

DigiTAG



HD on DTT

**Key issues for
broadcasters, regulators
and viewers**

published by
DigiTAG - The Digital Terrestrial Television Action Group
17A, Ancienne Route, CH-1218
Grand-Saconnex,
Geneva,
Switzerland.
Tel: +41 22 717 2735
Fax: +41 22 747 4735
www.digitag.org

© copyright 2007 DigiTAG
all rights reserved
Version 1.0

INTRODUCTION

High-definition television (HDTV) services provide viewers with a significantly enhanced television experience. Currently considered the next-generation of television services, they are gaining momentum around the world and are expected soon to become the norm for television viewing.

HDTV services offer notably higher picture quality than the traditional 'standard-definition' television (SDTV) services. Instead of providing an image with 576 active lines, as is the case of '625 line' SDTV in Europe, HDTV provides an image with a format of either 720 or 1080 active lines on the screen. Motion portrayal may also be better than traditional SDTV depending on whether the active lines form a progressively-scanned picture fifty times a second, rather than a complete interlaced image twenty five times a second. HDTV is also always formatted as 16:9, and for equal picture resolution needs proportionately a greater number of picture elements per line than for the conventional 4:3 format.

To transmit the increased amount of data necessary to adequately carry the more detailed images, HD services require more bit rate capacity than SDTV ones. Greater bit rate capacity translates effectively into more frequency spectrum requirement. Hence, the satellite platform, which has a relatively 'limitless' supply of spectrum, was the first platform to be able to offer such services.

Making HDTV services available on the digital terrestrial television (DTT) platform has proven more difficult in Europe given that the demand for spectrum generally outstrips supply. While other parts of the world, notably Australia, Japan and the United States made HDTV services an essential part of their DTT platforms from the beginning, this was not the case in Europe. Rather, DTT services have provided viewers with a greatly increased choice in the number of television programme services, and this has taken up much of the spectrum capacity made available through the innovative use of digital technology.

However, it may be possible for some spectrum capacity to be freed up through the switching off of the current analogue terrestrial television channels. With broadcast frequencies available following analogue switch-off, broadcasters may have the opportunity to offer HD on the terrestrial platform.

Viewers are expressing a demand for HDTV services. Uptake of pay HDTV services has been impressive and more and more households are purchasing HD-ready television sets. With the necessary display equipment available in homes, it now remains for broadcasters to begin to provide the services.

This DigiTAG handbook provides an overview of the issues surrounding the delivery of HD services on the digital terrestrial television platform. It examines such issues as spectrum availability, new technologies, consumer expectations and the business opportunities offered to broadcasters. Without the offer of HD services, the terrestrial platform risks being left behind by the other broadcast distribution methods. To conclude, therefore, the handbook offers some key recommendations in the form of an industry to-do checklist to help facilitate the delivery of HD services on the terrestrial platform, and encourage its continuation.

HDTV Landscape in Europe

HDTV services are available in many countries around the world. Australia, Japan and the United States lead in their HDTV offerings with services available across all the television platforms, from satellite to cable to terrestrial.

In Europe, HDTV services have only recently begun. The first service launched in 2004 on satellite and since then an increasing number of other satellite operators have launched HDTV services in various European markets, as have some cable and IPTV operators. However, these services have generally been offered as part of a pay platform with limited content available. At this stage, no country has yet launched commercial HDTV services on the terrestrial platform.

Satellite platform

In January 2004, Euro1080 became the first operator to launch HDTV services, offering a combination of free and pay-per view content across Europe. Since then, other satellite operators have launched HDTV nationally with such services available in France, Germany, Italy, the Nordics, Poland, Sweden and the United Kingdom. Take-up for these services has been high in the United Kingdom, with the satellite platform operator BSkyB asserting that Sky HD is its fastest-selling additional TV product ever.

The HDTV services have been offered on a pay basis although the public service broadcasters have generally made their HDTV services available for free. This has been the case in Germany, Sweden and the United Kingdom. In Germany, several commercial operators have also offered free HDTV services, although it is not known if they will remain free-of-charge in the future.

Cable platform

The cable platform has also begun the process of offering HDTV services. While few services have yet been launched, an increasing number of cable operators have expressed their interest as part of their move towards digitalisation. At the end of 2006, HDTV services were available in the Germany, the Nordic countries and the United Kingdom. These are pay subscription services.

IPTV platform

Limited HD services are available on the IPTV platforms in Europe. As it is a relatively new platform, IPTV has not yet launched in all countries nor attained a high level of household penetration. However, in countries where IPTV service penetration has been relatively high, such as France and Germany, IPTV service operators have begun launching HD services.

Terrestrial platform

At this stage, limited HD services are available on the terrestrial television platform (HD/DTT). In Sweden, HD content from the public service broadcaster SVT is available in several cities while the Spanish regional broadcaster, TV3, offers several hours of HD content per day in Barcelona. In France, the new media framework which was approved in February 2007, calls for the launch of HDTV services and the CSA (Conseil supérieur de l'audiovisuel) in June 2007 started the process of inviting applicants for two HDTV services to be offered nationwide on digital multiplex R5. Proposals were required to provide a minimum of 25% native HDTV services in 2008 increasing to 30% in 2009 and so on. By the August deadline, the CSA announced that it had received proposals from four potential service providers.

In many countries, HD/DTT services have been demonstrated as part of showcase trials associated with a festival or sporting event as has been the case in France, Italy, Spain, Sweden, and the United Kingdom. These showcase demonstrations have allowed viewers

to understand better the improved quality offered by HDTV, and have given operators and broadcasters experience in handling HDTV in distribution.

Broadcasters in France and the United Kingdom have undertaken more extensive HD/DTT trials while broadcasters in Italy have announced plans to undertake such trials. In France, two trials took place from May to July 2006 and September 2006 until January 2007 in the cities of Lyon, Marseille and Paris. In both sets of trials, HD services were made available on one free-to-air multiplex and generally offered sports and some original French content. In the second trial, the 'HDTV' material essentially consisted of up-converted SD programming.

In the United Kingdom, the public service broadcasters - BBC, ITV, Channel 4 and Five - undertook an HD/DTT trial over a five-month period from June to October 2006 with 450 specially-equipped homes in the London area. The trial aimed to test the technical viability and implications of delivering HD on the terrestrial platform and to assess viewer reaction to such services. In addition, broadcasters on the analogue terrestrial platform, together with manufacturers and retailers, formed an HD/DTT lobby group called HDforAll. This group calls for the allocation of terrestrial spectrum released as a result of analogue switch-off to be reserved for the delivery of free-to-air HD/DTT services.

It is likely that public service broadcasters (PSBs) will face increasing pressure to make their HDTV services available across all television platforms, including the terrestrial platform. It may not be a tenable situation for PSBs to offer their HDTV services only on the cable and satellite platforms, especially in countries where a large percentage of viewers rely on the terrestrial delivery platform.

Spectrum Issues

The terrestrial television platform has traditionally used frequencies in Bands I (47-68 MHz), III (174-230 MHz) and IV/V (470-862 MHz) for the provision of analogue television services. Given that Band I has some technical disadvantages, it has not been included in the planning for digital television.

The advent of digital television technology has allowed for more efficient use of spectrum in comparison with analogue. A frequency channel used to provide one analogue television service can generally accommodate from 4 to 6 or more standard-definition digital television services, depending on the transmission parameters and coding bit rate used.

The move towards digital television on the terrestrial platform allows countries to free up broadcast frequencies for new services, which can include greater choice of standard definition television programmes, mobile television and high-definition television. National administrations will need to decide how best to allocate these newly released frequencies to meet the needs of their local market. However, such frequencies will become available only after digital switchover is completed and all analogue channels are switched off.

Geneva 2006 Agreement

In June 2006, national administrations representing 118 countries agreed to a new plan to regulate frequency usage in the broadcast bands of Europe, Africa and parts of Asia. The Geneva 2006 (GE-06) Agreement establishes a frequency plan for an all-digital environment as well as a plan for use during the transition period when both analogue and digital services are available.

In an all-digital environment, GE-06 allocates frequencies in Band III for DVB-T and T-DAB digital sound radio services while frequencies in Band IV/V are allocated for DVB-T services. Generally, countries have been allocated 3 T-DAB and 1 DVB-T "coverage layers" in Band III and 7-8 DVB-T layers in Bands IV/V.

Because of the flexibility provided in the GE-06 Agreement, national administrations can choose how to use their allocated frequencies so long as they do not require more protection or cause more interference than allowed for by the plan. Although the plan allocates frequencies for DVB-T and T-DAB services, national administrations can use these allocations for other types of services.

The GE-06 Agreement sets 17 June 2015 as the end of the transition period. After this date, countries can begin freely using the frequencies assigned to them in GE-06 for their digital services. Countries will be able to implement the plan earlier, but doing so will require the prior agreement of neighbouring countries that may still be using the frequencies under the analogue plan from 1961 ('Stockholm 61').

The GE-06 Agreement has effectively accounted for the so-called digital dividend in its allocation of frequencies for T-DAB and DVB-T services. The dividend is incorporated in the roll-out of digital services since viewers will be able to access an increased number of DVB-T and T-DAB services or enhanced services such as mobile or high-definition television.

Allocation of spectrum

National administrations will need to decide how they choose to use the frequencies allocated to them as part of the GE-06 Agreement. Options can include DVB-T services in standard or high definition, mobile or portable television, and under some circumstances other technologies such as wireless broadband services.

Some spectrum will be used to provide standard-definition DVB-T services, specifically to replace the existing analogue services that will be switched-off. In some countries, the offer of DVB-T services may be increased to offer viewers an appealing terrestrial television platform and thus encourage the switch from analogue to digital services. In addition, some frequencies will be used to provide full population coverage for DVB-T services.

The frequency spectrum in Bands III and IV/V are particularly advantageous for some types of service since they do not suffer greatly from man-made noise, they need relatively small antenna sizes, lower power levels, and they have a good balance between coverage area and distance between transmitters. As a result, many different service providers, as well as broadcasters, are seeking access to these frequencies. Broadcasters who wish to provide HDTV services may find themselves in competition with other service providers for the right to access these frequencies and given the limited amount of frequencies available, national administrations will need to establish clearly their criteria for spectrum allocation.

Issues that national administrations will want to consider include:

- What applications are ready to be launched and which have an established business model?
- What services can use the frequencies within the GE-06 framework?
- What applications are best suited to the specific frequencies available?
- What applications offer the best 'social utility' by providing services to as wide an audience or customer base as possible?

Whilst the national administrations in some countries may favour a market-based approach where an auction process "sells" available frequencies to the highest bidder, others may instead prefer to allocate spectrum based on a so-called 'beauty contest' where proposals are sought for services which meet cultural or public service obligation thresholds. The actual monetary value of available frequencies is difficult to determine, especially in a market environment where clear business models have not yet been identified.

It should be noted, also, that in many countries, these frequencies will only become available following analogue switch-off. The date for analogue switch-off varies, and is sometimes planned to take place in a regionally-phased way. In some countries, analogue switch-off will not be completed until 2015.

Technical constraints

The terrestrial television platform is limited by the frequency spectrum available and the high demand for such spectrum. The terrestrial platform must be carefully planned to make most advantageous, equitable use of the spectrum to give as many coverages to each geographical area as interference allows. Other distribution platforms such as satellite do not have these constraints, although there are significant long term investment costs for satellite operators who wish to open up new orbital slots.

In general, the provision of high-definition television requires a greater amount of bandwidth capacity compared with the same services delivered in standard-definition. MPEG-2 compression technology has been improving with time since the launch of DTT in 1998, but still the use of the latest, most efficient compression technologies such as MPEG-4 AVC are needed to ensure that a sufficient number of HD services can be provided to viewers.

The HD/DTT trial undertaken in the United Kingdom demonstrated that each HD service will likely need the equivalent bandwidth presently used for 3 or 4 standard-definition services, despite using MPEG-4 AVC compression technology. Over time, it is anticipated that further improvements at the coding stage will eventually allow for two HD services per DVB-T frequency channel.

Gains in bandwidth efficiency may also be provided through the development of new transmission technologies such as DVB-T2 currently in discussion within the DVB Project, which may deliver greater bit rates through the same frequency channels.

It may also be possible to add to the instantaneously available capacity of the terrestrial platform by storing content locally on personal video recorders (PVRs) for time-shifted viewing, or perhaps by combining with other distribution technologies such as to use some of the bandwidth capacity from other television platforms such as IPTV.

Video compression

The majority of European countries have launched DTT platforms using the MPEG-2 Main Profile Main Level video compression standard to offer viewers standard-definition television services. In other countries such as Australia, Japan, and the United States, the MPEG-2 Main Profile High Level standard is used to provide the HD/DTT services.

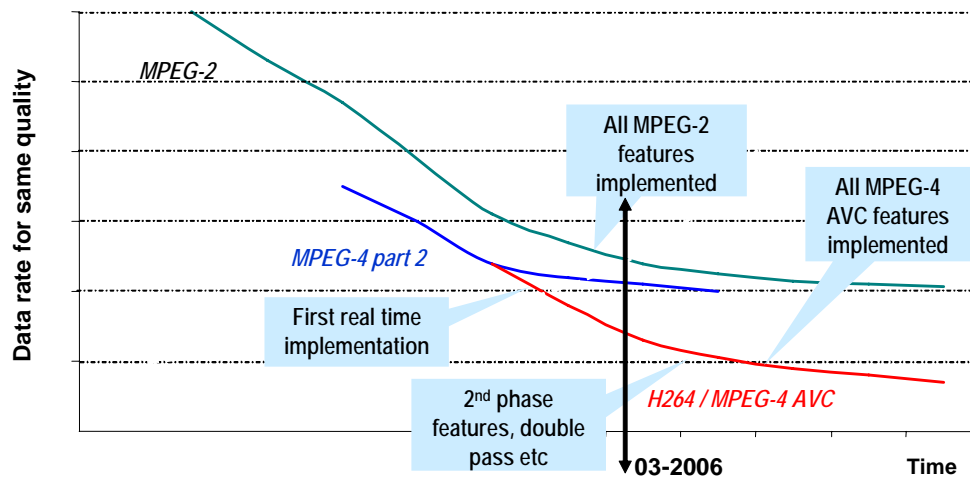
In Europe, it is expected that a launch of HD/DTT services will use the video compression standard MPEG-4 AVC as has been the case for current HD/DTT trials. Some trials have operated with two HDTV services combined into one multiplex, but others have used a higher bit rate for a single HDTV programme due to perceived inadequacies in the early implementations of coders, and the wish to avoid unnecessarily diminishing the HD viewing experience. For future services it will certainly be necessary to carry at least two HDTV services per multiplex to justify the use of the spectrum and make an economically viable offering. Fortunately improvements in the design of MPEG-4 AVC coders are expected over the next few years, and the coding efficiency is expected to follow a similar curve of improvement with time as MPEG-2 has done as shown in the chart on the next page.

The MPEG-4 AVC standard has also been selected for the roll-out of HD services on other television platforms such as satellite and IPTV, as well as in associated consumer audiovisual equipment such as game consoles, camcorders and portable video handsets. Such widespread use of the standard should spur further compression improvements and also help reduce the unit cost of MPEG-4 AVC coding equipment. The signs are also positive that MPEG-4 AVC decoding products are beginning to reach the mass market at acceptable prices.

Research into further video compression technologies has been continuing since the formal standardisation of MPEG-4 AVC, and, for instance, the BBC is developing a video compression tool, Dirac, with the target aim of achieving a two-fold reduction in bit-rate usage in comparison with the MPEG-2 standard.

Comparative Compression Efficiency

Algorithm Progress



U&S HD Conference November 2006

DVB-T2

The DVB Project is currently in the process of developing a second generation broadcasting standard for the terrestrial platform. The standard aims to make use of improvements to modulation and error-protection that have been developed since the specification of the DVB-T standard in 1995.

In a first phase, DVB-T2 is expected to provide a spectrum efficiency increase of at least 30% over DVB-T for a given reception channel profile and under similar conditions. The current commercial requirements specifically call for the use of existing reception antennas and general compatibility with existing transmission equipment and network infrastructures.

Work is currently underway to complete the standard in early 2008 with the expectation that mass volume production and market introduction could take place in 2009.

PVR trickle-down

PVR trickle-down is a proposed technique that allows for the broadcast of HD programming to a viewer's PVR using a slow data stream. The HD content stored on a PVR can be viewed either as an 'on-demand' service or, if only some of the HD content is made available, when the content is broadcast live in standard-definition.

For the technique to work, viewers need a PVR equipped with a large hard disc drive to store the downloaded programmes. Present estimates suggest that HD programming requires five times the storage capacity of SD content.

PVR trickle-down provides realistic means of providing HDTV services to viewers when spectrum may not be available to transmit HD services directly. It also benefits from the growing penetration of PVRs in viewer households and increased storage capacity available on hard drives.

However, it is only likely to be a transitional solution, and its appeal to viewers may be limited since it cannot support live television content, such as sporting events and news. In addition, it could create some confusion for viewers as content would be available in both standard and high definition, and the switch between qualities throughout an evenings viewing may have a disturbing and irritating effect.

This technique may be most feasible when used as part of a video-on-demand service.

Hybrid IPTV/DTT receivers

With the roll-out of IPTV services across Europe, set-top boxes have begun to appear on the market that can receive both IPTV and DTT services. Such dual capabilities could be used as a means to provide HDTV services to viewers.

For example, viewers could continue watching some television services using the terrestrial platform while using the IPTV platform to access HD content, either as linear services or as a video-on-demand offering. The offer of HDTV services on the IPTV platform has become increasingly feasible as higher bandwidth capacity is available for broadband connections.

Much like the PVR trickle-down technique, the use of hybrid IPTV/DTT receivers is only a temporary means to provide viewers with HDTV services until the necessary capacity becomes available for HD services on the terrestrial platform.

Business Issues

The decision to launch HDTV services on the terrestrial platform will ultimately be decided by the market based on viewer expectations as well as the opportunities and costs to broadcasters for the provision of such services.

Viewer expectations

Viewer expectations towards HD/DTT services will be influenced by such factors as the increased household penetration of flat-panel displays, the apparent decrease in quality of standard-definition services on flat-panel displays, the emergence of new HD-capable technologies and the desire to watch high profile sporting events in HD quality. In addition, as viewers are increasingly exposed to HD content, through the take up of Blu-Ray and HD-DVD, they will consider HD content to be the de-facto television “norm” while standard-definition will be considered substandard.

Already, trials of HD services on the terrestrial platform have demonstrated a high-level of viewer interest. This has been most evident in the HD/DTT trial which took place in London between June-October 2006.

According to the trial results, 98% of participants believed it is important for HD content to be available on the DTT platform with 86% expecting these services to become available in the next three years. For 71% of the trial participants, HDTV will become the quality benchmark for all television in the future.

These results demonstrate that viewer expectations are high and a strong demand for HD/DTT services exists. However, expectations may be overly optimistic regarding the timeframe for the delivery of services.

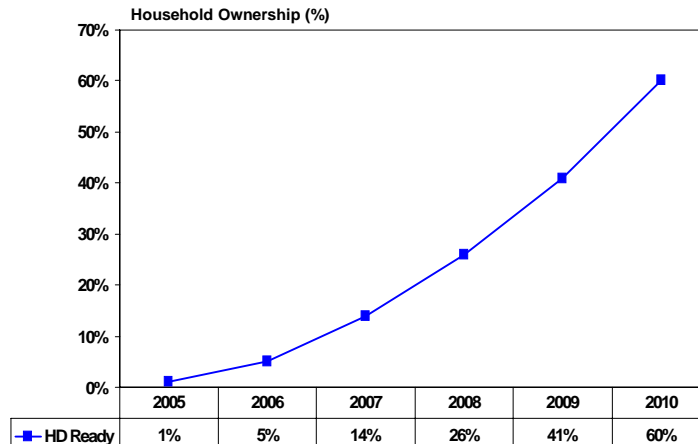
Growth purchases of HD-ready displays

Across Europe, consumers are purchasing flat-panel television displays. It is estimated that by 2008, almost 50% of European households will have flat-panel displays, with penetration expected to increase to 87% by 2010. The popularity of flat panel displays is due in part to the modern ‘look’ and flexibility of mounting compared with traditional cathode ray tube (CRT) television sets, and also to the continual decrease in purchase price in recent years.

The market growth for flat-panel displays coincided in Europe with the launch of the labelling of ‘HD-ready’ displays. Since the HD-ready logo was formally specified in January 2005, nearly all available flat-panel displays sized 28 inches or larger have been HD-ready. In addition, smaller sized flat-panel displays have subsequently tended to followed this trend and meet the HD-ready criteria. As information on HDTV has become available, consumers have increasingly reacted to the HD-ready logo, preferring to purchase television sets that will be “future-proof.”

The expected growth of the HD-ready displays in consumer households is shown in the chart below.

HD Ready CTV Household Ownership Total Europe*



*Comprises 17 Western European Territories and Poland, Czech Republic and Hungary

Source: Understanding & Solutions

As more and more households become equipped with HD-ready television sets, they will expect to be able to access HDTV services.

Increased image artefacts with flat-panel displays

The reduced picture quality of standard-definition services on flat-panel displays when compared with CRTs has become apparent in recent years. According to the European Broadcasting Union (EBU), which published a technical paper on the topic, “these displays mask picture impairments to a lesser extent than CRTs and thus, compared to CRT displays, are apparent magnifiers of impairments.”

The deterioration in subjective picture quality on flat-panel displays directly influences viewer satisfaction with standard-definition television services. They expect their new flat-panel display to give them a better picture quality than their old television set.

The issue of image quality is further impacted by the widespread penetration of large sized television sets in households. Because flat-panel displays are less bulky than comparatively sized CRTs, the trend has been for viewers to purchase increasingly larger screens than their old television sets. Unfortunately, the subjective decrease in picture quality becomes even more apparent with large screen sizes as encoding and decoding artefacts are more visible.

Emerging technologies

An increasing range of HD-capable consumer devices are becoming available, from Blu-Ray and HD DVD players to camcorders and game consoles. Access to these HD-capable devices provides viewers with the opportunity to see unbounded HD quality services and makes standard-definition content appear comparatively inferior in quality.

High-definition optical disc players are slowly entering the European market. The speed of uptake is likely to be influenced by the current high prices, and to a lesser extent the question of whether a single format, either Blu-ray or HD-DVD, is likely to dominate the market. However, these products can be expected to enter viewer households in large numbers in the next few years.

Game consoles will also make viewers more accustomed to HD quality images. Both the Sony PlayStation 3 (PS3) and Microsoft Xbox 360 can show HD content on HD displays from their built in disk players. HD camcorders have become increasingly available at relatively low costs with analysts estimating that almost half of the annual consumer camcorder shipments to Europe will be HD capable by 2010.

As viewers increasingly access HD content, whether through their home videos or DVDs, they will be disappointed if they do not obtain the same quality from broadcast television services.

Event drivers

Major events, especially sporting events, can help drive the uptake of HDTV services. Viewers will be willing to purchase new equipment to access these events in HD quality and subscribe to a platform able to offer HD services.

In 2006, the XXth Olympic Winter Games in Turin and the FIFA World Cup in Germany served as major boosts to HD service roll-out plans in Europe. These events also encouraged consumers to purchase HD-ready displays as was evident by the high number of displays sold in the months leading up to the World Cup.

The next global sporting events that will help drive the market include the Austria/Switzerland UEFA Euro Championship and the Beijing Games of the XXIX Olympiad in 2008, and two years later, the FIFA World Cup in Johannesburg and XXIth Olympic Winter Games in Vancouver in 2010.

Cost to broadcasters

The provision of HDTV services will imply an initial cost burden for broadcasters. These cost increases apply to production, content acquisition and possibly an additional new cost for the use of frequency spectrum.

Production costs

Research by the EBU shows that broadcasters can expect to increase their overall production costs by 10-30% in comparison with standard-definition production. It is expected, however, that the cost differential will decrease in time, especially as the price of HD equipment drops, thus easing the financial decision to migrate to HD production.

Increased costs will vary among broadcasters, depending on such factors as:

- Programme type (sports, documentary, etc). The programme type will dictate the production quality values necessary.
- Staff skills, efficiency and expertise in the areas of project management, technical, creative design and work flow management.
- Talent (actors).
- Technical infrastructure for production, post-production and transmission.

As noted also by the EBU, it is not possible to provide a cost analysis that is applicable for all European broadcasters given that broadcasters use different business models for programme production. While some broadcasters will produce their own content in-house, other broadcasters act as 'publisher/broadcaster' and purchase their content on the open market.

The technical infrastructure is a key element of overall production costs. However, its impact will be greater on smaller broadcasters than on large broadcasters. Generally large broadcasters continually re-equip their studios with a typical equipment cycle lasting approximately 8 years. In such a scenario, HD equipment can be purchased studio by studio and thus ensuring that each complete HD production unit is created in its entirety.

For smaller broadcasters, it is likely to be necessary to replace a much larger proportion of production equipment at the moment of upgrade to HD. This will engender a cost that cannot be spread over time.

However, the cost of HD production equipment is rapidly decreasing. Currently, the cost of mid-range SD and HD cameras are broadly comparable, although a cost differential still exists at the top-end of camera equipment. However, it will become more difficult for broadcasters to find SD replacement equipment in a few years' time as manufacturers focus increasingly on the development of HD equipment.

Available content

HD quality content is increasingly becoming available for purchase. While costs for this content are comparatively higher than those for standard-definition, it is expected that this difference will soon disappear, especially as HD services increasingly become the norm for television.

Broadcasters can acquire HD content either through in-house production or from independent producers.

Many broadcasters are already producing content in HD even if they do not have the immediate opportunity to transmit their HDTV services. Rather, they are building an HD library archive for the future, becoming accustomed to the particularities of HD production and leveraging sales opportunity for HD content in countries that broadcast in HD, such as Japan and the United States. In-house HDTV production is expected to be the norm for many broadcasters by 2010, although not all broadcasters will be able to produce sufficient content to extend beyond their requirements for a few hours of prime time television per day.

Broadcasters can also generate HD content by up-scaling existing standard-definition content. While the quality of up-scaled HD content is inferior to that of native HD production, up-scaled content offers a cost efficient means to provide HDTV services and ensure its availability at a time when native HD content is insufficient.

Currently, a considerable amount of HD content in Europe has been purchased from independent producers, with much of it originating in the United States. Acquiring HD content, especially US sitcoms and film rights, is an important cost consideration for broadcasters given that the acquisition costs are generally 30% higher in comparison with SD content. Sports rights in high-definition are currently considered premium content and allow rights' holders to demand a higher acquisition price. However, once HDTV becomes the main production and transmission norm, it is expected that these additional costs will disappear.

As HDTV services become increasingly ubiquitous, viewers will expect these services on all television viewing platforms. For public service broadcasters, who generate revenue via viewer television license fees, it will be all the more necessary to ensure that all of the content that they produce, including HD content, is made available to all viewers.

The widespread availability of HD content will be of great significance to the future of HDTV services. Viewers will be enticed to adopt HD services when compelling content is offered and a shortage of such content will limit service appeal. This has been demonstrated by the negative comments generated by viewers during the HD/DTT trial in London due to the regular repetition of some pieces of native HD content.

Cost of the spectrum

Depending on how spectrum is allocated in a given country, it may be necessary for broadcasters to pay national regulators for the use of frequencies on the DTT platform. In other countries, broadcasters may be gifted such frequencies, against an expectation or obligation to provide certain types of service.

The use of a market-based approach to spectrum allocation may escalate the cost of spectrum licenses, depending on the amount of demand such licenses generate. Given that the frequencies available in the UHF and VHF bands are limited, demand will be high as communication service providers compete for the frequency licenses. Because some of these service providers will have plentiful resources to pay high fees, due to their other businesses, they will increase the monetary value of the frequencies.

For organisations which have until now only been broadcasters, such a scenario will prove to be a large cost burden. It will also cause broadcast revenue to be used for the acquisition of frequency licenses rather than such services as content creation and acquisition. This can become an issue for public service broadcasters since viewer license fees will be used to acquire frequencies rather than for producing quality programming.

Business opportunities

Viewers have demonstrated a high interest in HDTV services and expect that these services will become the standard norm for television viewing. According to 71% of participants in the HD/DTT trial in the United Kingdom, HD will become the standard for all television in the future, thus replacing standard-definition television.

But key questions remain regarding the business model to adopt for HD services on the terrestrial platform.

- What kinds of services are offered to consumers and what is the minimum number of services necessary for the HD/DTT platform to be viable?
- Will HD content be offered as a pay or a free-to-air service?
- Will HD generate additional income for broadcasters whether through subscription fees, premium advertisement or an increase to the viewer license fee?
- If only a limited amount of frequencies are initially available, how will terrestrial broadcasters share the capacity?
- Will broadcasters need to simulcast services in both HD and SD format? Will triple-cast with analogue be necessary prior to analogue switch-off?
- Will the HD content offering be available 24 hours a day and offer the same content as currently available in standard-definition?

Broadcasters will need to find answers to these questions when determining how to launch and finance HD services on the terrestrial platform. Issues to be considered include pay versus free-to-air services, possible advertisement revenue and service offering.

Pay versus free-to-air services

In most European countries, HD content is available to viewers who subscribe to the service offering. In a few countries, such as Germany, HD content is available free-of-charge, although it is not known if commercial broadcasters will continue to do so. Rather, they may want to try to capture an initial audience with free-to-air HD services prior to making the offering a pay service.

For broadcasters that currently provide free-to-air services, especially public service broadcasters, it will be much more difficult to offer a pay services. However, these broadcasters must consider how they will generate the extra revenue necessary to launch HDTV services in an initial phase. Over time, however, the cost of HD services is not expected to be any higher than the current costs of standard-definition services.

Advertisement

So long as HD services are viewed as a premium service offering, it may be possible for broadcasters to charge higher prices for HD advertisements in comparison with the prices charged for standard-definition. An HD surcharge could be added given the higher cost of transmission necessary to carry the HD content as well as its time slot alongside premium HD content.

Over time, however, as HD content becomes increasingly available, it is unlikely that broadcasters will be able to charge extra for HD advertisements. Rather, HD advertisements will become the norm.

Service offering

Broadcasters will need to consider how many HD services they will be able to offer on the DTT platform based on the content and capacity available. For viewers to find the service offering appealing, at least 4-5 HD services will need to be offered. Such a package will be the minimum to encourage viewers to purchase new television sets and/or set-top boxes as may be necessary.

According to the participants in the HD/DTT trial in London, 10 television programme services should be offered on the Freeview (free-to-air) platform, although they would be willing to accept a lower offer limited to 6-7 services.

HDTV expected timescale

Delivering HD services on the terrestrial platform will be dependent on the availability of the necessary spectrum capacity in the VHF and UHF broadcasting bands. In most European countries, these broadcasting bands are currently used to deliver analogue and digital terrestrial television services. Following analogue switch-off, some of the released frequencies will be needed to extend the coverage of the digital services, however, it can be expected that some further spectrum capacity may be released.

In preparation for the completion of analogue switch-off, the broadcast industry may want to undertake certain actions to ensure that capacity is made available for HD/DTT services.

Analogue switch-off

Across Europe, countries are beginning to plan for analogue switch-off. The GE-06 Agreement requires that signatory countries end their analogue television services along their national borders by 17 June 2015 to avoid interference with neighbors' digital services. For many countries, it serves as the de-facto analogue switch-off date, especially given that the GE-06 Agreement is legally binding.

The European Commission has also called on countries to switch-off their analogue terrestrial television platform. Recognising that the full benefits of digital switchover cannot be achieved until all countries in a particular region have all switched off their analogue services, the Commission has recommended that its member-states complete switch-off by 2012.

The chart below provides an overview of announced analogue switch-off dates in key European markets.

	ASO date (official or estimated)	Expected range
Fast Track		
The Netherlands	2006	2006 - 2008
Finland	2007	
Sweden	2007	
Germany	2008	
Middle term		
Denmark	2009	2009 - 2011
Norway	2009	
Switzerland	2009	
Austria	2010	
Last		
Spain	2010	2012 - 2015
Czech Republic	2010	
France	2011	
Italy	2012	
United Kingdom	2012	
Hungary	2012	
Poland	2014	

For many countries, the analogue switch-off date is a proposal that has not yet received the approbation of the broadcast industry. It is not until firm planning begins that the analogue switch-off date can be confirmed. Hence, it is reasonable to question whether all of these target dates will be met.

It is unlikely that many European markets will be able to launch a full HDTV offering on the terrestrial platform until they have completed analogue switch-off.

Broadcast industry to-do checklist

Broadcasters, together with other industry groups, will need to encourage the adoption of the HD services on the terrestrial platform. The recommendations below offer the broadcast industry some ideas on steps they should consider to ensure that HD/DTT becomes a reality.

✓ Action to improve awareness of HD among terrestrial broadcasters

Terrestrial broadcasters should develop greater awareness of issues concerning HD broadcasting and programme production, and build their knowledge of developments across Europe.

✓ Action for terrestrial broadcasters to adopt a roadmap for HD production

Terrestrial broadcasters should actively establish HD programme production roadmaps, leading to a date as early as possible where 100% or a 'maximum amount' of programming will be produced in HD.

✓ Action to promote industry consistency over HD phraseology

Manufacturers should create and promote a common and consistent set of terminology and descriptions for HD resolutions, in order to continue to successfully promote HD and educate consumers about the different HD resolutions available.

✓ Action to establish and co-ordinate national HD Forums

The broadcast industry can establish national HD forums across Europe where they may not already exist, and seek to ensure that such forums are as widely representative of HD/DTT stakeholders as possible.

✓ Action for a firm analogue switch-off date

Terrestrial broadcasters should fully engage with regulators and governmental departments to lobby for firm analogue switch-off dates and stress the importance of adhering to published deadlines.

✓ Action regarding spectrum allocation to HD/DTT services

Terrestrial broadcasters should fully engage with regulators and governmental departments to support the allocation of spectrum to HD/DTT services at costs that are affordable to terrestrial broadcasters.

✓ Action for UHF spectrum to be retained for primarily terrestrial television services

Terrestrial broadcasters should fully engage with regulators and government departments to support the allocation of UHF spectrum primarily for terrestrial television services.

✓ Action for a target cut off date for SD digital terrestrial broadcasting

Terrestrial broadcasters should convince regulators and government departments, in countries where requisite capacity can be made available, that a fixed date for the total conversion of SD broadcasts to HD is necessary to encourage the development of HD/DTT.

✓ Action for manufacturers to integrate MPEG-4 AVC into iDTVs and STBs

Consumer electronics manufacturers should incorporate MPEG-4 AVC chipsets at the earliest opportunity in their products across Europe.

✓ Action for DTT broadcasters and IPTV operators to develop hybrid HD services

DTT broadcasters and IPTV operators should begin discussions leading towards the development of hybrid DTT / IPTV services for delivering HD content to consumers.

