an acceptable level; 6 channels are required per multiplex for the near-national coverage.

[9] Although reasonable coverage could be obtained with a national Single Frequency Network (SFN), better coverage is obtained with the regional and sub-regional versions, and better still with the MFNs. In addition, implementing SFNs would introduce new technical constraints which the broadcasters would need to develop solutions to, at some cost, both financial and time-wise.

54. Whilst the increase in coverage obtained with a 6 channel MFN does not appear all that significant compared to, say, a 4 channel MFN, there is a hidden problem. With a 4 channel MFN, as the network is built up, it becomes increasingly difficult to allocate channels to new stations, and hence to increase the coverage, without causing interference to existing stations in the network. With a 6 channel MFN, the position is much easier and there is plenty of scope for expansion of the network.

55. The BBC has developed a network plan based around three analogue conversions and three existing assignments at 80, 110 and around 700 transmitters with acceptable levels of coverage. This implies a requirement for 32 channels i.e. 12 channels released.

56. The map to the right shows how a 6-channel MFN network could be implemented.



Q3. Do you agree that we should continue to plan on an interleaved basis to support regional services?

57. The Government has reiterated its commitment to regional broadcasting and intends, in the context of its forthcoming Communications Bill, to reinforce regional programming obligations on the BBC and ITV. Planning DTT using interleaved frequency assignments provides the only practical way of allowing those broadcasters to meet their legal obligations and to deliver the Government's policy for regional broadcasting.

58. The BBC therefore agrees that spectrum planning must continue to facilitate regional services. Beyond the legal obligations placed upon broadcasters, audience research continually shows strong support for regional programming, for which terrestrial transmission is particularly suited. In addition, for DTT, interleaved planning produces the most efficient and effective use of spectrum i.e. it maximises the achievable coverage from a given amount of spectrum for a given network.

Q4. To what extent should the future planning of this spectrum take account of the provision of local services?

59. Given the limited availability of local (analogue) services operated under Restricted Service Licences (RSLs), it is no surprise that audience research does not yet show a similar degree of support for local programming as it does for regional programming. However, this does not mean that there is no future for such services, merely that it is early days.

60. The BBC believes that the suitability of terrestrial transmission, combined with the likely availability of locally spare interleaved frequencies, should provide opportunities for a wide availability of local services operated under RSLs. But frequencies must continue to be made available for use by RSLs in a manner which does not undermine the availability and reception of regional and national DTT services. Yet allocating specific frequencies for local services, which in analogue have yet to prove their long-term viability, would not be an efficient use of the spectrum either.

61. This suggests that, in the all-digital future, local services should be interleaved with existing DTT multiplexes, but should operate using low power and a more rugged transmission mode.

Q5. What factors would have to be taken into account in order to plan to support mobile broadcasting services?

62. Although the question asks about mobile broadcasting services, the consultation primarily discusses portable reception. Planning for mobile reception is something different altogether and it is essential that the concepts of *portable* and *mobile* reception are not confused.

Portable reception

63. Millions of consumers currently rely on set-top aerials ("portable reception") for at least some of their TV viewing, often on second and third TV sets. For many, particularly those in urban areas, this is their only method of reception. There are many reasons for this, but unless portable reception (principally by DTT) is addressed, then it is likely that, under a rolling switchover programme, those transmitters providing analogue TV to the areas of greatest portable usage would probably be the last to be switched-off (if the switchover criteria would permit them to be switched off at all).

64. Outside the areas where consumers who only have portable reception are concentrated, there are still likely to be many consumers, albeit not necessarily of the order of 5 per cent of local households[10], who would lose all TV reception if analogue were switched off.

[10] The current switchover criteria require digital take-up to reach 95 per cent of households before analogue TV could be switched off.

65. Yet we believe that the assertion in the consultation that “reception of digital broadcasts by set-top aerials could be at least as good as for analogue broadcasts using the transmission power levels which could be available once analogue broadcast cease” is somewhat optimistic.

66. Analysis by BBC Research & Development suggests that, even after the power increases associated with analogue conversion had been implemented, many consumers would still not have satisfactory portable DTT reception. While we expect post-conversion DTT to be able to provide satisfactory reception to about 43 per cent of ground floor set-top aerials[11] (compared with only 39 per cent having good analogue reception), and to 56 per cent of first floor set-top aerials (where 55 per cent have good analogue reception), these achievements would not enable the many households which currently accept very noisy analogue pictures to receive satisfactory DTT reception.

67. There are two potential solutions to this:
    - require consumers who currently have portable reception to obtain access to a roof-top aerial, to satellite or to cable for those TV sets; or
    - change the DTT transmission mode.

68. Changing the DTT transmission mode to a more “rugged” mode[12], perhaps to facilitate mobile reception, would offer significantly improved portable reception than the current transmission mode. But it would not be a panacea. The resulting more rugged multiplexes would also have reduced capacity by comparison[13]. The multiplex licensees would need to consider the impact on services to existing DTT viewers as well as the potential for increasing geographical coverage. The BBC believes that it is sensible to keep the transmission mode under review, weighing the advantages of more ruggedness against the capacity drawbacks, and that receivers should remain able to cope with different modes. The draft ITC revision to its Community Digital Standard policy document, leaving open the possibility of alternatives, has the BBC's support.

69. A switch to the 8k carrier option should bring increased robustness against impulsive interference and improved resistance to multipath interference. But there would be implications for the legacy base of receivers and the potential for considerable consumer confusion. None of the current generation of ITV Digital set top boxes would be capable of receiving 8k transmissions and the extent to which software downloads could fix this is unclear.

[11] These are only noise-limited estimates and take no account of interference or (in the case of analogue reception) ghosting, which can sometimes be a significant obstacle to set-top reception.

[12] Changing to a more rugged transmission mode would allow receivers to continue to function in the presence of higher levels of interference. By reducing the impact of interference on reception, such a mode change would also increase the geographical area in which a receiver would be expected to work i.e. DTT coverage would improve.

[13] The current transmission mode has a bandwidth of approximately 24Mbit/s per multiplex. The most likely alternatives have bandwidths of approximately 18Mbit/s and 12Mbit/s.

Mobile services

70. Mobile services will be very different in nature to traditional broadcasting services. They will also require very different network topologies[14], which are not compatible with interleaving with a traditional broadcast network, and would probably not be aimed at similar uses to that of television[15]. In fact, a network designed to support mobile multimedia services would tend to be more akin to a cellular structure, such as the 3G networks being built now, than to the DTT networks currently in place.

71. These characteristics, and the fact that any demand for mobile multimedia services (and hence transmitters to support them) is likely to be localised (e.g. alongside major roads), suggests that mobile services should be planned in a completely new, cleared band or in spectrum released for re-use from Bands IV and V. Provided that the DVB-T or DVB-Mobile (under development) standards were used, these would be appropriate alternative uses for these frequencies.

Q6. Does this analysis of coverage potential and associated costs adequately inform those taking decisions about the level of coverage by terrestrial means that should be required for public service broadcasters?

72. More detailed network planning studies would need to be undertaken before firm decisions should be taken on final post-switchover[16] DTT coverage obligations for the public service broadcasters. Certainly, it would be difficult to be more definitive until the new UK Planning model had been tested and implemented.

73. However, in order to inform the general debate on coverage requirements for public service broadcasters, the analysis provided in the consultation is a fair starting point, albeit that the (oft-quoted) assumption that analogue TV is available to 99.4 per cent of households is essentially unverifiable and ignores the often poor quality of roof-top aerials in this country.

74. What should drive any post-switchover coverage obligations for the public service multiplexes should be the desire to achieve universal digital coverage irrespective of platform. Universal coverage cannot be achieved without near-national DTT coverage as even satellite will not, on its own, offer universality. Indeed, the coverage of digital satellite is also essentially unverifiable and it can depend upon how much additional expense consumers are willing to bear to install it. That building out DTT to near-national coverage would also contribute to the public policy objective of maximising the number of consumers with access to more than one platform further commends this route.

[14] For example, high powers, denser transmitter spacings.
[15] For example, the small screen sizes implied by PDA or vehicular use would suggest uses other than traditional TV.
[16] Prior to switchover, even if money were no object, maximum DTT coverage for the three multiplexes carrying the public services would be about 87 per cent of households.

75. In addition, there are considerable ongoing costs, currently borne entirely by the public service broadcasters, for providing "solus"[17] cards to satellite households which do not wish, or cannot afford, to subscribe to pay-TV services. These costs could increase substantially if a large number of households uninterested in subscribing to pay-TV only had the satellite option (especially if multiple receivers, each requiring a separate solus card, were required). Again, this argues for maximising DTT coverage post-switchover.

Q7. Our working assumption is that the public service broadcasters should be required to reach a certain minimum percentage of households by the terrestrial platform. However, we would like your views on whether it is right to require a minimum, what that might be and the associated costs and benefits?

76. As we have outlined in the introduction, the BBC believes that wide availability of satisfactory DTT reception will be essential to achieve switchover. It will be the availability of free-to-view services on DTT, with the public services as the cornerstone, which will encourage many of the significant minority of households currently uninterested in pay-TV to adopt digital TV.

77. There are significant costs associated with rolling out DTT coverage to near national levels, and coverage greater than about 87[18] per cent of households would be unachievable prior to switchover. However, there can be little doubt that consumers would expect the public services to drive any improvements in DTT coverage and to be ultimately made available to more households than ITV Digital is likely to regard as being practical.

78. We believe that a minimum of 95 per cent of households should be covered after switchover by the three multiplexes carrying the public services. This should be an obligation upon those three multiplex operators provided that the Government commits to analogue conversions for those multiplexes and that sufficient spectrum would be made available for those coverage obligations to be met. Without these commitments, it would not be remotely practical for such an obligation to be placed on the broadcasters concerned.

[17] Subscribers to pay-TV services retailed by BSkyB also gain automatic access to the encrypted free-to-view public services. Consumers who choose to adopt satellite without a subscription to BSkyB must obtain a smartcard which decrypts the public services only – the "solus" card.

[18] DTT coverage forecasts are subject to revision by the Digital Action Plan Spectrum Planning Group.

79. Even if the public services become available with satisfactory reception (subject to consumers' aerials) to 95 per cent of households by DTT, there will still be many households which will rely on satellite for distribution of those services. While this may be a more cost-effective solution to providing universal coverage than building ever more DTT transmitters, it would raise two major concerns:
    - the costs of issuing "solus" cards (see the answer to question 6 above); and
    - for as long as there continued to be no guarantee of satellite distribution for the public services (either linear or interactive), universal access to them could not be guaranteed either.

Q8. Do you agree that the level of coverage provided by the networks supporting the four multiplexes carrying predominantly pay-TV services should be left to the commercial judgement of the operators?

80. ITV Digital has established the DTT platform in the minds of most DTT viewers and it is unlikely that the market would be on the point of launching affordable free-to-view receivers had ITV Digital not driven DTT penetration to where it is now.

81. If DTT pay-TV continues to be made available, the investment necessary to achieve any coverage improvements for multiplexes B, C and D should be a matter for ITV Digital, which applied for its licences, and based its business plan, on the basis of an obligation to build only 81 transmitters. Likewise, the business plan of any successor DTT pay-TV operator would have been made on the same basis. If DTT pay-TV continues, the scope for improvement to its coverage must not be artificially constrained because the Government has not made available sufficient spectrum for this.

82. Multiplex A, however, is a different matter. While this multiplex certainly currently carries pay-TV services, it also carries Channel 5 UK-wide and, in Wales, S4C and S4C-2 while in Scotland it also carries the Gaelic programming of Tele-G. While not a public service, multiplex A also carries the ITN News Channel free-to-air. The wider availability of these services, and the potential of this multiplex to offer DTT viewers more of the enhanced TV and interactive services which broadcasters can provide more easily on satellite, argues for the level of coverage for multiplex A not being solely a matter for SDN - in return for a Government commitment to analogue conversion for this multiplex.

83. Maximising the availability of multiplex A will drive switchover and, to the extent that its capacity is used to provide enhanced TV and interactive services, this will also spread the social benefits of digital TV more widely.

Q9. Which channels are cleared will depend on the costs and benefits of different re-planning options. For example, clearing 5 channels at the top and bottom of the frequency range is less disruptive to consumers and has lower switching costs than clearing ten at the top end. The benefits, though, will depend on the use to which such freed up spectrum can be put. We would like your views on the costs and benefits of different options.

Q10. Which frequency channels should we clear?

84. In conjunction with the ITC, the BBC has considered a number of options for spectrum release based upon cost benefit analyses of the most likely switchover scenarios.

85. As a result of this, combined with the BBC's experience as a spectrum planner, our belief that three analogue conversions are essential to drive switchover, and our desire to minimise consumer costs and annoyance, have the following implications for spectrum release:
    - 12 channels could be cleared;
    - it would not be possible to release these in one contiguous block without causing significant disruption to viewers and networks, and without significantly curtailing the coverage (and therefore spectrum efficiency) of the remaining DTT networks;
    - nationwide clearance of the six channels at the top of Band V (i.e. channels 63–68) could be achieved relatively painlessly. This –
        - maximises the effectiveness for other users (contiguous blocks throughout the whole country would be of most value),
        - limits the disruption to existing viewers (in terms of aerial re-use),
        - clears channels which have lower current occupancy and so would be easier/quicker to clear, and
        - would minimise incompatibility with other Europe countries;
    - nationwide clearance of channels at the bottom of Band IV, as suggested, could not be achieved without significant disruption and cost. In addition, re-use of these channels would have no inherent greater efficiency than nationwide clearance of additional channels at the top of Band IV. Channels at the bottom of Band IV would also be more difficult to use by new incumbents in a flexible way; and
    - the broadcasters could nationally clear the six channels 31-37[19] in Band IV.

86. None of the above precludes the use of locally-spare interleaved frequencies for a limited range of relatively low-powered alternative uses, such as services ancillary to broadcasting[20] or data broadcasting[21].

[19] This does not take account of channel 36, which currently has limited use for radar, which the Government may also wish to clear for re-use.
[20] For example, outside broadcasts.
[21] Delivered to either PCs with DVB-T cards installed or to suitable TV receivers.