

Response by Voice of the Listener & Viewer (VLV) to *Ofcom Consultation on the Future of Digital Terrestrial TV in the UK, enabling New Services for Viewers.* Published 21 Nov. 2007.

Executive Summary:

Whilst welcoming opportunities for improving the DTT service after Analogue Switch-Over [ASO] Voice of the Listener & Viewer [VLV] has a number of reservations and concerns about the proposals being made by OfCom. In particular some assumptions made in forming the proposals are not well supported with evidence and some technical matters are far from satisfactory.

VLV has learned that some of the assumptions made regarding the current multiplex contents may be flawed leading to underestimation of the capacity required for some service elements. The DTT platform already suffers from capacity constraints and neither the consultant's report nor the consultation document provides comfort that the proposals will resolve these constraints adequately to provide the DTT platform sufficient room to grow and compete in the future. There is insufficient capacity available to the DTT platform to permit the quality improvements that are necessary and this will not be fully resolved after analogue switch off (ASO). The consultation does not provide adequately convincing evidence that improvements in technology – particularly with respect to MPEG4 and DVB-T2 – will make up the difference and provide headroom for the future.

VLV is not supportive of the levels of picture quality implied by the proposals; according to evidence in the consultant's report some HDTV material will be rated only marginally better than standard definition (SDTV) and well below its potential. This is far from satisfactory. Already the Standard Definition service suffers from poor picture quality as a result of over compression and VLV does not wish to see this practice extended to any new HDTV services whose very essence is high picture quality.

Furthermore, the lowest resolution HDTV standard – 720 - is being proposed. Many viewers already have access to high quality flat panel displays and also have access to HDTV services using the highest HDTV standard - 1080. By ASO many more of these will exist and viewers will be capable of affordably supporting the 1080 system. VLV believes that the proposal to use 720 only will deny the DTT viewer a competitive and high quality service.

There is a need for additional DTT spectrum to support a good quality service capable of offering a significant amount of HDTV high quality programming sufficient to be attractive to viewers and to compete with other platforms. The current and likely spectrum allocations and the capacity reorganisation proposed are extremely unlikely to be effective and will lead to long term damage to the DTT service.

Introduction:

Voice of the Listener & Viewer (VLV) welcomes the publication by OfCom of its consultation *"The Future of Digital Terrestrial Television: Enabling new services for*

viewers" and of the technical consultant's report that underpins most of the proposals made. The VLV also notes the recent OfCom statement on Spectrum Review but greatly regrets that this statement has been made before comments have been received on the present consultation "*The Future of Digital Terrestrial Television: Enabling new services for viewers*".

Voice of the Listener & Viewer [VLV] welcomes the improvements to the UK digital service that Analogue Switch Over [ASO] will bring but wishes to see more detailed analysis and debate of the evidence supporting the proposals. It also wishes to see more safeguards for service and picture quality if existing capacity constraints are maintained into the future when the development of the platform will need flexibility and room to grow in order to compete.

The following response comprises elements concerned with:

- Spectrum resource issues,
- Capacity and Multiplex content management,
- New Technologies,
- Coding standards for HDTV,
- Future development of DTT

Spectrum Resources:

VLV considers in particular that the possibilities for a significant number of services of HDTV should be given priority and that OfCom should give the maximum possible opportunity for the public terrestrial digital service to be competitive with other distribution platforms by making available appropriate resources including additional spectrum. This particularly applies in the future – the terrestrial digital service should not be constrained to operate within spectrum limits that may appear adequate now but will preclude future expansion and improvement that will be for public benefit.

When DTT was being considered over a decade ago no specific services were recognised and the total capacity was set by considerations of spectrum planning that determined that 6 multiplexes of varying coverage potential could be supported in a pre-ASO environment. It was assumed that the existing analogue services would be replicated and new services added to use the remaining capacity. At that time HDTV was certainly seen as a future possibility and its capacity requirements were known to be greater than those of SDTV. It is understood that no detailed post-ASO planning was done.

The limited spectrum resource that is available currently is in part due to technical restrictions that will be removed after ASO. However, it is clear from OfCom statements on spectrum review that the present intention is not to make any more spectrum available for PSB terrestrial broadcasting after ASO than is currently allocated to the 6 multiplexes. It is understood that the only way that this can be possible with the present OfCom position is that if broadcasters make successful bids for the Digital Dividend Spectrum [DDS] i.e. that spectrum that is nominally released as a result of ASO. This would require the PSB broadcasters to make, individually or collectively, financial provisions which themselves would *ante facto* be subject to regulatory control [specifically the BBC], which means that the process is flawed in principle. The VLV urges OfCom to reconsider this position and to make more of the DDS available for PSB purposes, even if the licence conditions are different from those

of the current 6 multiplexes, for example, the loan of spectrum for an appropriate period.

VLV is aware that this issue is not the subject of this present consultation nevertheless it is raised here as an essential and material part of its background. It is regrettable that the study was not commissioned to explore more fully what the capacity, and therefore spectrum, requirements would be given a greater number of HDTV services and with a much better potential picture quality i.e. 1080P.

Capacity and Multiplex content management:

More gross digital capacity will be made available in some multiplexes from the transmitter power increases made possible by ASO; these same power increases will also improve coverage quality. Both these improvements are welcomed but they clearly are the result of the removal of interim conditions that were necessary to allow co-existence of the Analogue and Digital services sharing spectrum during the transition period.

Small amounts of additional capacity might also be available from:

- Reordering of the current services within multiplexes and
- Improvements in coding performance but for current MPEG2 technology this has probably reached its natural limit.

Such improvements are also welcomed provided that they do not result in degradations to existing quality of service indeed we would wish picture quality to improve over time.

The re-ordering of the multiplexes, especially to release a complete multiplex to be allocated to HDTV depends upon detailed management issues relating to the contents of each multiplex and its variation as services change. The VLV has learned that some of the assumptions made in the consultant's report and carried forward by OfCom into its consultation document may be dubious as a result of sampling the bit rate of individual services on each multiplex successively rather than simultaneously. It is believed that the multiplex content tables provided in the report therefore underestimate the capacity used by some service components and that this distorts the conclusions reached. VLV therefore would wish to see a more detailed analysis of the capacity budgets that reflect a more accurate picture of the actual dynamic behaviour and multiplex occupancy over an appropriate measurement window.

VLV echoes the concerns raised over the practicability of a change in Statistical Multiplex [SM] arrangements that are claimed to contribute some capacity savings. Generally the number of services involved in SM groups in the DTT context is small and the consequential SM gain is low [10-15%] and highly dependent on picture content and the independence of services in the SM group. Therefore, such gains will be small and should not form a significant part of the reliable core savings used as basic assumptions in re-planning the multiplexes.

New Technologies:

In the future, improvements in new generation coding and modulation technology, some of which is yet to be standardised, are expected. Specifically, MPEG4 video

coding has been deployed commercially for broadcast distribution for about 2 years and will be the coding technology of choice going forward. However, it has yet to reach its full potential in commercial product and this will take more time to accrue and for the cost of such product to be affordable. Despite this the legacy of MPEG2 which is unable to adopt some of the features of MPEG4 will have to be sustained for some years to come. Any additional capacity made available by a conversion to MPEG4 in current multiplexes will be slow and will need careful planning and management.

New modulation technology will be available in due course when the second generation of DVB-T is finalised and an appropriate introduction scenario presents itself. DVB-T2 as it is understood at present is loosely defined and so the suggestion of a 30% increase in capacity compared to DVB-T1 is only an estimate and it will need careful monitoring as the technology components are assessed and the specification takes shape. This technology is still being formulated and will take some time for the appropriate parameters for UK use to be tested adequately and the specification completed.

VLV is concerned that the time scales implied by OfCom for its introduction after ASO may be ambitious. It is matter of experience that new and modern technologies are complex, multi layered and can take some years to reach full commercial maturity. Early introductions using the simplest, most readily implemented, options are subject to the risk of becoming trapped by the legacy of a large population of early receivers unable to be upgraded. The UK choice of the 2k option of DVB-T1 was caused by expediency and it was good fortune for the UK that eventually the 8k option was embodied in receivers earlier than expected and the pool of 2k only receivers is small. The deployment of DVB-T2 technology may not be as simple.

Coding standards for HDTV:

The proposal for accommodating HDTV in a separate multiplex seems one practical way to introduce HDTV services on DTT. The VLV warmly welcomes the opportunity to provide for HDTV. However, whilst it is recognised that the Quality/Quantity ratio depends on factors that include content and genre interest as well as technical ones, the VLV is also concerned that too few premium services will not be a sufficient attraction to DTT compared to other platforms. The OfCom consultation document makes some suggestions based on assumptions about:

- Capacity constraints and
- HDTV Scanning and Coding standards

Capacity Constraints:

Without new spectrum [i.e. spectrum that is additional to the 6 existing multiplexes] the introduction and development of HDTV services will be restricted in number and picture quality. It is regrettable that, because of capacity constraints aggravated by commercial need to support the largest number of services in each multiplex, some SDTV services already have less than adequate picture quality. The expectation of HD is that it should be of a higher picture [and sound] quality than SDTV. This must be clearly discernible by the viewer both in terms of an inherently better picture quality [comparable to all other HDTV sources including Blu Ray DVD] AND the absence of visible artefacts of the

picture coding process that presently mar many SDTV transmissions. It follows then that *pro rata* more capacity is needed. The capacity needed depends on a number of factors one of which is the HDTV scanning standard used which in turn determines the ultimate displayable picture quality inherent in the transmission.

HDTV Scanning and Coding standards:

The proposal to use the so-called 720P image format is understandable in the context of this consultation and of the wider aspects of DTT in the UK. However, it would seem to VLV that this proposal is made 'back to front'. A proper determination of the appropriate coding standards for service quality reasons should be made first and then means of providing the necessary capacity should follow. The present proposal is clearly made with the presumption that spectrum will not be provided *de facto* and so capacity will be restricted and that leads to the lowest resolution scanning standard that can justifiably be called "HDTV" together with a significant level of systematic picture impairment. The report is clearly not a wholly open minded assessment of all the options but reflects the narrower intentions of its commission.

VLV does not support this rationale and considers that the overall case for 720P was not sufficiently well made in the consultant's report or in the OfCom consultation document. The evidence provided in the consultant's report and based on EBU subjective tests seems to suggest that for normal HDTV viewing distances 720P pictures provide adequate resolution and that 1080 pictures are not discerned to be better. This appears to be so over a relatively small range of pictures sequences; this is not consistent with the choice of 1080 for premium satellite HDTV channels and for Blu Ray DVD material. Furthermore some results¹ illustrate clearly that 1080P is inherently and visibly better than 720P indicating that preventing its future adoption is not in the public interest.

It is noted that these results, published at IBC 2007, use a new subjective test method that is not yet agreed for international use. The image compression for the tests was performed using only one implementation of a complex algorithm which may or may not be state of the art and therefore it is not known what potential, if any, remains for improvement. Furthermore, there are some questions to be raised regarding the processing within the displays themselves and the impact that this may have on performance. These factors suggest that whilst these are the only results of their kind currently available they can be used only as indicators until they can be confirmed by other workers. The VLV would wish to see a wider range of results from several sources before any final decisions are made.

There is also the implied suggestion in the report² that systematic picture quality impairment due to compression artefacts be allowed in the broadcast signal such that only 60% of the quality potential is conveyed to the home³. Some picture

¹ See results for the picture sequence "Ice Dance" where the 1080P pictures consistently maintain quality even at low bit rate; this is not so for 1080I. This illustrates that the difference between 720P and 1080P is significant for some picture material. This is due to the absence of major compression artefacts allowing the basic picture quality to be seen directly.

² See page 24.

³ The consultant's report suggests a bit rate of 8 MBit/s [falling in the future to 7] for 720P transmissions. The subjective tests results for the "Dancer" sequence shown at 720P on the LCD/PDP display was rated at 60%/51% with a most perceptive viewer rating of 52%/45%.

material will be more degraded than others, some displays will perform better than others and some viewers will be more perceptive of degradation than others as is illustrated by the subjective test results. This means that some picture material will, to some viewers with certain types of display, be rated at only 45% the potential of the uncompressed original⁴ and comparable to uncompressed standard definition 625 line pictures. The VLV considers that setting such a quality target with such a worst case of 45% is wholly inadequate and fails fundamentally to contribute towards the expectation that HDTV has sufficient impact to be a success with consumers.

Those viewers that have invested in higher quality displays with the expectation that they will be able to experience much better picture quality will be disappointed. The quality standard should be balanced closer to the most demanding material because this is more likely to be noted by viewers and should reach at least 80% of the potential uncompressed quality, if not higher, otherwise the consumer is being "short changed". Using these criteria and the EBU test results the bit rate for 720P needs to be at least 16Mbit/s at which rate 1080P performs just as well⁵. Currently satellite services using 1080I provide good quality HDTV services at 16 Mbit/s.

Whilst it is to be expected that coding performance will improve with time it has been amply demonstrated with DAB and DTT SD services that any additional capacity gained in this way is consumed by additional services NOT in the maintenance and improvement of picture quality. Thus the promise of better quality in the future is likely to be unfulfilled unless safeguards are put in place at the start.

The report indicates⁶ that five 720P HD services may be supported by the time of complete ASO in 2012. It is the view of the VLV that, even with a choice of 720P as the scanning standard, the DTT offering is not good enough with present spectrum allocation to be competitive with other sources of HDTV material. By ASO and beyond 2012 there should be room to provide a much greater proportion of HDTV services. This pressure will not relax in the future.

VLV has learned that there has been a consistent debate about this matter over the last 2 decades. There are those in the industry who do not accept 720P as an adequate HDTV standard, even though it is listed in international specifications, because its resolution is not sufficiently greater than current European standard definition [equivalent to 576 lines]. The 720 image size is approximately 1 megapixel whilst the 1080 image size is 2 megapixels. A consumer purchasing a digital camera would not miss the significance of this fact; typical image sizes in current digital cameras are in fact significantly greater than this. The processing of twice as many pixels per image is solely a problem

This picture sequence contains rapid movement and challenges the compression process at low bit rates and thus the impairment comprises mostly coding artefacts rather than inherent picture quality deficiency.

⁴ See for example the subjective test results for the picture sequence "Dancer" shown on the PDP display at 720P and the most discerning viewer's opinion.

⁵ See overall results table for 720P and 1080P.

⁶ See consultant's report page 4 item11.

of computing power in coders and decoders, not of the coding algorithm. There is no disagreement that progressive standards are better than interlaced.

1080 has been for some time the international interchange format for HDTV programme material. Any widespread use of 720 formats will involve conversion from 1080 which will involve some quality degradation particularly when frame rate conversion from 60 Hz to 50 Hz is involved. The alternative basis of 1080 lines offers inherently better picture quality than 720. This situation will be more so in the future when displays and decoders will affordably support the 1080P version. However, a short term limitation to 720P now might be acceptable IF and only IF the future resource needed to allow 1080P services can be available to allow a competitive number of 1080 services on DTT to those on other platforms at an appropriate time. The legacy receiver/decoder issue once again needs to be carefully considered. The consultant's report was lacking any discussion of the possibilities for decoder devices that support 1080P being practical in the time scale of ASO by which time it is expected that 1920 x 1080 displays will be widely available at affordable cost. The VLV considers this to be an essential factor in deciding the way forward and to future proof any HDTV services on the DTT platform post ASO.

Furthermore viewers are already being advised by retailers and manufacturers that certain decoders and/or display devices are "HD Ready". Some panels, especially the smaller and cheaper ones, naturally and directly support picture resolutions less than 1280 x 720 [i.e. the so called "720" format] and are required to up-convert any signal having a lower resolution. These displays are not able naturally and directly to support a picture of 1920 x 1080 resolution [i.e. the so called 1080 format] but will render such a picture [supplied via "HD Ready" HDMI interfaces] by down converting the input to meet its own capabilities. Such conversion will add its own impairment to the displayed images. Thus, in the context of the OfCom proposals, "HD Ready" does not mean that consumers can assume that their 1920 x 1080 displays will receive future HDTV of this standard from DTT and thus be able fully to use the potential of their investment. Without a post ASO DTT "road map" that includes a planned 1080P option the future potential for these displays will never be fulfilled using DTT sources programming. The VLV considers this to be an inadequate situation and the "HD Ready" labelling to be misleading.

Finally, the consumer's perception that "bigger numbers are better" implies that 1080 will always be perceived to be better than 720, regardless of any other argument. The selling pitch of retailers will reinforce this perception especially if the displays are to be used with other devices like games machines and Blu Ray type DVD players.

Future development of DTT:

It is from the combination of improved technologies such as MPEG4 and DVB-T2 that a sufficiently compelling DTT HDTV service will come mainly because of improvements in capacity exploitation. Furthermore, new SDTV services will also eventually benefit from using the newer technology. It is notable that the improvement offered by DVB-T2 is estimated to be only 30% that is 1 extra HDTV channel in 3. The essential argument does not lie with DVB-T2, which is desirable, but with spectrum constraint,

MPEG4 potential and the judgement of how much systematic impairment is to be allowed in normal programme content.

The opportunities to introduce new technologies within an existing service infrastructure are rare and in the past took many years of planning and implementation. It also typically required new spectrum or, as in the case of DTT, an ability to re-use the same allocations because of changes in planning rules.

VLV is concerned that a repeat of the DAB example does not occur where capacity constraints are affecting the sound quality delivered partly as a result of so many stations being accommodated in each multiplex. This is also due to the age of the MPEG1 audio coding [dating from the late 1980s] which now performs badly compared to more recent technologies. This DAB example illustrates the need for great care in choosing flexible introduction scenarios and future proofed standards.

Even in an environment where the life cycles of technologies are shortening it cannot be assumed that systems can be easily upgraded. It is true that the consumer's reluctance to change equipment more frequently is being eroded by the experience of computers and mobile phones. These are new technologies with immediate benefits of upgrade whereas Televisions and Radios have traditional replacement cycles and would require similar significant benefits to be visible. There is also the incidental issue of the environmental impact of disposing of large numbers of serviceable but obsolete receivers. The key lies in the future proofing of the receivers and delivery systems.

MPEG4 has considerable potential for improvements over MPEG2 in a range of applications and is expected itself to improve with time. Few if any of the MPEG4 improvements can be applied to MPEG2 which has reached its maturity. Manufacturers will not develop it further and legacy decoder devices will not support any systematic improvements. Whether the gains expected will materialise as predicted is yet to be seen; the consultant's report attempts to predict improvements based on extrapolation from the present situation and from previous MPEG2 experience. There is no objective evidence provided [eg from manufacturers' opinion and product data] to support this speculation. MPEG4 has only recently been widely implemented in affordable product with some early commercial implementations now being up to 2 years old. Current product has already improved since then and it seems reasonable to expect that some further benefit will become available in the next two years but beyond that it seems more likely that benefits will be harder to achieve. If the state of the art is currently getting close to its ultimate potential then no significant future improvements can be expected and so capacity constraints will not be eased.

OfCom is right to be raising these matters at this stage but it seems clear to VLV that there is insufficient evidence presently available to take any definitive decisions for the future of DTT. VLV urges OfCom to consider very carefully the future proofing of the only truly public digital terrestrial broadcasting platform and in particular its spectrum needs. The risks to the businesses involved and consumer confidence are such that the denial of room to grow could prove fatal.

Voice of the Listener & Viewer (VLV) is an independent, non-profit-making association, free from political, commercial and sectarian affiliations, working for quality and diversity in British broadcasting. VLV represents the interests of listeners and viewers as citizens and consumers across the full range of broadcasting issues. VLV supports the principles of public service broadcasting and is concerned with the structures, regulation, funding and institutions that underpin the British broadcasting system. VLV does not handle complaints

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