

The Digital Dividend Review : HD Options

Greg Bensberg
HD Masters June 2007

Agenda


- DDR - Introduction
- HD Services – Ofcom Approach
- HD Capacity on Existing Muxes
- Conclusions


DDR - Introduction

- The UK has committed to implementing digital switchover of analogue terrestrial television services on a region by region basis between 2008 and 2012
- Digital switchover has been planned in such a way that a number of UHF channels will be totally cleared of terrestrial television services and will thus be available for use by a wide range of new services
- Ofcom established the Digital Dividend Review in 2005 to evaluate how this valuable resource could be best made available
- The DDR project has commissioned a large amount of technical, economic, and consumer research during 2006 to help analyse the options and constraints that this spectrum offers
- Ofcom published its DDR consultation on the 19 December 2006, the consultation closed in March 2007 and we received c750 responses to, one of the largest set of responses to an Ofcom consultation ever!

The spectrum band – 470-862MHz

Channel Frequency (MHz)	21	22	23	24	25	26	27	28	29	30	31	32
	470-478	478-486	486-494	494-502	502-510	510-518	518-526	526-534	534-542	542-550	550-558	558-566
	33	34	35	36	37	38	39	40	41	42	43	44
	566-574	574-582	582-590	590-598	598-606	606-614	614-622	622-630	630-638	638-646	646-654	654-662
	45	46	47	48	49	50	51	52	53	54	55	56
	662-670	670-678	678-686	686-694	694-702	702-710	710-718	718-726	726-734	734-742	742-750	750-758
	57	58	59	60	61	62	63	64	65	66	67	68
	758-766	766-774	774-782	782-790	790-798	798-806	806-814	814-822	822-830	830-838	838-846	846-854
	69											
	854-862											

 112 MHz of cleared spectrum
(14 x 8 MHz)

 256 MHz already assigned to six DTT multiplexes
(32 x 8 MHz - but some 'white space' available
within this - see next slide)

 Channel 36 – used mainly for airport radar

 Channel 38 – protected for radio-astronomy
in UK and Netherlands

 Channel 69 - used for equipment such as wireless
microphones

Major policy proposals

- Ofcom proposed that a market-led approach should be adopted for awarding the released spectrum
 - Cleared spectrum available for full range of possible uses
 - Channel 36 offered alongside other cleared spectrum
- Interleaved spectrum offered with packages suitable for local TV, and professional PMSE
 - Updated PMSE consultation issued last week (20th June)
 - Proposed longer transition period and range of award options including beauty contest
- Channel 69 made available for wireless microphones and similar use, free of charge and licence-exempt
- Invite views on other low-power uses, and possible “innovation reserve”
- Important to note potential developments in Europe – European Commission may come forward with proposals on digital dividend, though not yet clear. Other international issues are also relevant, eg channel 36

Agenda

- DDR - Introduction
- HD Services – Ofcom Approach
- HD Capacity on Existing Muxes
- Conclusions

High Definition Television

- Ofcom has always believed that HD television is an important technology that is becoming increasingly significant to broadcasters and viewers
- The DDR proposals are entirely compatible with the use of the spectrum for HD services
- The question is whether Ofcom should reserve some or all of the digital dividend for HD on DTT, and by doing so, preclude other services from gaining access
- Ofcom considered this issue very carefully in its consultation, using a robust analytical framework

Risk of
market failure

Risk of
regulatory failure

Opportunity cost
of intervention

HD services

- Any intervention will require evidence demonstrating that the benefits that may accrue from the intervention outweigh the costs
- According to the evidence gathered in 2006 there was not a compelling case for intervention in favour of HD services provided by the public service broadcasters
- Ofcom did acknowledge that the circumstances of HD could easily change over time

“However, HD is a relatively new service, and many viewers currently have little knowledge or experience of it. Extrapolating future behaviour from current perceptions is unlikely to yield an accurate forecast for the development of the market. As the market develops, and the technology becomes more familiar, it is likely that interest will grow and attitudes will change.

As a result, it is possible that consumer demand could grow significantly, and that this could happen relatively quickly.”

(Para 6.140/141 DDR condoc)

HD Options – DDR Condoc* noted range of HD options

Delivery option	Potential benefit	Implications
A : Use extra capacity available at switchover and rearrange multiplexes	Provide 5 HD channels to at least 90% of homes with no loss of existing services	Some PSB services in HD carried on commercial multiplexes. Services across the six multiplexes rearranged.
B : Boost coverage of commercial multiplexes	Increase coverage of HD channels under option A from 90% to c. 96%	Additional transmission costs to expand coverage. Wider availability of all services on those multiplexes, not just HD.
C : Use freesat services to ensure universal availability of HD free-to-view	Deliver 100+ HD channels to up to 98% of homes (including outside DTT coverage)	Additional costs for broadcasting via freesat. New freesat platform proposed by some PSBs could enhance competition & choice, but viewers would need satellite dishes.
D : Upgrade DTT platform from MPEG2 to MPEG4	Scope for up to doubling of capacity of DTT platform when transition complete. Capacity could be used for many HD and/or SD services.	Existing set top boxes and integrated digital TVs are MPEG2. Viewers would need new set top box to receive MPEG4 services. Various options for managing the transition to maintain confidence of viewers.
E : Acquire additional spectrum for seventh multiplex	Offer 3 HD channels to up to 98.5% of homes	Large opportunity cost of spectrum and risk that this is not optimal use.

*Ofcom DDR consultation December 2006: Page 88, "Figure 6.3: Options for delivery of PSB services in HD"

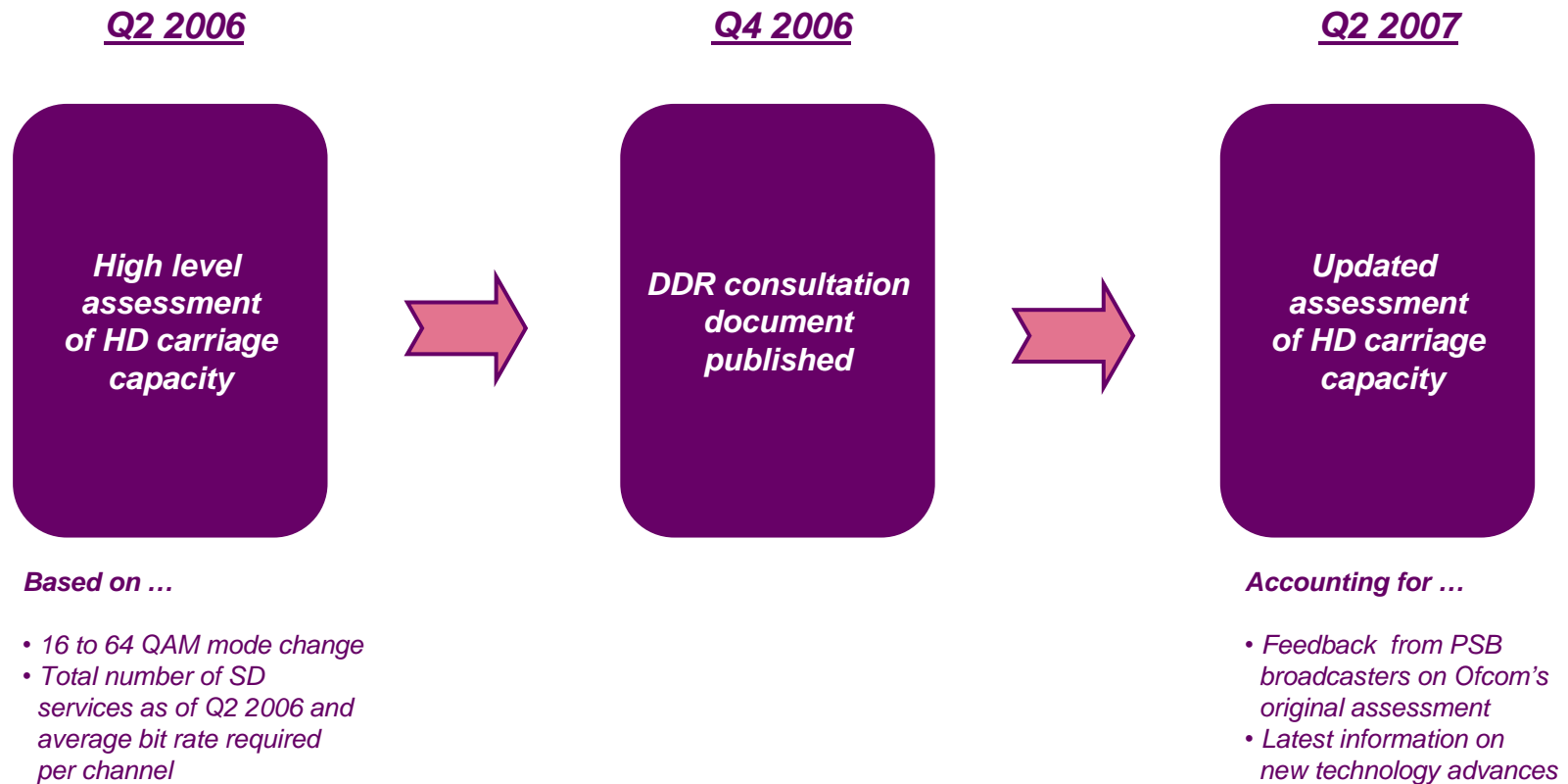
Agenda

- DDR - Introduction
- HD Services – Ofcom Approach
- HD Capacity on Existing Muxes
- Conclusions

HD Capacity

- ▶ Ofcom noted in its consultation that there a number of ways in which the public broadcasters could make HD versions of their main services available
- ▶ One of these was to use the capacity of the existing six multiplexes to carry up to five HD services post switchover
- ▶ This proposal has generated a lot discussion and has been challenged by a number of the main proponents of HD services
- ▶ The **principal focus** of the following slides is to consider the capacity available on the DTT platform as **a whole** post switchover rather than on individual multiplexes

The process so far ...



Key assumptions and caveats

- Need to estimate the capacity available for HD services on the six DTT multiplexes when DSO is complete (end 2012)
- The need to look five years ahead creates a number of variables and uncertainties ...
 - Potential capacity gained from adopting the latest generation of MPEG2 encoders and statistical multiplexing on all multiplexes
 - Whether standard definition (SD) services are broadcast using MPEG2 or MPEG4 compression
 - Picture quality requirements on larger flat screen displays
 - The number and type of SD and interactive video services
 - The number and type of radio and interactive text services
 - The development of new 'push to PVR' applications
 - Improvements in MPEG4 encoder compression efficiency for delivering HD services
 - Potential efficiency gains from the new DVB-T2 transmission standard

Broadcaster and multiplex operator service choices

- ▶ The number and nature of SD and other DTT platform services is critical in determining the amount of capacity available for future HD services
- ▶ Recent changes and ongoing developments
 - Launch of Five US/Life and replacement of ITV Play
 - BBC Parliament switch from multi-screen to single channel broadcast
 - Top Up TV move from linear broadcast to ‘push to PVR’ services
 - Sky Pay TV service proposals
- ▶ HD capacity assessment is based on number of services available in April 2007
 - 34 SD video channels and 3 interactive video services and taking into account the data capacity used for EPG, interactive text and radio services

Capacity for HD services could be provided from three different sources post DSO ...

- 16 to 64 QAM mode change: 24 Mb/s
- Improved MPEG2 compression: up to 8.7 Mb/s
- Use DVB-T2 on a dedicated HD multiplex: up to 8 Mb/s

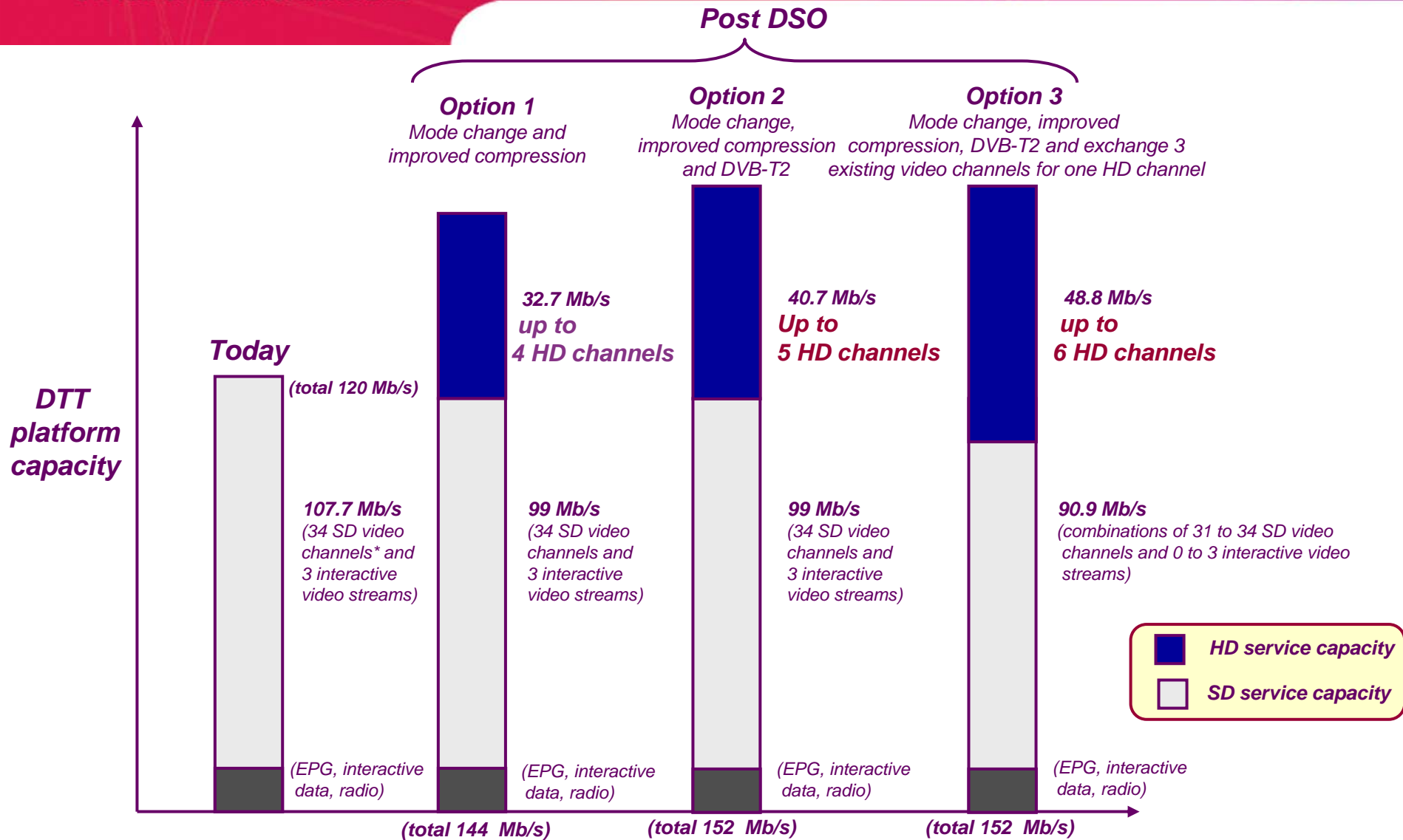
Could be sufficient for five 720P MPEG4 HD channels operating at 8 Mb/s

Improved MPEG2 compression

- Range of different TV channel bit rates used on different DTT multiplexes
- Average bit rate used on current DTT multiplexes (ie total multiplex capacity available for TV channels divided by the number of channels) varies from 4.1 Mb/s to 2.3 Mb/s
- Within multiplexes a higher statistical multiplex priority (and hence bit rate) is often allocated to certain TV channels such as the digital versions of the analogue public service channels
- Differences in average TV channel bit rates likely to be due to:
 - Different broadcaster picture quality objectives
 - Use of different generations of MPEG2 encoder and whether statistical multiplexing is employed for all services
- Ofcom estimates that if digital versions of main analogue services were operated at 3.5 Mb/s and remaining services operated at 2.7 Mb/s (or a lower bit rate if already adopted) up to 8.7 Mb/s of capacity could be released

DVB-T2

- New European DTT transmission standard expected to provide at least a 30% improvement in multiplex capacity
 - Expected to be finalised early 2008
 - First set top box deployments anticipated early 2009
 - Similar to DVB-S2 standard already developed and used to deliver HD services more efficiently on satellite
- Key issue is that DVB-T2 transmissions are not compatible with existing set top boxes and cannot co-exist in the same multiplex as standard DVB-T transmissions
- Adoption is therefore only possible if a complete multiplex is converted
- Ofcom believes that this could offer the potential to provide up to 8 Mb/s of additional capacity per multiplex
 - One multiplex converted to DVB-T2 could deliver 4 HD services to new HD MPEG4/DVB-T2 compliant set top boxes



*As of April 2007. Only one video service counted if two or more channels share time-shifted capacity

Agenda

- Introduction
- Packaging
- HD Services – Ofcom Approach
- HD Capacity on Existing Muxes
- Conclusions

Conclusions

- HD is an important technology which is growing in significance
- Ofcom believes that there could be sufficient capacity within the retained spectrum (as used by the six multiplexes) for a number of additional HD services
- However, any reordering of current capacity will be a very complex task