

DCMS/DTI Memorandum - the Costs and Benefits of Digital Switchover

1. The Government is pleased to submit a supplementary memorandum on the cost benefit analysis carried out by DTI and DCMS between 2002 and 2005. This work was undertaken as part of the Government/Industry Digital Television Action Plan¹ which recommended that the Government “carry out an overarching cost benefit analysis of the options and timing for achieving digital switchover.” The cost-benefit analysis (CBA) was designed to inform decisions concerning digital switchover, including issues about timing and the nature of Government policy towards digital television. The CBA provides a sound evidence base upon which to make decisions about policies which would help maximise the net benefit to consumers and the economy of the switchover.
2. As is standard in a CBA methodology, we considered the net effect of policy choices. Thus, for example, the benefit to be attributed to the use of released spectrum is measured by the sum of any consumer and producer surplus arising from this use. There is also an important distinction to be made between financial costs and economic costs, and benefits and costs have been attributed to the parties who benefit from or incur them.
3. In practical terms, the CBA model is a spreadsheet showing costs and benefits over time. Developed over a period of time, the model is a dynamic tool for policy-makers that has been modified and improved by market information that is added over time (e.g. to reflect new data on the take-up of digital television).
4. Undertaken by a team from DCMS, DTI, HM Treasury and the Radiocommunications Agency (RA) (subsequently OFCOM) including economists and policy officials, the CBA model was developed in accordance with the HM Treasury Green Book². All significant costs and benefits (measured in real terms) were identified and brought into directly comparable “present value” terms by applying the 3.5% per annum discount rate used in the public sector. The CBA modelling was subject to an independent academic examination and audit by Professor Andrew Chesher and Joseph Swierzbinski of University College, London. Their final report of October 2003 is being sent separately to the Committee.
5. DCMS and DTI have published two reports³ on this work.
 - The first report, published in September 2003, indicated that digital switchover would lead to quantifiable net benefits in the range £1.5 and £2bn in Net Present Value (NPV) terms for a range of completion dates from 2010 to 2015.
 - The second report published in February 2005 indicated that digital switchover would result in quantifiable net benefits in the range £1.1 to £2.2bn for the same range of completion dates, and of £1.7bn in NPV terms for completion in 2012. The February 2005 estimates took account of more recent data on digital take up, new estimates of consumer benefits (based on research by Steer Davies Gleave in 2004) and an assessment of the costs of increased energy consumption using a methodology agreed with Defra.

¹ Report of the Digital TV Project – March 2005. Available on www.digitaltelevision.gov.uk

² The Green Book” – Appraisal and Evaluation in Central Government. HM Treasury

³ Both reports are available on www.digitaltelevision.gov.uk

As requested by the Committee, this Memorandum sets out the results published in these two reports.

Methodology

6. The Cost Benefit analysis for digital switchover compares the costs and benefits of switching off analogue terrestrial transmissions and subsequent reuse of the UHF spectrum with the continuation of both analogue and digital transmissions. Costs and benefits which are or would be the same in both scenarios are excluded from the analysis. For example, the CBA assumes that, even after the announcement of the switchover decision, some first set conversions will continue to be made voluntarily by consumers (those who would have adopted digital television anyway), and therefore excludes those from the assessment of consumer costs.

7. As is normal in all cost-benefit analyses, all sunk costs, such as previous investment by consumers in digital equipment or by broadcasters in building the existing DTT network are excluded. The CBA for digital switchover also excludes:

- estimates of producer surplus (the difference between what a supplier is paid for a good or service and what it cost to supply); it was concluded that in the highly competitive market for digital television equipment any benefits to manufacturers, retailers, aerial installers were likely to be competed away;⁴
- estimates of non-quantifiable benefits, such as the benefits consumers have from the public service aspects of the new digital channels (e.g. the extension of coverage of BBC digital channels on DTT) above and beyond those captured by any survey data;
- estimates of costs of changes to the pattern of disposal of equipment – these were identified as part of the Regulatory and Environmental Impact Assessment, and are estimated to reduce the total NPV of switchover by £11m in 2012.

8. Finally, the CBA did not investigate the distribution of costs and benefits between, for example, consumers and broadcasters, and of course does not take into account any transfer costs⁵, such as the costs of the assistance schemes to help the most vulnerable consumers.

9. A decision needed to be made about the appropriate period over which the costs and benefits of switchover accrue. For digital switchover, we concluded that the determining factor was the length of DTT licences. The assessment therefore starts at the end of 2004 (the date of the most recent CBA) and ends in 2026, to tie in with the date when licences for

⁴ OPTA: The Impact of announcing Analogue Switch-off on UK manufacturers and retailers - published by DTI in March 2005. This work informed the analysis in the Regulatory and Environmental Impact Assessment on Digital Switchover - DCM/DTI - September 2005

⁵ The costs of the switchover assistance scheme are treated as transfer payments in the CBA. Like social security payments, they are in economic terms a form of income redistribution (from one group to another) and are not payments for factors of production. The benefits gained by the recipients are equal to the losses of the providers of the funds. Transfer payments do not appear as either a cost or a benefit in cost benefit analyses.

digital multiplexes granted in 2002 to BBC and National Grid Wireless (previously Crown Castle) reach the end of their second period of 12 years.

Consumer Costs and Benefits

10. Estimates of future digital take up came from a forecasting model constructed by Marco Ottovani and Jerome Adda from academic consultants Oeconomica and from forecasting work commissioned by Ofcom. These estimates were used to predict the number of households which would convert to digital television by any given date. First set conversions that were forecast to take place anyway were treated as voluntary conversions and were excluded from the CBA. All other conversions (including both secondary sets and VCRs) after the date of a firm announcement, were considered to be “non-voluntary” and were included. The CBA model does this in the following way:

- For primary sets, the figure used for non-voluntary conversions is the number of households in the non-switchover scenario which according to the Oeconomica forecasts would still be using analogue two years before the assumed switchover date (therefore the forecast take up for the year 2010 is used for estimates of switchover at 2012).
- For secondary sets and VCRs, the figure used excludes equipment which survey work indicated would not be converted at switchover (for example rarely used equipment, TV sets that were used only for playing games or pre-recorded material, or VCRs that were not used for recording transmissions). Research carried out by the Generics Group⁶ in 2003 found that around 17% of sets (implicitly 2nd sets) would not be converted at switchover. The CBA report published in 2005 assumes that a total of 54 million non primary unit units (32 second sets and 22 million VCRs) should be regarded as non-voluntary conversions.
- For both first and second sets and VCRs, the CBA model distributes non voluntary conversion over the years of the switchover programme (linked to the end date used) to model the distribution of consumer costs arising from the regional programme.

11. The CBA applies a retail cost of £50 to all equipment converted – the retail price of a DTT set-top box. However, using the retail cost of a set top box will tend to over estimate the net economic effect of the purchase. As digital switchover comes closer, some consumers will have been very close to going digital. In other words, they will value digital television at some level below the cost of a set-top box, but greater than zero. This is reflected as a straight line between 0.01p and £49.99 (assuming a set-top box is £50.00). Therefore the valuation of economic cost used in the CBA is half the costs assumed for each set-top box.

12. The CBA model takes account of other reception based costs. An allowance is made for those homes predicted to have to use digital satellite at switchover. The CBA also includes an allowance for aerial upgrades. From estimates provided from by Ofcom (previously the ITC), the CBA assumes that 10% of non-voluntary households would need to

⁶ Attitudes to Digital Switchover - Generics Group March 2004.

replace their roof-top aerial. The cost of replacement was assumed to be £150. This figure was used as a proxy for costs for communal systems (generally higher than individual roof-top aerials) and for set top aerials (typically 10-15% of that cost). The cost of MDU upgrades was not separately assessed. At the time the CBA modelling was done, no reliable estimates were available from the English House Conditions Survey or other housing datasets about the number of communal TV system or their readiness to transmit digital signals. DCMS commissioned research from NOP World⁷ to track the level of progress by social landlords (local authorities and housing associations). Having reviewed the NOP World findings, we concluded that there was no need to revise the CBA estimates as the costs per household of a communal system upgrade (between £600- £1000 according to a report by the Digital Television Project in December 2003⁸) were within the ranges assumed for domestic aerial costs.

13. The model also includes an assessment of energy used by the consumer equipment. Two scenarios for DTT power are considered: high 9 watts per hour (in on mode), 6.5 watts per hour in standby mode); and low: 8 watts (in on mode) and 2 watts (in standby mode). These are based on the power use of sample DTT boxes available in the market in 2004. These are broadly comparable with assessments made by the Defra/DTI sponsored Market Transformation Project (MTP). The CBA figure is based on an arithmetical central case between the two ranges. Cost of Carbon is also included in line with DEFRA and HMT guidance. The full assessment of the energy costs is set out in the Regulatory and Environmental Assessment (REIA) which was published on 16 September 2005⁹.

Broadcaster Costs - capital and running costs of new digital terrestrial transmission sites

14. Broadcasters and commercial multiplex operators will need to contract with network operators to develop a new digital terrestrial network, replacing both analogue and existing DTT transmitters at all 1154 sites now used, including the 80 sites which transmit DTT services currently. The CBA model draws on two sets of cost estimates:

- from the ITC and the Spectrum Planning Group (SPG); and
- from The Digital Network (TDN), an organisation that coordinates the digital terrestrial network and includes representatives of public service broadcasters and multiplex operators

16. Both sets of forecasts include information supplied to DTI/DCMS economists in confidence. Broadcasters, multiplex operators and transmission operators are now negotiating the terms of new contracts for the replacement of the existing analogue and digital network and the roll out of the new DTT network. The information on costs that underpins the CBA model remains commercially sensitive, and cannot be released.

⁷ Communal TV Systems and Digital Switchover – NOP World. Published by DCMS February 2005

⁸ Digital Television Group Report for DTI. Action Plan task5.9 Survey of MATV and SMATV systems – December 2003

⁹ Regulatory and Environmental Impact assessment; the timing of digital switchover – DCMS/DTI September 2005

Summary of Cost Assumptions

17. Table 1 sets out the source and basis for the main forecast and costs assumptions used in the CBA model. The figures quoted relate to switchover completed in 2012.

Table 1 –CBA Cost Assumptions			
Assumptions		Assumptions for 2012	Source of estimates
Costs to consumers who have not already switched to digital.	Non digital primary sets		
	- number of households with unconverted primary sets two years before the year of completion	18% of first sets unconverted (as at 2010)	Oeconomica (viewed against Ofcom forecasts)
	- equipment costs (retail cost)	Costs per primary set £50 (para 12)	Assumes Market Price as at 2004 based on discussions with Ofcom and the Action Plan's Technology and Equipment Group (TEG)
	allowance for fitting costs	£50 per home needing help	
- extra costs for non-DTT households (1.5% of those not switched by 2010) (primary sets)	Additional £100. £10 per year allowed for encryption card costs	Market price – based on the current BSkyB Free to View option	
	Non Digital secondary sets and VCRs		
	- number of unconverted secondary sets (minus TV sets that will not be converted) and VCRs at the decision point in 2005	75% second sets and VCRs (as at 2005)	Oeconomica based on Ofcom and Intellect assessments of total market sets/VCRs for conversion.
	- equipment costs	secondary sets and VCR £50 per unit	Ofcom and TEG (see above)
	Aerial/Multi Dwelling Unit Costs		
	- aerials that need to be upgraded for digital switchover (as a proxy for any communal system and set-top reception costs)	10% of aerials of homes with sets not yet converted	Ofcom estimates based on the BBC/NTL/ITC Measurement Study (2003)
		£150 per aerial	
	Domestic Energy Costs		
	- extra energy costs (primary sets and secondary sets) – net of transmission savings	£1.46bn NPV from the RIEA. This is net of transmission cost savings	DEFRA/DTI derived from Market Transformation Project (MTP) estimates.
Broadcaster costs	Network Costs		
	- capital investment and running costs of the DTT network post switchover (1154 sites)	The information provided is commercial in confidence.	Separate estimates provided by ITC/ Ofcom and in confidence by The Digital Network (TDN) and Mentor
	Other Switchover-related costs		
	- Marketing Communications costs	£200 million over 5 years	Estimates from the Report of the Digital TV Project

Benefits Assumptions

18. The CBA work identifies and quantifies four main benefits from a managed migration from analogue to digital transmission:

- consumer benefit in current, non-DTT areas;
- consumer benefit from additional services in retained spectrum (interleaved spectrum) and from the reuse of spectrum released by switchover;
- imputed consumer benefit of compulsory migration;
- broadcaster savings on analogue transmission and energy costs.

Benefits of extending DTT to areas not currently served by DTT

19. The main consumer benefits are to consumers who are currently not served by DTT and who are unable to access the BBC's digital services via terrestrial networks. There is also a benefit for people who currently live in marginal reception areas or who are unable to have set-top aerial reception, who will gain from improved reception due to transmission power increases.

Benefits of released spectrum

20. In January 2003, the Government¹⁰ endorsed the recommendations made by the Spectrum Planning Group¹¹ that planning for DTT transmission post-switchover should be developed based on the retention of six multiplexes (three PSB multiplexes and three commercial multiplexes) enabling 14 frequency channels of 8MHz each (112 MHz in all) to be allocated for other uses. In addition, spectrum in the bands used by the six multiplexes is available for other services (so-called interleaved spectrum). It is not possible now to make any reliable estimate of the market value or potential proceeds of spectrum released. The future economic or market value of the spectrum released by switchover released depends on a number of factors – which ultimately feed into what a user might be willing to pay:

- the possible uses, technically, to which the spectrum can be put, e.g. TV or mobile telephony;
- international agreements on use – for example the UHF band is currently restricted to broadcasting use;
- the nature and extent of conditions for its use (such as PSB requirements in broadcasting or licence conditions); and
- the amount of spectrum available to potential competitors – this may be linked to the efficiency of equipment using it.

¹⁰ Statement on the principles for planning the use of the UHF spectrum once analogue terrestrial transmissions end DTI, Jan 2003

¹¹ Spectrum Planning Group (SPG) was the coordinating group consisting of broadcasters, multiplex operators and transmission companies managed by the ITC (later Ofcom) – this work was carried out under the Digital Action Plan. The work is now taken forward by the Joint Planning Project, a similar grouping chaired by Ofcom

21. What can be assessed (and the method used in the CBA) is the value of the consumer surplus (that is, the propensity to pay above actual payment for a good or service) that would be created by the new services using released spectrum. The CBA model uses the conservative assumption that the spectrum would be used for additional standard definition television services (two new DTT standard definition multiplexes).

22. The information on consumer value for the 2005 report was gathered from a revealed preference and stated preference (RP/SP) survey, commissioned from Steer Davies Gleave by DTI in 2004. Both the Steer Davies Gleave and earlier research by RAND Europe surveyed within product choices and between product choices to determine willingness to pay values:

- the within product exercise required respondents to make choices between two hypothetical television packages with different services and costs; whilst
- the between product exercise gave respondents choices between the platforms that will be available when the analogue signal is switched off, and asked them to choose the subscription package they would opt for.

23. The research identified the following willingness to pay estimates; these are based on the continued provision of competing analogue, cable and satellite services:

- for a basic subscription channel on DTT, the survey estimated a willingness to pay at 25p per channel per month (or £3 per channel per year).
- for premium channels (sport and movies) – the survey estimated a willingness to pay at £1.64 per month (£19.68 per year).

24. These figures were used with different assumptions about the number of TV channels which would be available, whether on the 6 current multiplexes, or provided on services using spectrum interleaved between the 6 multiplexes, or using the 14 frequency channels cleared nationwide for reuse. Current market prices (at the time of each the CBA run) were used as a proxy for future costs because of conceptual difficulties in creating a separate pricing model for future television services.

Imputed consumer benefit

25. As noted earlier, for non-adopters at switchover an economic cost of £25 (half the cost of a £50 set top box) was used to estimate the consumer cost. This gives a net average benefit of £25 per set-top box which is counted as the imputed cost of compulsory migration. The CBA model makes an adjustment to imputed benefits assumed for consumers in areas not currently served by digital television in order to avoid double counting.

Broadcaster cost savings

26. When analogue transmission ceases, there will be a saving in the running, maintenance and capital replacement cost of analogue transmission sites. These costs would continue to be incurred in the non-switchover scenario, so they are counted as a benefit in the “switchover scenario”.

Summary of benefit assumptions

27. Table 2 sets out the source of the benefit estimates.

Table 2 – Benefit Assumptions		
Assumptions		Source of estimates
Consumer benefits.	Consumers living in areas not currently served by DTT <ul style="list-style-type: none"> - households that do not have access to digital terrestrial will benefit from access to DTT services for the first time. <p>80% of households can currently get the PSB services on DTT. This increases to 98.5% of households at switchover.</p>	<p>Outputs from Consumer willingness to pay for new DTT services - based on survey by Steer Davis Gleave.</p> <p>Ofcom based on from the work of the Spectrum Planning Group</p>
	Consumers who receive additional DTT services after switchover <ul style="list-style-type: none"> - households that have limited access to DTT services now but who will have increased access to DTT services at switchover; and - households that gain new services offered in spectrum vacated by current DTT network (known as the “interleaved” spectrum) - 73% of households get all DTT services (including commercial services from Freeview and Top Up TV). Predicted to increase to at least 80% on switchover 	<p>Consumer willingness to pay for new DTT services - based on survey data from Steer Davis Gleave.</p> <p>Ofcom forecasts from the work of the Spectrum Planning Group</p>
	Consumers who get new services in spectrum release by switchover <ul style="list-style-type: none"> - households that benefit from new services developed in spectrum released by switchover. - services assumed to be new DTT services (12 channels) available. The assumption used is that services will be available to at least 73% of homes. 	<p>Consumer willingness to pay for new DTT services - based on survey data from Steer Davis Gleave.</p> <p>Work of the Spectrum Planning Group</p>
	Imputed consumer costs of compulsory migration <ul style="list-style-type: none"> - households who have not switched to digital switchover within two years of the completion date for DSO. 	<p>Average estimate of value for households who only take up digital because of switchover.</p>
Broadcaster savings	Network infrastructure <ul style="list-style-type: none"> - savings in the running, upkeep, including energy costs and capital replacement costs of analogue transmission sites. 	<p>Ofcom/ITC</p> <p>TDN</p>

Sensitivity analysis

29. Sensitivity analysis is used in cost-benefit analyses to test input factors which are prone to variability and assess where a variation in one or more factors can result in considerable variation in overall NPV outcomes. The CBA model developed for digital switchover allows two types of sensitivity detailed analysis to be carried out:

- firstly, by varying the completion date, the model produces an assessment of what the impact of costs and benefit of different completion dates compared to the current dual transmission scenario. The CBA considers a range of different completion dates from 2010 to 2015 (end of year, for each date);
- secondly, a number of the input variables are subject to a degree of risk. The model therefore, tests sensitivities in order to highlight the assumptions with potentially the greatest impact: low consumer benefits; high consumer benefits; high energy consumption; low energy consumption; efficient energy consumption; high infrastructure costs and high reception costs.

30. The effect of changing the main assumptions in the central case is discussed in more detail in table 3.

Table 3 - Sensitivity to changes in Individual Variables	
Variation	Result
Variation of estimates of benefits of extended coverage/released spectrum	<p>The CBA model gives a central estimate of £530 million per annum, a high case of £690 million per annum, and a low case of £424 million per annum.</p> <p>If the low case is used, with all other variables the same as in the central case, then the NPV will be lower than in the central case by between £0.6 billion and £1 billion depending on the year of switchover.</p> <p>If consumer benefits are higher, the overall NPV would be £2.9 billion for 2012 switchover, some £1.2 billion above than the central case.</p>
Variation in the assumptions about the energy efficiency of equipment and use	<p>The CBA model uses estimates of the amounts of the net additional consumption of energy brought about as the result of switchover, and estimates of the additional costs of the externalities of this extra energy use, through the inclusion of the costs of equivalent tons of carbon.</p> <p>Forecasts of extra energy consumption depend upon forecasts of future purchases of equipment, the energy efficiency of this equipment and upon consumer purchasing behaviour. Government will have an influence on these factors.</p> <p>Given the number of assumptions that have to be used in the forecasts, there is a wide range in the results of the sensitivity analysis for energy costs. If switchover is completed in 2012, the difference between the central case and either of the two energy use variants is around £700 million in NPV terms.</p>
Varying estimates of transmission infrastructure equipment costs	<p>Using higher estimates of these costs has a substantial effect on the NPV. For 2012 switch-over, the central NPV of £1.7 billion would reduce by nearly £700 million to around £1.0 billion.</p>
Varying estimates of reception equipment costs	<p>The central case uses higher estimates of the future population of non-converted TV sets and VCRs (i.e. we have taken an even more pessimistic view of the voluntary conversion of second TV sets and of VCRs).</p> <p>For 2012 switchover, the NPV comes down compared to the central case by about £ 250 million - around £1.4 billion.</p>

Conclusion

31. The CBA model developed by DTI and DCMS economists between 2002 and 2004 has provided a robust method of testing whether switchover is in the UK's economic interests. The most recent run in November 2004 (and published in February 2005) shows quantifiable costs and benefits for the central case option of £1.7bn in NPV terms for the period to 2026.

32. As in all cost-benefit analysis, the results are sensitive to the input assumptions. The switchover CBA model is most sensitive to changes in assumptions affecting the value of released spectrum for new services.

DCMS/DTI

20 December 2005

Abbreviations

CBA	Cost-benefit Analysis
DSO	Digital switchover
DTI	Department of Trade and Industry
DTT	Digital terrestrial television
ITC –	The Independent Television Commission (the ITC functions are now carried out by Ofcom)
MDU-	Multi Dwelling Units – Flats and other housing with shared communal facilities.
MHZ	Megahertz
NPV	Net Present Value
Ofcom	Office of Communications
RIEA	Regulatory and Environmental Impact Assessment
RP	Revealed Preference
SP	Stated Preference
TEG	Technology and Equipment Group of the Digital Television Project
TDN	The Digital Network (broadcasters and transmission providers)
UHF	Ultra High Frequency – The spectrum range where terrestrial television in the UK (analogue and digital) is broadcast
VCR	Video Recorder