



postnote

June 2006 Number 264

ANALOGUE TO DIGITAL TV SWITCHOVER

In September 2005 the Government committed to switch over from analogue to only digital television in the UK. Digital switchover will occur, region-by-region, between 2008 and 2012. This briefing updates POSTnote 233 on Digital Television¹ and looks at the logistics of implementing the switchover and its implications.

Background

Digital television (Box 1) is received by choice by nearly 70% of UK households on at least one television (TV) set.² For consumers it has the advantages over analogue television of giving more choice of channels, interactive services and easier recording methods. With the appropriate equipment, digital television services can be received either free-to-view (terrestrial and satellite) or by subscription and pay-to-view (terrestrial, satellite, cable and broadband telephone lines). While analogue terrestrial TV is available for free (apart from the BBC licence fee) to 98.5% of UK households, not all digital services are as widely available. Currently, it is possible for only 73% of UK households to receive the full range of digital terrestrial television (DTT) services (marketed as Freeview) and 79% to receive the public service channels. The Government has thus committed to providing "affordable, universal access" to free digital public service broadcasting TV to substantially the same population as analogue terrestrial.

The UHF spectrum used to transmit terrestrial television (Box 1) has limited capacity; analogue signals use much more of this capacity than digital television signals. The other forms of transmission (satellite, cable, broadband) do not have such limited capacity but are controlled by private companies. The Government (through Ofcom: Box 2) manages the terrestrial radio spectrum so, to increase access and ensure most efficient use, it needs to turn off the terrestrial analogue signal. Additional advantages are: digital transmission is cheaper per programme service

once the initial infrastructure investment has been undertaken and; switching-off the analogue terrestrial signal will mean that UHF spectrum can be used more efficiently, leaving capacity for additional uses.

Box 1. Digital television¹

Analogue TV is transmitted as a continuously variable signal. Digital TV encodes the television picture as a series of binary numbers, then uses computer processing to compress it so it is transmitted in a fraction of the bandwidth, or capacity, taken by the equivalent analogue TV signal.

Digital terrestrial TV is transmitted in the UHF (ultra high frequency) part of the radio spectrum. The number of digital services that can be carried in a single 'frequency channel', including high definition TV (HDTV),¹ is increasing rapidly with the improvement of compression technology. However, as a guideline, a single frequency channel can carry:

- a single analogue TV service or;
- a multiplex of digital services, consisting of 4 to 10 TV services, plus digital radio and text-based services.

Why analogue switch-off?

Almost all TV services are now transmitted digitally. Five public service broadcasting (PSB) channels (BBC One, BBC Two, ITV1, Channel 4/S4C and Five) and the public teletext service are also transmitted in parallel in analogue terrestrial form.

DTT services currently occupy six digital multiplexes (Box 1), which are transmitted in between the frequencies used for analogue services. They are kept at a relatively low power to avoid interference with reception of these services. However, this restricts their geographical coverage. Turning off the analogue signal will enable the power of DTT signals to be increased, so improving the coverage. (See 'Switchover process'.)

Advantages

The Government anticipates that switching to only digital terrestrial TV and turning the analogue signal off will:^{3,4}

- benefit the UK economy as a whole by £1.1 to £2.2 billion in net present value terms;⁵
- bring DTT signals to the 20 to 25% of the UK households who live in areas that cannot currently receive them because of spectrum limitations;
- enhance reception in areas of existing DTT coverage;
- increase choice for viewers;
- reduce costs for broadcasters, who will no longer have to transmit services in both formats, or replace old analogue transmission equipment;
- release about a third of the spectrum, currently used by analogue transmission, for new services.

Disadvantages

Turning off the analogue transmission of TV will mean that all current analogue TV sets will need to be converted to receive digital TV via a set-top-box (STB) or be replaced with an integrated digital TV set (iDTV) to decode digital signals. Video cassette recorders (VCRs) will also be affected (Box 3). This will impact on domestic and non-domestic settings (such as hospitals and TV rental businesses). A new rooftop aerial may also be needed in some areas (Box 3). All of this will incur a cost.¹

Feasibility studies

Several feasibility studies for turning off the analogue signal have been carried out:

- a technical trial in 2002 on a small group of houses in the Sutton Coldfield, Litchfield and Tamworth area. This showed that interest in digital TV increased after it was experienced;
- a fuller trial which investigated the technical issues for broadcasters and consumers in two Welsh villages. Started in November 2004, the trial led to the residents voting for the analogue signal to be switched off. Several key lessons were learnt on transmission and coverage, consumer experience, remote controls, aerials and connectivity and communication (see 'Issues');
- an ongoing trial, started autumn 2005, in a very socio-economically mixed ward in Bolton for those aged 75 and over. This trial will inform the development of the assistance scheme that will be rolled out to those aged 75 or over, or with a serious disability, prior to each regional switchover (see 'Support for the vulnerable').

Management and implementation

Three main parties are managing and implementing digital switchover: the Government, the regulator (Ofcom) and Digital UK (Box 2). To be implemented successfully, switchover will need the support and contribution of:

- public service broadcasters to end analogue terrestrial transmissions;
- the DTT multiplex operators⁶ to roll out the digital terrestrial transmission network;
- the supply chain industry (television equipment manufacturers, retailers and aerial manufacturers and installers) to ensure suitable equipment is available;
- consumer organisations and groups to advise the digital switchover programme and their members;

- a number of government departments, agencies and other bodies to implement digital switchover in the public sector (for example in social housing, on public estates and where TV services are provided in support of public services);
- all those who own or maintain television systems to ensure they have been adapted/upgraded in preparation for digital switchover, including landlords and hoteliers.

Box 2. Digital switchover – the main players

The Government

The Department for Culture, Media and Sport (DCMS) and the Department of Trade and Industry (DTI) are responsible for managing the digital switchover policy. They are committed to ensuring affordable, universal access to high quality digital TV and achieving this switchover between 2008 and 2012.

Ofcom

The independent regulator has to ensure commercial (non-BBC) broadcasters and multiplex operators switch to digital TV. Ofcom will negotiate and secure international agreement to use the channels required for digital broadcasting after the switchover and to reuse the spectrum that this releases.

Digital UK

Digital UK, previously known as SwitchCo, launched in September 2005. It is the independent, impartial, not-for-profit organisation responsible for co-ordinating switchover. Digital UK was formed, and is jointly owned, by the public service broadcasters (the BBC has a 56% share) and the commercial digital terrestrial multiplex operators (National Grid Wireless and SDN). The interests of the supply chain are represented on the Board. Digital UK is responsible for: co-ordinating the technical roll out of DTT across the UK; communicating with the public about digital switchover to ensure everyone knows what is happening, what they need to do, and when; and liaising with the supply chain, digital platform operators and consumer groups.

Switchover process

Timing of digital switchover depends on several factors. Economic calculations suggest that the sooner the analogue signal is turned off the greater the benefit to the UK economy as a whole, to manufacturers and retailers. However, planning and preparation time is needed.³ Due to the scale of this policy, technical considerations and constraints within the supply chain, switchover needs:

- to be a rolling region-by-region programme (Table 1);
- to take at least four years from the first switch-off;
- at least two years' preparation before the start of the process for broadcasters to plan to upgrade and extend the digital terrestrial transmission network and to give consumers sufficient time to prepare.

Several changes will be made to increase the coverage and signal quality of PSB DTT throughout the UK:

- the number of digital transmitters will be increased (all analogue transmitters will be converted);
- the power of transmission will be increased, as it will no longer be necessary to keep it at low levels to avoid interference with the analogue signal;
- provided 98.5% coverage is achieved, the transmission mode in four of the six multiplexes can be changed to

release an additional amount of capacity in each of these multiplexes for new services

Table 1. The timetable of starting dates for switching over ITV regions to digital television.

Switchover date	Region	Switchover date	Region
2008	Border	2011	Yorkshire
2009	West Country		Anglia
	HTV Wales		Central
	Granada	2012	Meridian
2010	HTV West		Carlton/LWT (London)
	Grampian		Tyne Tees
	Scottish Television		Ulster

Source: www.culture.gov.uk/global/press_notices/archive_2005/dcms116_05.htm

Switchover sequence

In each region, one analogue TV channel, most likely to be BBC Two, will be converted to one of the BBC's digital multiplexes carrying the digital equivalent of this analogue channel and other BBC services. Consumers who have not converted to digital, or those who have problems with reception, would then have a chance to set up their TV, with only a short-term possible loss of one channel. After up to one month, the remaining analogue channels would be switched off and replaced by the remaining PSB multiplexes. The power would also then be increased on these multiplexes. However, the frequencies of the multiplexes will change, so STBs and iDTVs will need re-tuning at each stage. Most current STBs do not do this automatically, which could be a problem for many viewers. Proposals for an automatic rescan mechanism are under consideration for new STBs and iDTVs.

Issues

Digital switchover is inevitable due to universal access needs and cost and spectrum capacity savings; many other countries are also turning off their analogue terrestrial TV signal. However, many issues need to be addressed leading up to and throughout the process. Some (summarised in Box 3) are still ongoing from POSTnote 233. Updates and other issues are detailed below.

Communication

After the Government's announcement confirming digital switchover last autumn, the information for consumers on the policy has been increased. Digital UK has launched a press campaign and set up a website and information line (0845 650 5050) to answer non-technical questions. It is important, particularly to the manufacturers, retailers and aerial installers, to aim for a steady rise in take-up of digital equipment, so good communication is also important for the advanced planning of the supply chain.

In addition to the communications campaigns that Digital UK will organise, the PSBs are required to inform their viewers about how they can continue to receive their services after digital switchover. As the time for the analogue signal to be turned off in each region gets nearer, the information will intensify. In the last few days before switchover starts in a region, it is intended that messages about switchover will be on screen.

Box 3. Ongoing issues

Communication and marketing: Many people are still not aware of the policy to switch the analogue signal off. Some people do not want to convert to digital TV, due to costs and satisfaction with current TV services. The digital switchover certification mark (also known as the 'digital tick') identifies products and services that are designed to help consumers through switchover. When used on digital television equipment, this certifies that it is designed to meet certain agreed technical criteria and provides access to the replacement services for the analogue services being withdrawn at switchover.

Converting secondary TV sets: Most homes have more than one TV set, each of which needs to be converted to digital (or replaced by an integrated digital TV) if viewers wish to continue to use them for viewing broadcast TV after switchover. By the end of 2005, just under one in four homes had fully converted all its sets.

Reception problems: For current low power DTT, 34% of rooftop aerials⁷ are likely to need upgrading to receive a reliable signal. Even after switchover, up to 10% will need replacing. There could be particular problems in multiple dwelling units, where services are delivered through a communal aerial system, owned and maintained by the landlord, and with reception through set-top aerials.

Coverage: The reception of DTT will increase from 73% of households only when the analogue signal is turned off, all the transmitters converted to digital and the power increased. After switchover, reliable coverage will match analogue but still be only 98.5% of households. A relatively cheap alternative for those who still could not receive DTT is free-to-view digital satellite TV (watched on a non-subscription un-encryption card) offered by Sky. A separate free-to-air satellite service (no card needed) may soon be offered by some of the PSBs.

Recording methods: VCRs are analogue devices so it is not possible to watch a different digital channel to that being recorded on a VCR. A second STB is needed to convert the VCR to digital reception separately from the television set. For convenience, it is most likely that consumers will want to replace VCRs, probably with a hard disk digital personal video recorder (PVR), although VCRs may be retained for watching pre-recorded tapes.

Digital equipment

The most common equipment available for converting to digital television for all platforms is still STBs. The availability of iDTVs, with a decoder built in, is still limited in choice and is only for terrestrial reception. Therefore, consumers buying new TV sets now, especially those with smaller screens, will not necessarily be ready for digital switchover without additional equipment, for terrestrial, satellite or cable TV. The price, functionality, ease of use and energy consumption of DTT STBs varies widely.

Environmental effects⁸

There are two potentially damaging effects to the environment due to digital switchover: increased energy consumption and the disposal of televisions, VCRs and other equipment replaced or made surplus as a direct consequence of switchover.

Energy consumption

The Government states that 'digital switchover will increase energy usage and will therefore contribute to

climate change'. In terms of power usage, digital transmission is more efficient than analogue. However, any savings in energy use will be offset by use of new services on the radio spectrum released by switchover.

Greater use of additional electronic equipment for digital television has increased consumer power usage. STBs tend to be less energy efficient than iDTVs as they have a separate power supply from the TV and also consume a significant amount of electricity in stand-by mode, the commonest setting when not in use. The extra energy costs for consumers for each terrestrial STB could be around £2 - 8 per year.⁹ This is an increase of around 0.1 - 0.4 kWh per day, 1-3% of total electricity consumption for an average household.¹⁰

The Government has suggested ways that the overall energy impact could be decreased using existing technology. These include improvements in the design of STBs, changes to the marketing of digital TV sets (for example smaller screens and/or portable sets) and policy interventions such as promoting energy efficiency standards and labelling for new equipment.

Waste

Although switchover in itself will not require equipment to be discarded, there is likely to be an increase in the disposal of equipment due to switchover. Some consumers will consider TV sets not worth converting with a STB, or will replace their TV sets earlier than otherwise to get an iDTV. There is also likely to be some acceleration in the disposal of VCRs and recordable DVD players. The DTI and the Department for Environment, Food and Rural Affairs have commissioned research to model any changes in patterns of waste disposal generated by switchover now that the timescale has been determined. The Government and Digital UK have stated that they will make sure that consumer communications do not encourage unnecessary disposal of TV equipment.

Support for the vulnerable

The Government is putting in place a support scheme for the most vulnerable consumers, for which the BBC will meet the costs. Assistance will be offered to all households with at least one person aged 75 or over and/or with a significant disability (receiving attendance or disability living allowance). This will be free to those in the qualifying groups who receive pension credit, income support or jobseekers' allowance; other qualifying households will pay a modest fee. Specific support will be offered for the blind. Consumers who do not fall into the above categories will not be offered any help under this scheme. A limited choice of the necessary equipment will be provided to convert only one television set to receive digital TV, along with the relevant help to install and use the equipment. Consumers wanting a platform other than DTT (satellite, cable, broadband) will be provided with appropriate equivalent assistance.

Details of this scheme are still being developed, but the aim is to contact all those who qualify to ensure that they know they are entitled to help. The identification of these

consumers (helped by Social Services) will need new legislation to overcome privacy restrictions from the Social Security Administration Act 1992 that would otherwise apply. Follow up support will be offered, although friends, family and voluntary organisations will be encouraged to provide continued support.

Use of released spectrum

The switchover process will release fourteen frequency channels in the UHF spectrum for re-use. Their use is governed by International Telecommunication Union (ITU) regulations and will be negotiated internationally over the next few years. Ofcom wants the ITU to allow more flexible use of the spectrum to maximise the benefits. Technology applications and compression technology are developing rapidly, but potential future uses for the released spectrum include increasing DTT coverage, additional broadcasting and interactive services, terrestrial HDTV and mobile communications.

Overview

- The analogue terrestrial TV signal will be turned off, region-by-region, between 2008 and 2012.
- All analogue TV sets will need converting with a set-top decoder or replacing with an integrated digital TV.
- After switchover, virtually the whole country will have access to affordable, free-to-view digital television, with more choice of channels, services and of delivery platforms (terrestrial and satellite).
- Digital switchover has many advantages, but several challenges have to be overcome to ensure that everybody benefits from it.
- Spectrum efficiency will increase, allowing for additional uses of freed spectrum.

Endnotes

- 1 Digital television, POSTnote 233, Parliamentary Office of Science and Technology, Dec 2004
- 2 The highest digital TV penetration of any country in the world, with the US second at 55% of TV homes.
- 3 *The Digital Switchover Programme-Programme Structure*, Digital UK, DCMS, DTI & Ofcom, Sept 2005
- 4 *Report of the Digital Television Project*, Digital Television Project, Nov 2004
- 5 *Cost benefit analysis of digital switchover*, DTI & DCMS, Feb 2005
- 6 Multiplex operators (operate the networks using frequencies into which digital television is organised): BBC (Multiplex 1), Digital 3&4 Ltd (Digital 3 and 4 Multiplex), SDN Ltd (now owned by ITV, Multiplex A), BBC Free to View Ltd (Multiplex B), National Grid Wireless Ltd (Multiplexes C and D).
- 7 *Driving digital switchover*, Ofcom, April 2004
- 8 *Regulatory and Environmental Impact Assessment: the timing of digital switchover*, DCMS & DTI, Sept 2005
- 9 *Cost and power consumption implications of digital switchover*, Ofcom report: Scientific Generics, Nov 2005
- 10 *Digest of UK Energy Statistics*, DTI, 2002

POST is an office of both Houses of Parliament, charged with providing independent and balanced analysis of public policy issues that have a basis in science and technology. POST is grateful to all contributors and reviewers. For further information on this subject, please contact Dr Theresa Squire, at POST.

Parliamentary Copyright 2006

The Parliamentary Office of Science and Technology, 7 Millbank, London SW1P 3JA; Tel: 020 7219 2840; email: post@parliament.uk

www.parliament.uk/post