



Final Report for the European
Commission

Public policy treatment of
digital terrestrial television
(DTT) in communications
markets

26 August 2005

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0 Executive summary

This document is the final report on a study carried out by Analysys on the public policy treatment of digital terrestrial television (DTT) in communications markets for DG Information Society and Media, European Commission. Its target audience includes the broadcasting industry and broadcasting policymakers (governments and regulators) in Europe. The report places DTT in the context of other digital television platforms and draws upon experience to date to identify DTT success factors. Public policy towards DTT is explored, highlighting the objectives of Member States. The extent to which public institutions may legitimately support DTT is explored, as is the contribution of new digital technologies.

This study is the result of a joint effort by Analysys, Hogan & Hartson and Aleph. Analysys has taken the lead role, with Hogan & Hartson focusing on the legal context of digital television, and Aleph contributing from a technical perspective.

0.1.1 Digital television platforms and their suitability for providing widespread coverage

In most EU Member States (as well as most countries in the world), television broadcasting has traditionally been dominated by terrestrial networks using analogue technology. Such broadcast systems require significant spectrum resources that are scarce: the benefits of a migration to digital broadcasting have become accepted, which include freeing up of such valuable spectrum as well as improving the quality of the service.

Developments over the past two decades have led to various technology platforms being able to provide digital television: many satellite (DTH) operators have been launched, new digital cable networks have been built and many analogue cable networks upgraded. More

recently broadband networks have established themselves as serious digital television platforms (IPTV). Given these developments, as migration from analogue to digital television takes place, there is no reason why the traditional focus on the terrestrial platform should be maintained. A scenario is possible whereby multiple platforms collectively provide full digital television coverage.

In the EU today, commercial broadcasters (CSBs) are largely allowed to choose the digital transmission network of their choice. However, as far as public service broadcasters (PSBs) are concerned, this is less clear, with many advocates for a continued emphasis on the terrestrial network (e.g. Ofcom in UK).

PSBs are typically required to provide television coverage to the majority of the population. This is akin to the universal service obligations (USO) that are imposed on dominant telecoms operators. Telecoms operators are mostly allowed to choose the technology they prefer in order to deliver services to remote areas (as long as the technology can provide the required service). In principle, television broadcasters should also be allowed to choose the transmission network of their liking. Indeed, broadcasters may then use market mechanisms (for example, tenders or auctions) to select the most appropriate transmission network.¹

From a policy perspective, the required emphasis needs to be on deciding what and how much content (or channels) is in the public interest. The choice of the network may then be made by broadcasters, on the merits of each technology. Doing this would be consistent with the principle of technology neutrality, a widely accepted concept guiding regulatory policy in Europe and beyond. There are good reasons for technology neutrality: in dynamic markets with rapidly evolving technologies, governments'/policymakers' focus on specific technologies has often not been successful. A recent example of focus on a particular technology limiting market success may even be found in digital television: in Finland, a focus on the multimedia home platform (MHP) standard contributed to the early failure of DTT (see Annex A.4).

¹ Note that there is currently a move towards not requiring the incumbent telecoms operators to be the USO provider. Instead, auctions may be used in which various companies may compete to provide USO services to particular areas. However, such a regime is difficult to implement in the field of broadcasting: whereas different companies may provide similar telecoms services, this is not the case in broadcasting: the service is more specific in nature, limited by what content is deemed to be suitable for public service broadcasting.

Having argued for allowing broadcasters to choose the most appropriate technology/transmission platform, the objective of analogue switch-off places some constraints. Analogue switch-off requires not only availability of digital television (coverage), but also high penetration, without which switch-off will be politically unacceptable. This places the incumbent transmission platform in a special position: where a large proportion of the population depends on a given transmission platform, a rapid migration from analogue to digital television (as per EC objectives) may only be achieved with a significant contribution from such a platform.

From the perspective of policymakers in countries with high dependence on a specific platform, a rapid shift towards alternative platforms may be considered risky and politically difficult to sell. Thus, in some cases there may be a conflict between the principle of technology neutrality and the objective of rapid analogue switch-off. European Community Law allows technology neutrality to be sidelined only under certain specific circumstances, and Member States are required in the electronic communications framework to take utmost account of this principle.

In Member States where no single transmission platform dominates, a multi-platform approach may be adopted, with various platforms collectively providing full digital television coverage. The platforms differ from each other, both qualitatively as well as in terms of costs. This will impact the choice of platform by broadcasters, including PSBs with obligations for near-universal coverage.

Given network costs, wireline platforms (cable and IPTV) are unsuitable as platforms that may replace free-to-air (FTA) analogue terrestrial and provide nationwide public service broadcasts, except where the networks already have widespread coverage.² In other countries, such platforms may contribute to the digital migration by serving customers that are willing to pay towards the high cost of rolling out such networks. Instead, wireline platforms differentiate themselves by their high transmission capacities and advanced interactivity.³

² For example, the Netherlands and Belgium, where past cable investments have led to high cable coverage.

³ Note that availability of wireline platforms is greater in densely populated areas where terrestrial coverage is easy/cost-effective.

From a network cost perspective, satellite (DTH) represents the only real alternative to terrestrial networks for coverage of non-urban areas, thus ensuring nationwide public service coverage. For medium to large countries, such coverage is both easier and cheaper (per household covered) via DTH. DTH may also enable more content to be broadcast than DTT, which is constrained by the spectrum available. However, for small countries (or countries requiring regional programming ?), DTH may not represent an economically viable alternative to DTT⁴.

Where broadcasters have full control over which network they prefer to use, network economics may not be the only (or even the key) factor in selecting the platform for providing coverage to non-urban areas. After all, transmission typically represents a limited part of a broadcaster's costs and any discontent or reception difficulties experienced by households may affect viewing and, in the case of CSBs, advertising revenues⁵. Additionally, each platform has a number of qualitative strengths and weakness that will impact the decision.

For example, the terrestrial platform benefits from using an established, low end-user cost technology, allows local content to be broadcast and has proven to be broadly robust. (Localised failures may nevertheless occur. Some transmitters cover a significant percentage of the population and a failure at such a transmitter may affect a large number of people. Such an event took place in New York on 11 September 2001.) However, the terrestrial platform also suffers from significant shortcomings that include a limited capacity dependent on scarce spectrum resources, difficult coverage of certain terrains such as mountain areas and limited potential for interactive services.

The DTH platform, by comparison, is the only platform that enables wide coverage in most locations, and this can be provided by a single satellite. DTH may also broadcast a large number of channels, assuming sufficient transponders. However, end-user costs of DTH

⁴ Note that DTH costs are independent of the population covered: if a mechanism is developed whereby DTH transmission costs are dependent on the coverage provided, DTH may become an economically attractive platform for small countries as well. However, such a value based costing mechanism would go against the principle of cost orientation, one of the potential remedies where an undertaking is considered to have SMP in market 18 under the Framework Directive.

⁵ Broadcasters refer to content providers and not network operators. Transmission represents a relatively small proportion of broadcasters' costs (that are dominated by content): in 2004, 9% of Channel 4 (UK broadcaster) total costs were transmission related. At ITV (UK broadcaster), 71% of the operating costs were content or staff related (excluding general and administration costs, advertising costs, etc.). The same figure was 67% for Antena3 (Spanish broadcaster).

may be much higher than DTT (given need for in-house wiring and antennas). DTH may not enable local content to be easily broadcast and a risk of catastrophic satellite failure exists. Less importantly, delivery of FTA content via DTH may result in content rights issues (though encryption may resolve this)⁶. Moreover, reception is likely to be less than 100% as steep cliffs and high buildings create shadow areas (though a hybrid DTH/DTT approach may address the coverage ‘holes’).

Apart from the difficulties with migrations between platforms, and the individual pros and cons of each platform, other factors may impact the choices made by Member States. Besides spectrum efficiency and pluralism, which are common digital television objectives of Member States (and can be achieved irrespective of the digital platform to which they have migrated), some Member States consider having multiple transmission platforms as key objectives as this may help ensure competition between platforms. Other Member States seek a contribution to ICT development: though wireline platforms are better suited, ICT development using televisions may be easier in countries with low PC penetration.

Given the above, PSBs across Europe are unlikely to adopt a homogeneous means of covering non-urban areas. Some Member States may opt for DTH to provide coverage in non-urban areas, with urban areas likely to be served by multiple transmission platforms. Equally, DTT, despite its capacity limitation, may represent an appropriate platform in some Member States for achieving full digital television coverage: it is capable of delivering a sufficiently attractive multi-channel offering.⁷

0.1.2 Development of DTT: business models, key success factors and regulatory environment

Business models used for DTT have evolved since its launch in November 1998, when Ondigital launched in the UK with its offer of a pay-TV package. Subsequent developments in Europe, including the UK, have resulted in new DTT business models being designed and the following three business models currently exist:

⁶ Where the DTH signal goes beyond areas for which the broadcaster has acquired content rights, the broadcaster may need to compensate the content owners.

⁷ As demonstrated by the success of Freeview in the UK.

- *Pay-TV platform* – DTT multiplexes are used to provide a premium content offering in direct competition with cable and DTH and primarily financed by subscription revenues. This was the original model in the UK, Spain and Sweden. Though a DTT pay-TV platform exists in the Netherlands, it does not provide premium content.⁸
- *FTA platform* – DTT multiplexes are used to offer a variety of FTA channels, financed either by public funds (in the case of PSBs) and/or advertising revenues. This was the original business model in Italy, Finland and Germany, and has been the business model in the UK since May 2002.
- *Hybrid DTT* – an offering combining a number of FTA channels supported by public funds or advertising revenues, together with a limited pay offering. Migration to a hybrid DTT model has taken place in the UK, Sweden and Finland.

Most pure pay-TV models have not succeeded. A review of DTT evolution across the countries where DTT has been launched shows that an FTA offering has been crucial to the take-up of the platform. Following the success of FTA DTT, a trend towards a hybrid model is emerging, combining FTA with some form of pay-TV.

The arrival of a hybrid model has also brought some innovation to the pay-TV market: in some countries such as Italy (PPV events) and Sweden (subscription), pay-TV is sold using prepaid cards. As in the case of mobile telephony, the lack of a contract may help take-up. Furthermore, such a revenue collection mechanism is more suitable for customers generating low-medium monthly revenues (EUR15-20 per month), as is likely to be the case with pay-TV offerings not containing premium content, and PPV events.

A review of DTT developments to date highlights that four key factors are required for the market take-up of DTT services.

- Firstly, an attractive offering is required that delivers tangible benefits at an affordable cost. What may be considered ‘attractive’ depends on market conditions and varies between countries. Where penetration of multi-channel television is low, FTA multi-channel has been the key attraction. However, in markets where multi-channel is already ubiquitous, DTT has differentiated itself via other means including technology

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Premium content refers to coverage of key sporting events and recent movies from major US producers. Instead of competing with premium cable and DTH offerings, DTT in the Netherlands is priced close to cable charges such that most households in the Netherlands consider it as a normal utility-like expense.

improvements (better sound and picture quality than analogue television, portable indoor reception, etc.).

- Secondly, a further requirement for DTT success is low cost and widely available set top boxes (STBs). Recent price falls mean that in many countries the requirement of cheap STBs has been met.
- Thirdly, all successful implementations of DTT have required a strong campaign of market communication. Consumers are largely unaware of the value of DTT, and need information on presence and contents of the offering, benefits to them, technical issues (coverage, STBs, etc.) and precise switch-over dates (where this is imminent). However, clear market communication is only possible where a clear and stable regulatory regime exists.
- Finally, DTT development requires that a range of stakeholders need to be brought together and incentivised to drive DTT. This includes policymakers, content owners, broadcasters as well as network owners. Another analogy with mobile telephony may be appropriate: whereas in mobile telephony the incumbent service providers willingly migrated to digital technology driven by clear economic benefits, this is not the case with the migration away from analogue terrestrial television (ATTV).

The migration from ATTV to DTT presents a risk for incumbent analogue terrestrial broadcasters. While DTT improves the quality of TV broadcasting and puts it on a more equal footing to the other digital platforms, implied consumer switching costs (primarily STBs) increase the risk that viewers may migrate to other (non DTT) platforms. Furthermore, unlike the case of mobile telephony, instead of benefiting the incumbent broadcasters, migration to digital technology may instead confront them with new competitors (given the increased terrestrial transmission capacity). Although DTT transmission costs are lower than those for ATTV (per channel), migration may imply higher overall costs for incumbent broadcasters: in the short term, if a simulcast period is required, broadcasters will need to pay for both analogue and digital transmission. In the longer term, they may need to pay for transmission of several channels to maintain the same market share as in the analogue world. Thus, the interests of each stakeholder need to be considered, and a framework developed that aligns these interests without infringing Community law.

Regulatory decisions have had a significant impact on the outcome of DTT projects. Early DTT ventures suffered from the specification of an unviable pay-TV business model, the imposition of high-coverage obligations on commercial broadcasters and technical specifications leading to expensive STBs. However, in general, the latest regulatory developments in the EU have addressed the shortcomings of the first DTT ventures in Europe:

- in most countries, either the choice of business model has been left to industry or an FTA business model has been chosen by policymakers
- coverage obligations for commercial broadcasters have typically been softened or lifted altogether
- furthermore, despite strong continuing interest in developing interactive services and the MHP standard, with a few exceptions, policymakers do not plan to impose specific services or standards on the market.

However, policymakers in Europe are still faced with the key regulatory challenge of how to ensure full digital television coverage. As mentioned above, DTT may represent an appropriate platform, and this path has been adopted by the UK for PSBs. However, most other countries have not yet decided upon their own strategies for digital television coverage. Also, in spite of falling STB prices, the difficult regulatory challenge remains of how to ensure take-up of STBs and full penetration of digital television. This may require regulatory measures in Member States with high dependence on terrestrial broadcasting as the primary means of receiving television programming.

0.1.3 Legal context for DTT

Digital television developments in Europe take place within the context of the legal framework established by Community law. The existing legislation affecting DTT includes specific media legislation, various directives in the field of electronics communications, and competition law. Competition law provides limits on subsidies that may be provided to a specific transmission network (such as DTT), or those that may be considered to be State aid. However, for services that are deemed to be in the general economic interest, Community law permits some degree of policy intervention that might otherwise be inconsistent with competition rules.

In some markets where terrestrial is the dominant means of broadcast television, Member States believe that DTT should be promoted in order to achieve analogue switch-off due to difficulties in rapidly migrating large numbers of households to alternative platforms⁹. This may require incentives to be provided to key stakeholders to ensure their active co-operation. In particular, participation of incumbent broadcasters is a key criteria for DTT success given their dominance of audience ratings. However, in order to incentivise industry to develop DTT, some Member States have taken measures that have raised State aid and other competition concerns, such as reserving spectrum for incumbent analogue broadcasters and providing ‘must-carry’ status on certain networks.

Community law allows for public intervention in markets where ‘clearly defined general interest objectives’ exist, subject to a number of conditions such as clear definition and entrustment, necessity, proportionality, and limited distortion of competition. Consequently, if such objectives can be demonstrated by Member States as underpinning spectrum reservations and ‘must-carry’ status (and the conditions are fulfilled), State aid concerns may be allayed. In fact, the use of such measures in digital broadcasting is a continuation of traditional broadcasting policy: public subsidies have historically been widely used in analogue television broadcasting. However, extending these approaches into the digital environment, in light of substantial changes in markets and technologies, requires new justifications and not mere legacy regulation from the analogue environment. Thus, new questions must be answered, such as:

- how much content is in the general interest
- if the terrestrial platform is required to achieve a general interest objectives such as analogue switch-off¹⁰
- if the terrestrial platform is required, how much aid is appropriate for DTT and what steps are required to ensure that aid does not discriminate amongst distribution platforms.

Thus, essentially it is a question of defining the quantity of content that is in the general interest and whether or not the terrestrial platform is required to achieve clearly identified objectives that are of general interest. The first of these questions is primarily a matter for

⁹ Note that other arguments have also been made (for example, see Annex A for arguments provided by Ofcom).

¹⁰ If the terrestrial platform is required, the spectrum that may be reserved for PSBs and ‘must carry’ rights on alternative networks should depend on the amount of content deemed to be in the general interest.

Member States: Community law gives Member States a wide remit regarding the definition of ‘services of general economic interest’ in the broadcasting field. We discuss this and other questions below.

Although policy intervention to assist broadcasters may be acceptable under certain circumstances, the impact of any measure taken on other electronic communications markets needs to be considered. For instance, while some subsidies towards DTT broadcasting by a PSB may be acceptable, Member States should ensure that this will not negatively impact other markets where the broadcasting network operator is present. Moreover, Member States must pay strict attention to how subsidies given to one platform will affect other means of distributing broadcasting content.

The European Commission should possibly take a role in providing explicit guidelines. Some concern exists that the application of Community rules to ‘services of general economic interest’ is not sufficiently clear: the Commission may choose to provide explicit guidelines regarding the treatment of such issues in the context of DTT. Such clarity will help accelerate the switchover process; it will also help meet the proposed deadline of 2012 as some Member States may be awaiting EC rulings before launching DTT migration plans, in order to avoid breaching competition rules.

The Commission may also aid Member States by providing greater clarity on other aspects of Community law. We note that only a few Member States have implemented the various electronics communications directives to the broadcast transmission market. Furthermore, where such directives have been implemented, Member States interpret them in different ways. This is the case with the *Framework Directive*: in the five Member States (namely Ireland, Austria, Finland, the UK and Sweden) where it has been applied, very different approaches have been adopted. We believe that such differences indicate that Member States would benefit from the Commission’s support in disseminating best practice and providing guidelines for regulatory measures.

0.1.4 Contribution of new digital technologies

Digital television technology is still evolving. Below we consider the following three developments: high-definition television (HDTV), mobile broadcast television (DVB-H) and advanced video coding (AVC).

HDTV is an enhancement to standard definition television (SDTV), which delivers a richer viewing experience. A number of developments are taking place that may drive HDTV:

- rapid sales of flat-screen televisions
- imminent launch of high-definition DVDs
- competition between multi-channel television platforms leading the search for the next innovation in broadcasting
- consumers are also being accustomed to paying for high-definition-like innovations, such as home cinema and wide-screen television.

Although HDTV is suitable for distribution via all delivery platforms, satellite and cable platforms have certain advantages. An HDTV channel distributed via satellite is already available in Europe, and satellite and cable are likely to see several more European HDTV launches over the next few years.¹¹ Insufficient terrestrial spectrum is available for HDTV in most European countries and, despite advances in encoding technologies (see below), this is expected to be the case until analogue switch-off.

However, the success of HDTV depends on relevant content being produced, the availability of means of transmission and the availability of affordable receivers for viewers. This will require significant industry co-operation, as these requisites are interdependent – for example, if receivers are not available for purchase, broadcasters may not invest in transmission, and without broadcasts, manufacturers may not promote the receivers. Also, a number of technical issues surrounding HDTV are yet to be resolved: for instance, the transmission format needs to be decided upon. In order to avoid market fragmentation arising from different technical options for HDTV, market players have developed, with the encouragement of the European Commission services, a ‘Roadmap on HDTV Technical Interoperability’.

¹¹ See www.hd-1.tv for further details on the HDTV channel.

DVB-H-enabling mobile TV reception is another service that may be launched using terrestrial spectrum. However, in spite of strong interest some key challenges lie ahead in DVB-H development:

- incompatibility with GSM900 terminals may prevent the use of the upper UHF band (the band in which DVB-T services are implemented in many countries)¹². This may restrict DVB-H deployments prior to analogue switch-off unless equipment manufacturers develop a solution
- DVB-H services may use the broadcasting UHF band or the mobile telecom bands. However, such spectrum in the UHF band is unlikely to be widely available before analogue switch-off, limiting DVB-H deployment.

In addition to the above challenges, one of the crucial issues is finding a viable business model. DVB-H service rollout will require significant network investments; at present, it is not clear how the deployment of DVB-H networks will be funded. In addition to network investments, incorporating receivers into handsets implies an incremental cost that the mobile industry may need to support. However, the mobile industry is unlikely to support the development of mobile TV via DVB-H as mobile operators have recently made large 3G investments and will be focusing on achieving a return on these. They may therefore be unwilling to invest in another technology before the potential of their current investment is realised, despite DVB-H providing a much cheaper implementation for point-to-multipoint content delivery than a 3G network. Indeed, mobile TV via 3G may help operators achieve greater 3G penetration, and the introduction of mobile TV via DVB-H may put this 3G growth at risk. Consequently, even where spectrum is available (Finland, for example, where a multiplex has been reserved for DVB-H), commercial deployments may be more than three years away.

Another new technology, namely AVC, may help increase the possibilities of digital television by reducing the transmission capacity required for applications¹³. AVC is coding technology that offers a much higher coding efficiency than the incumbent coding technology (MPEG2),

¹² All GSM900 backwards compatible terminals are affected.

¹³ AVC is also known as ITU-T H264 or MPEG4 pt10.

and allows plenty of room for further enhancements. Furthermore, the benefits of AVC may be enjoyed by both low bit-rate applications (for example, DVB-H) and high bit-rate applications (for example, HDTV). The coding efficiency of AVC will facilitate the development of digital television where capacity is constrained, as is the case with DTT in many Member States. However, AVC is not backwards compatible with MPEG2, leading to compatibility problems with STBs already installed in some Member States.

By increasing demand for digital television (via various platforms), these new technologies will contribute towards achieving the switchover target of 2012 across Europe. In the short term, several launches of HDTV services are expected, starting with DTH platforms. However, DVB-H is likely to take a few years before market introduction, given technical and business issues. By reducing the capacity requirements, AVC will assist the deployment of both of these new services and may lead to HDTV services via DTT (though this may not occur until analogue switch-off).

0.1.5 Role of the European Commission in promoting digital television

The European Union has previously contributed towards the development of television services and technologies. Over 1993-97, the European Union committed approximately EUR206 million towards the development of wide-screen television services. However, such direct market intervention by the European Union may no longer be required.

The Action Plan for wide-screen television that committed such funding was designed to overcome a market failure whereby broadcasters would not invest in transmissions without receivers, and manufacturers would not develop receivers without broadcasts. No such market failure exists anymore. Where suitable regulatory environments exist, commercial digital television platforms are gaining large numbers of subscribers. The same exists with respect to new technologies: already an HDTV broadcast via satellite is available in Europe and many more HDTV services are expected to be launched over the coming years. Although some key challenges exist to DVB-H development, significant industry interest exists in the technology and commercial solutions are likely to be found.

On the other hand, given the benefits associated with analogue switch-off, there may be scope for public intervention to ensure that switch-off is not delayed. Such interventions

that may favour individual transmission platforms need to be decided on a country by country basis, given the significant differences that exist between national markets. Given such Member State specificity, national authorities may be best placed to assess whether and what type of intervention is required. The European Commission may assist by providing clarity as to how far any interventions may go, including guidance on principles of State aid in the context of digital television: in spite of two Switchover Communications, uncertainty remains in this area.

The European Commission can make further substantial contributions to facilitate the development of digital television in Europe. A number of other areas of European legislation currently permit multiple interpretations and lead to some uncertainty and risk for various stakeholders involved in digital television development. Providing greater clarity in the following areas of European law will help Member States accelerate their plans for digital migration:

- ensuring that changes to Community media law avoid gaps or inconsistencies between regulation of broadcasting versus information society services
- specific guidance on the determination of broadcast transmission markets eligible for *ex-ante* regulation to complement that already in place
- guidance and exchange of ‘best practice’ concerning ‘must-carry’ rules
- continued information sharing and possible Community harmonisation of spectrum management issues relevant to DTT.

In its recent Switchover Communication,¹⁴ the Commission proposes that the beginning of 2012 be agreed for switch-off in all Member States. Although this provides a challenging target, especially given that many Member States have not yet developed their switchover strategies, further guidance from the Commission on the above issues will help Member States in meeting this deadline.

¹⁴ COM(2005) 204 final, 24.05.2005 at page 6 (“2005 Digital Switchover Communication”).

1 Introduction

This document is the final report on a study carried out by Analysys on the public policy treatment of digital terrestrial television (DTT) in communications markets for DG Information Society & Media, European Commission. Its target audience includes the broadcasting industry and broadcasting policymakers (governments and regulators) in Europe. The report places DTT in the context of other digital television platforms and draws upon experience to date to identify DTT success factors. This incorporates analysis of network economics, DTT business models and the regulatory environment in Member States. Public policy towards DTT is explored, highlighting the objectives of Member States in developing DTT and the regulatory challenges that lie ahead. New technologies relevant to the development of digital television in Europe are also covered.

This study is the result of a joint effort by Analysys, Hogan & Hartson and Aleph. Analysys has taken the lead role, with Hogan & Hartson focusing on the legal context of digital television, and Aleph contributing from a technical perspective.

1.1 Project objectives

Within the next decade, analogue terrestrial broadcasts are scheduled to be switched off across Europe, with a migration to digital television taking place. This will result in many benefits to Europe's citizens such as higher-quality television services and the freeing of spectrum, which may be used for broadcasting or other activities. However, the migration raises a number of questions:

- is it simply a case of replacing analogue terrestrial with digital terrestrial broadcasting, or should we replace analogue terrestrial with a mix of digital television platforms?

- if DTT is to contribute towards the migration, how do we ensure that it is successful?
- if DTT success requires some support from public institutions, how far can such support go without negatively impacting private investments in alternative platforms, and infringing Community law?
- what contribution may new digital technologies make in developing digital television?

The objective of this report is to address these questions and to identify what measures may be taken at Community level to help Member States develop digital television in general, and DTT in particular. In doing so, we draw upon European experience to date and examine the current objectives of Member States in developing DTT.

1.2 Report structure

This report begins by placing DTT in the context of the various digital television platforms, and explores its strengths and weaknesses, both qualitatively as well as economically. It then focuses on DTT and examines:

- the development of DTT in Europe to date, highlighting the business models that are developing and key lessons for and reasons for DTT success (Chapter 3)
- the regulatory context for digital television across the European Union (Chapter 0)
- developments in new technologies, and their impact on digital television (Chapter 5)
- the impact of existing Community law upon digital television development, and specifically the importance of general interest objectives (Chapter 6).

2 Comparison of digital television platforms

This chapter places DTT in the multiplatform context, comparing it to other digital television platforms, namely satellite (DTH), digital cable and IPTV. A qualitative assessment of the strengths and weaknesses of the different platforms is combined with a quantitative analysis of the implied transmission costs for broadcast channels. We have used this analysis to examine what implications, if any, do the comparative advantages and weaknesses of the platforms have on public policy towards digital television.

2.1 Qualitative comparison of platforms

Where alternative digital television transmission platforms are used instead of DTT, more valuable spectrum resources are available for other applications. Having recognised this advantage of non terrestrial platforms, a variety of other parameters have been considered in order to compare the various digital platforms against each other, and against analogue television. These range from the ability to provide widespread coverage to the possibilities for interactive services. Exhibit 2.1 below summarises the relative advantages that different platforms offer in the transmission of television content.

	<i>Analogue terrestrial</i>	<i>DTT</i>	<i>DTH</i>	<i>Digital cable</i>	<i>IPTV</i>
Widespread coverage					
Capacity					¹⁵
Local content					
Interactivity and ICT development					
CPE cost ¹⁶					
Robustness (against full failure)					
Reception means	Wireless	Wireless	Wireless	Wireline	Wireline

Exhibit 2.1: Platform comparison [Source: Analysys]

As shown by Exhibit 2.1 above, DTT's strengths include its ability to deliver local content and the robustness of the platform. Exhibit 2.2 below shows a typical digital (or analogue) terrestrial television network, which comprises key transmitters, with a number of secondary transmitters dependent on them.¹⁷ Failures in terrestrial networks may occur, though these are typically limited and affect only a few transmitters.¹⁸

¹⁵ Note that, as technology advances, the capacity of broadband networks continues to increase significantly. However, the non-broadcast nature of IPTV implies that (at least in the short term) capacity is limited by comparison to digital cable.

¹⁶ Customer premises equipment.

¹⁷ Secondary transmitters in the case of analogue television are transposers. In the case of DTT, they are both transposers and gap-fillers. Gap-fillers are significantly cheaper than DTT transposers: the number depends on the network configuration (guard interval used).

¹⁸ One example of a significant failure took place in New York on 11 September 2001: the attack on the Twin Towers took out the transmission facilities of the public broadcaster WNET. A nearby surrogate transmitter was required to be used for a period of ten months.

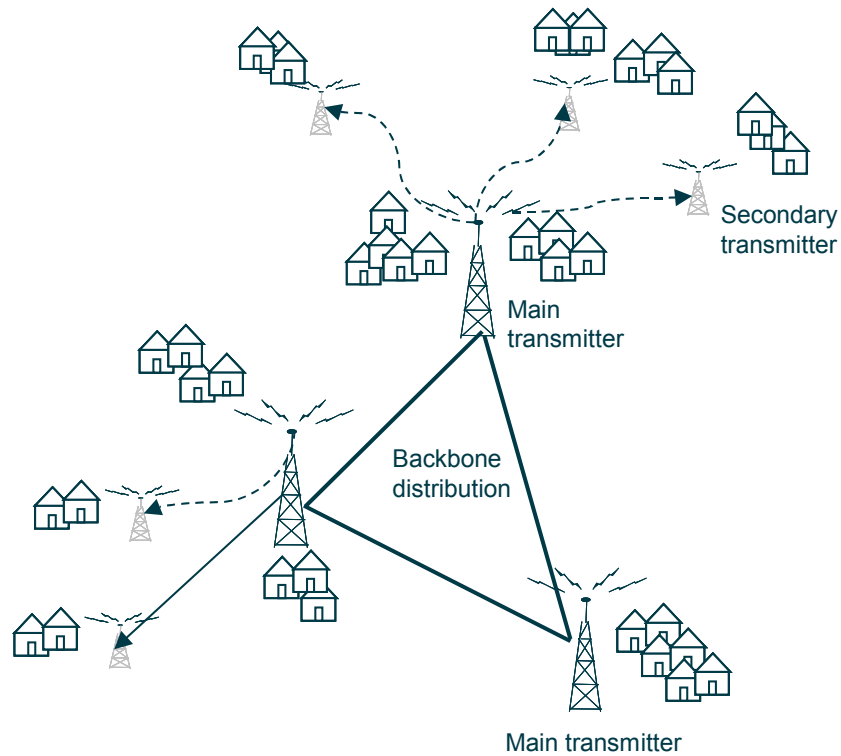


Exhibit 2.2: Terrestrial television network [Source: Analysys]¹⁹

By contrast, DTH networks have a single point of failure – the satellite – as shown in Exhibit 2.3 below. However, DTH enables large numbers of channels to be broadcast using a limited amount of spectrum. Another key advantage of DTH in most Member States is its ability to be received in most locations.

¹⁹ Secondary transmitters may not be used everywhere. Typically, they are found beyond large cities.

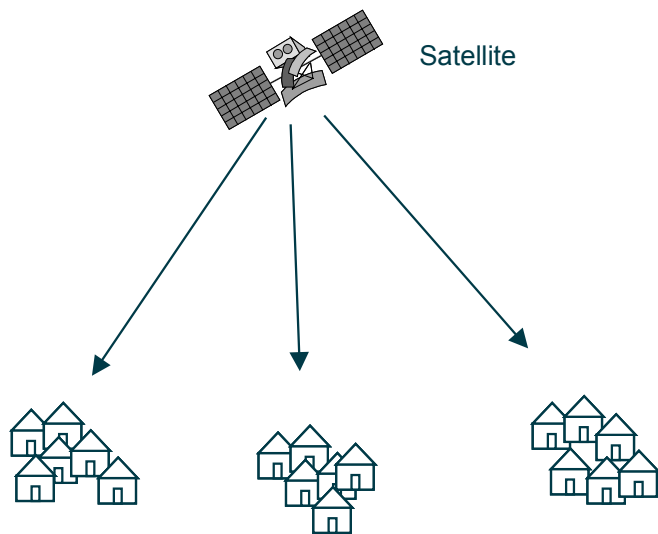


Exhibit 2.3:
 Satellite television network [Source: Analysys]

As shown in Exhibit 2.4 below, cable networks typically consist of a hierarchy of rings that may deliver large quantities of content to households, as in the case of DTH. However, unlike DTH (which is limited by the need for a return channel), digital cable networks are also capable of delivering advanced interactive services.

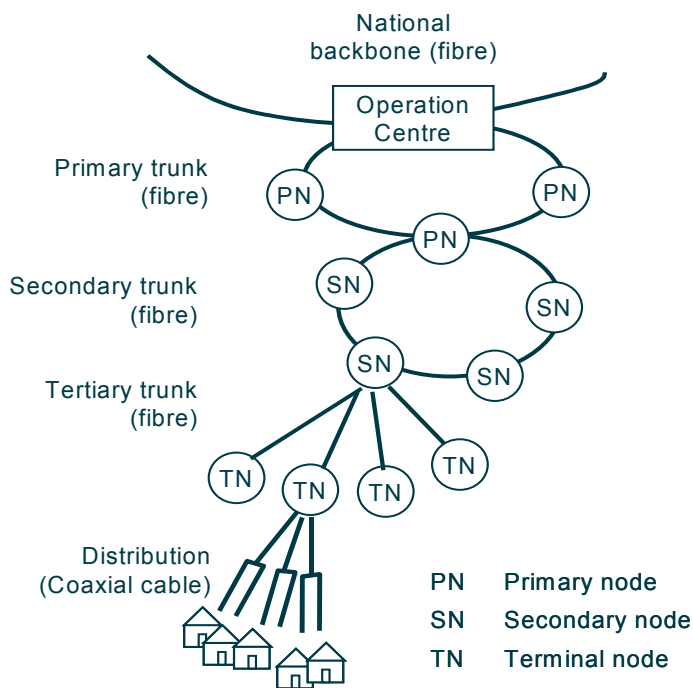


Exhibit 2.4:
 Cable network [Source: Analysys]

Two of the strengths of IPTV are capacity and interactivity. Exhibit 2.5 outlines a typical IPTV network configuration, with content servers at the local exchange providing services to a number of households via individual access lines.

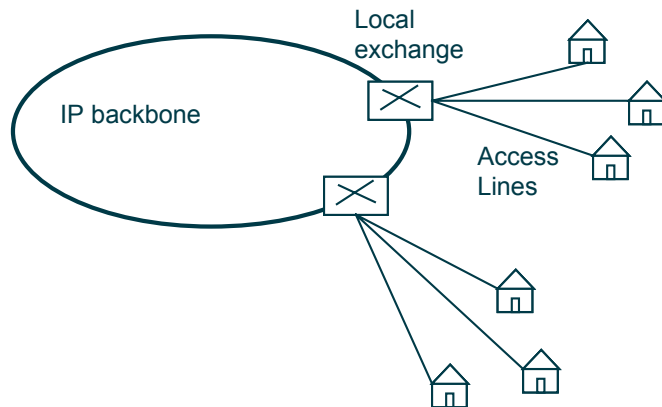


Exhibit 2.5:
IPTV network
[Source: Analysys]

IPTV benefits from new technology developments, which are further increasing the capacity of broadband networks and thus may enable more content to be carried. One such technology is ‘very high-speed digital subscriber lines 2’ (VDSL2), which is an improvement to the DSL access technology, standardised by the ITU at the end of May 2005. VDSL2 may enable asymmetrical or symmetrical transmission, with aggregate data rates of both streams of up to 200Mbit/s via standard telephone lines (i.e. twisted copper pairs). This is ten times faster than current ADSL services and four times faster than new ADSL2+ services. VDSL2 is particularly well adapted to offer a triple play of video, voice and Internet data services.²⁰

The strengths of wireline (cable and IPTV) represent a weakness for DTT, whose capacity is limited by spectrum constraints and also requires a separate return channel for non-basic interactivity. However, this does not prevent DTT from succeeding as a digital television platform: DTT can deliver an appealing multi-channel offering, as demonstrated by the success of Freeview in the UK.

The following table explores in greater detail how the various platforms compare on the parameters presented in Exhibit 2.1.

²⁰ It may provide reliable operation over distances of up to 1.8km from the local exchange. It is interoperable with existing ADSL services and may work with either legacy ATM networks or new generation IP-based networks.

Coverage	
<i>DTH enables widespread coverage</i>	DTH is the only platform that enables wide coverage in most locations, and this can be provided by a single satellite. By contrast, wireline network deployments require wires to enter each household. As a result, cable networks are best suited for high-population density areas and are rarely found in rural areas
<i>IPTV coverage is limited by broadband availability</i>	<p>Terrestrial television represents an intermediate platform that enables substantial population coverage to be achieved with a few transmitters. However, near universal coverage requires a non-linear increase in transmitters, and geographical features such as the presence of mountains can make network deployment difficult</p> <p>IPTV (typically via DSL) coverage is limited by where broadband services are available and the bandwidth possible. In some countries such as the UK, broadband availability is becoming near ubiquitous.²¹ Together with improvements in coding technology that reduce the bandwidth requirement for television, IPTV coverage is set to increase rapidly</p>
Capacity	
<i>Cable and DTH have large capacities</i>	<p>Digital cable systems can carry a large number of channels.²² DTH may also broadcast a large number of channels, assuming sufficient transponders</p> <p>IPTV can offer a wide variety of content, assuming that the local exchanges are connected to a fibre ring. Typical network structure of IPTV consists of local exchanges connected via a high-capacity fibre ring. Individual homes are connected to the local exchange by a copper pair, that can enable ADSL services of above 4Mbit/s</p>
<i>DTT capacity is limited by spectrum constraints</i>	DTT in current implementations has limited channel capacity (as it is constrained by available spectrum) ²³
Local content	
<i>DTH is not well suited for providing local services</i>	<p>Some countries and regions place importance on the broadcast of local content that reflects the specific cultural, social and economic interests of the area. Terrestrial, IPTV and cable platforms allow the broadcast of localised content (including local advertising), relevant to a particular region.²⁴ In contrast, the large coverage of DTH makes localised content difficult. This stems from two reasons:</p> <ul style="list-style-type: none"> • it may not be economically viable to broadcast content that only a limited population is interested in over a large region • content rights may not permit free to air (FTA) broadcasts beyond a certain area, though encryption may be used to overcome this constraint and enable FTA broadcasts

²¹ The incumbent operator, BT, claims that 99.6% of households will be connected to broadband-enabled local exchanges by mid-2005.

²² Note that analogue cable systems are capacity constrained. Traditional analogue coaxial systems operate with 330MHz of capacity, whereas digital hybrid fibre/coax (HFC) systems can utilise 750MHz (or greater) capacity. Total bandwidth varies according to the cable company's head end equipment, but most HFC networks can transmit signals from 54–750MHz.

²³ Upon analogue switch-off in many Member States, a significant amount of spectrum will become available (112MHz in the UK), which may be used to provide many more channels via DTT. However, television will compete with a variety of other applications for the use of this spectrum.

²⁴ The use of multiple transmitters for terrestrial television and the presence of multiplex transmission nodes in cable and IPTV networks enables regional content to be broadcast.

<i>Interactivity/ICT development</i>	
<i>Wireline has the greatest potential; DTT and DTH are limited by the return channel</i>	Wireline platforms (IPTV and digital cable) permit the greatest range of interactive services, including high-speed Internet. Consequently, these platforms allow sophisticated applications to be used. Although DTT and DTH allow some interactivity, including access to the Internet, both systems are constrained by the need for a return channel
<i>CPE costs</i>	
<i>DTT has a current advantage</i>	In the short term, DTT has the set-top box (STB) cost advantage, as STB prices have fallen to EUR60. However, in the longer term, this cost advantage may not be sustained. Factors that have driven down DTT STB prices – open competition between manufacturers and scale economies – may also lead to inexpensive STBs for the other platforms
<i>STB costs may become increasingly less important</i>	However, once prices for STBs have fallen below a certain threshold, they no longer act as a constraint on demand. Indeed, consumers may be willing to pay more for additional functionality, as experienced in the UK recently where the price of the average DTT STB sold has increased (as reported by Ofcom). Consequently, limited differences in the STB costs will not be a significant differentiator between the platforms
<i>The need for antenna places DTH at a disadvantage</i>	The cost to the consumer of DTH is likely to remain higher, given the need for external antennas. Although some households may require antenna adjustments for DTT (additional costs estimated between GBP80–300 per household by Ofcom for the UK), this will only affect a subset of households
<i>Robustness</i>	
<i>DTH has a single point of failure</i>	Satellite systems have a single point of failure. For example, in January 2005, Intelsat experienced a complete failure with one of its satellites, due to an electrical failure. ²⁵ Where television broadcasts depend on DTH, this presents the risk of long interruptions (days or weeks) for viewers, as a change in satellite may imply a re-directioning of millions of household antennas (though it may be cheaper to move the satellite). Although failures also take place in terrestrial networks, their effects are typically limited to few transmitters, only resulting in limited coverage loss
<i>Terrestrial networks have proven to be more resilient</i>	Note that wireline networks are typically very robust
<i>Reception means and business model</i>	
<i>Broadcast reception favours the FTA model</i>	The means of reception have an impact on the broadcaster business model. Potential subscribers may access FTA terrestrial and DTH broadcasts by simply acquiring the appropriate equipment (STB and antenna). As a consequence, terrestrial and DTH platforms are appropriate for FTA broadcaster business models that rely on advertising revenues. However, for wireline platforms, significant investment is required for incremental subscribers. ²⁶ This favours a subscription business model, allowing the network operator to recover the investments made more rapidly ²⁷
<i>Wireline reception favours the pay-TV model</i>	

Exhibit 2.6: Comparison of digital television platforms [Source: Analysys]

²⁵ The satellite in question provided voice and data communications to various South Pacific islands and the failure resulted in a complete cut in communications for some islands. Alternative Intelsat satellites were used to restore communications in most places.

²⁶ In the case of deploying cable to the home; for IPTV, the network operator is required to install a modem at the local exchange as well as in the customers home (assuming copper pairs are used for local access).

²⁷ Note that a pay-TV business model is technically feasible on both wireless and wireline networks. In both cases, encryption is used to protect the pay-TV signal.

2.2 Quantitative comparison of platforms

This chapter presents the results of the economic analysis of the different digital television platforms. The analysis shows that cable and IPTV are not appropriate platforms for providing universal coverage of digital television, given the high cost per subscriber (excluding where cable networks have already been extensively deployed). It also shows that the transmission costs for DTH are the lowest amongst all platforms (for wide coverage), except for the scenario where we consider small countries or regions.

In addition to costs, a number of other factors will affect Member States' choice of transmission platform for widespread digital television coverage. These include the current status of the television market (particularly, the level of dependence on the terrestrial platform) and the public policy objectives in developing DTT (addressed in Chapter 4). Also, from the broadcasters' perspective, transmission represents a relatively small proportion of broadcaster costs, which are dominated by content. Consequently, if the choice of a particular platform may have a negative impact on revenues (by impacting audience levels), this may outweigh any transmission cost benefits.

2.2.1 Methodology

In order to assess the economics of digital television networks, we have considered three scenarios of DTT deployment: a country with a large population (such as the UK or France), a country with a medium-sized population (such as Finland or Austria) and a small country or region (such as Denmark or Berlin). Exhibit 2.7 below highlights key assumptions made for each scenario:

	<i>Large</i>	<i>Medium</i>	<i>Small</i>
Households in area	24.5 million	2.4 million	1.8 million
DTT transmitters required for near universal coverage (98%+)	1154	36	3
Network profile	UK	Finland	Berlin

Exhibit 2.7:
Scenario
assumptions
[Source: Analysys]

The analysis is based on high-level network information from specific countries/regions. However, the results are intended to be indicative of each area size of country/region and are not intended to be a calculation of the exact DTT network costs for each country/region. This would require a consideration of the topology and population distribution of each country, and the consequent impact on the number of transmitters, the output power of each transmitter and other variables. Differences exist between the countries, for example in terms of population distribution, as shown in Exhibit 2.8.

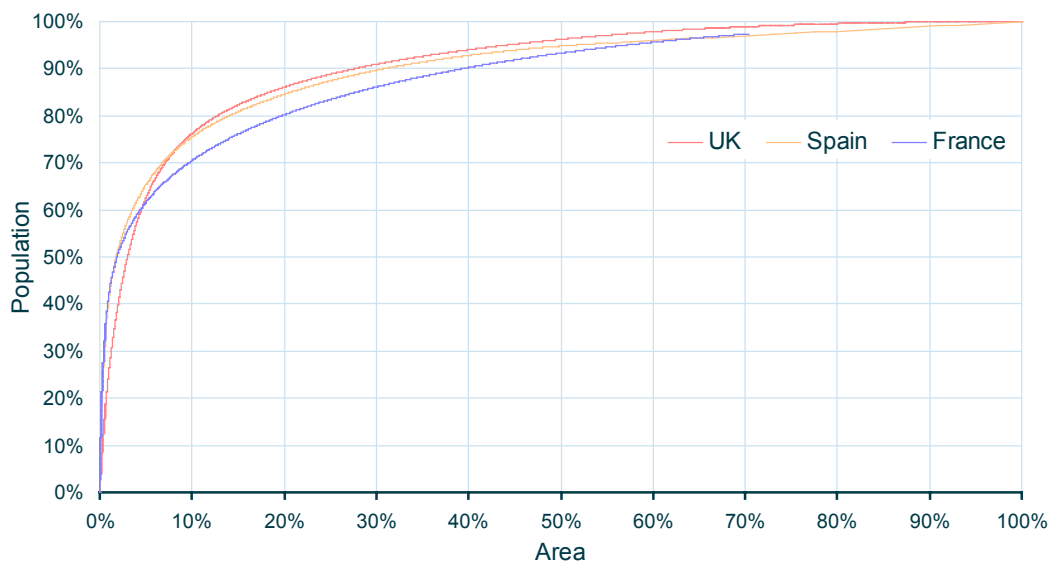


Exhibit 2.8: Population against area [Source: Analysys]

Other factors that affect DTT network deployment include variations in altitude (for example, mountains) and the split between urban and rural populations. As a result, 80 transmitters are required in the UK to achieve 80% population coverage during the simulcast period for multiplex 1, whereas 147 transmitters are required in Spain.²⁸

²⁸ Note that in spite of variations between countries, the analysis is indicative of the comparative costs of the different platforms. This is because of the significant difference between the economics of the different platforms. Also, where large numbers of DTT transmitters are required, incremental transmitters are likely to be of low radiating power and thus have limited cost impact.

There is also a variation between countries in terms of the number of DTT multiplexes and the channels per multiplex. For the purposes of our analysis, we have made the following assumptions for all areas:

<i>Assumption</i>	
Channels per multiplex	6
Multiplexes per site	6
Discount rate ²⁹	10%
Equipment lifetime	10 years

Exhibit 2.9: Other assumptions
[Source: Analysys]

We have considered the costs of satellite (DTH), cable and IPTV transmission separately:

- the DTH transmission cost analysis is based on benchmarks of the current cost of satellite transponders
- cable transmission costs are based on benchmarks of the capital expenses incurred by European cable operators (per household passed)
- IPTV transmission costs are based on the costs of the equipment required to deliver the service.

Key assumptions for DTH, cable and IPTV are shown in Exhibit 2.10.

<i>Assumptions</i>	
DTH: bandwidth per transponder	45Mbit/s
DTH: bandwidth per channel	4Mbit/s
Cable: average lifetime of assets	14 years ³⁰
DSL: lifetime of assets	10 years

Exhibit 2.10: DTH, cable and IPTV assumptions
[Source: Analysys]

2.2.2 Results of the economic analysis

This chapter presents the results of our economic analysis of digital television platforms.

²⁹ Discount rate refers to the return on capital employed required by the network operator. Note that limited changes in the discount rate do not significantly changes the result of the platform comparison.

³⁰ This reflects the weighted average lifetime of cable assets (civil works, electronic equipment, etc.)

Scenario 1: small country/region

Exhibit 2.11 below shows the comparative cost of providing full coverage to a small region (using the assumptions described above). The various platforms have been compared on the basis of annual cost per household, taking into account all households that would be covered by the deployed network. As shown in the chart, the cost of providing digital television coverage via cable or IPTV is significant higher than via DTT or DTH.

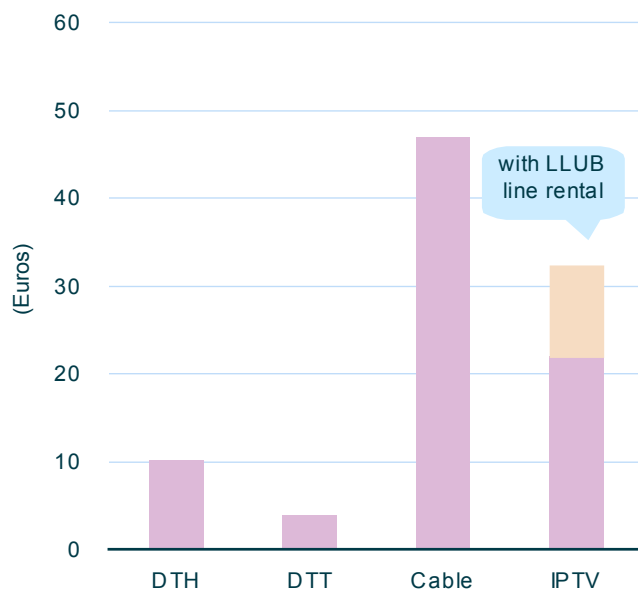


Exhibit 2.11:
Annual
transmission cost
per household
covered [Source:
Analysys]³¹

The chart considers full rollout of each of the platforms (it is assumed that none of the platforms is already deployed). Only capital costs for the wireline platforms (cable and IPTV) have been considered: inclusion of operating costs will increase the cost differential between wireless and wireline platforms.

Also, in the case of IPTV, it is assumed that a telephone line is already present and no local loop line rental (LLUB) costs are included. This may reflect a television service offered by an incumbent telecoms operator. However, where an alternative operator wishes to provide IPTV services, local loop rental costs will be incurred. The exhibit above shows that the inclusion of LLUB charges also widens the cost gap between IPTV and wireless

³¹ The chart assumes that the various platforms provide at least 50 channels. A cable deployment is assumed in dense urban areas only.

platforms.³² Note that the significant difference in costs between wireless and wireline platforms makes the above conclusions robust in terms of the sensitivity to changes in assumptions.

Given that the cost of DTH and DTT platforms is related to the number of channels broadcast, their costs have also been compared in terms of annual cost per channel per household, as shown in Exhibit 2.12 below.

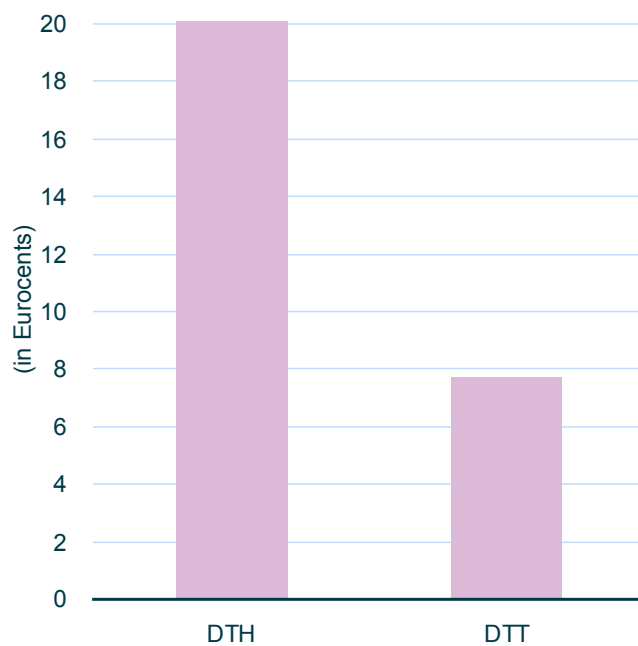


Exhibit 2.12:
Annual transmission cost per channel per household [Source: Analysys]³³

As shown in Exhibit 2.12, the per-channel cost of providing digital television via DTH is higher than DTT for a small country/region. However, the gap may be significantly reduced by variations in topology (i.e. presence of hills, which would require additional transmitters).

³² Note that the comparison assumes that, even for wireline platforms that enable other services (Internet, voice), all costs are allocated to the TV service. This is reasonable given that we are considering the deployment of these platforms for television services. However, even if we assume that all wireline subscribers take television, telephony and Internet, and costs are equally allocated among these services, the wireline television is still more expensive.

³³ The chart assumes broadcast of 50 channels via DTT and DTH.

Scenario 2: medium-sized country

Exhibit 2.13 presents the transmission cost per household covered for DTT and DTH at different levels of coverage.

The total cost of DTH transmission remains unchanged, as the same satellite can provide coverage over a wide area: this results in falling costs per household as coverage increases. By contrast, the cost of DTT transmission per household increases with coverage. Although DTT and DTH transmission costs are similar for 70% population coverage, DTT transmission costs exceed those of DTH for coverage above 70%.

Cable and IPTV costs are not included in Exhibit 2.13, as they are significantly higher than DTH and DTT and are virtually unchanged in scenarios of larger countries (on a per-household basis).

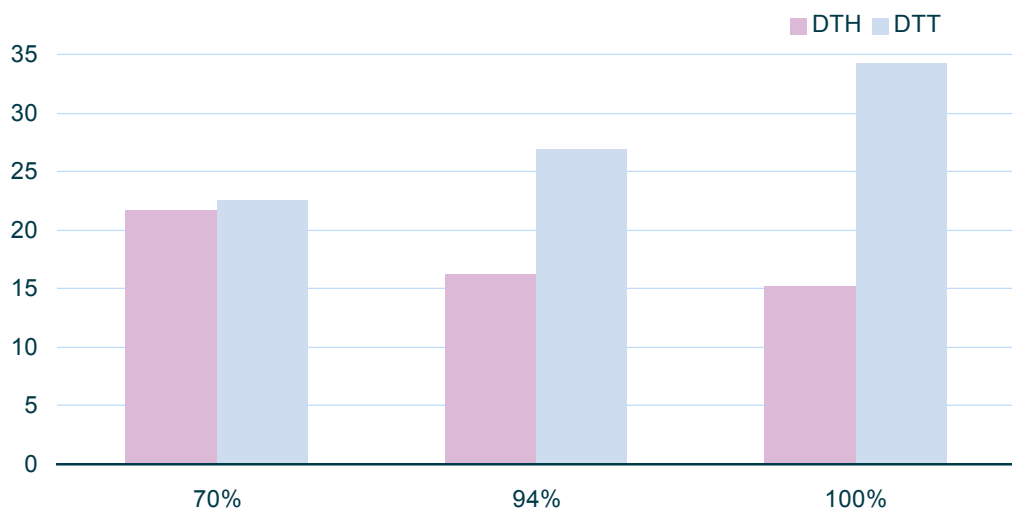


Exhibit 2.13: Transmission cost per channel per household [Source: Analysys]

Scenario 3: large country

As shown in Exhibit 2.14, when DTH transmission costs are considered on a per-household basis, DTH is substantially cheaper than DTT at high levels of population coverage.³⁴

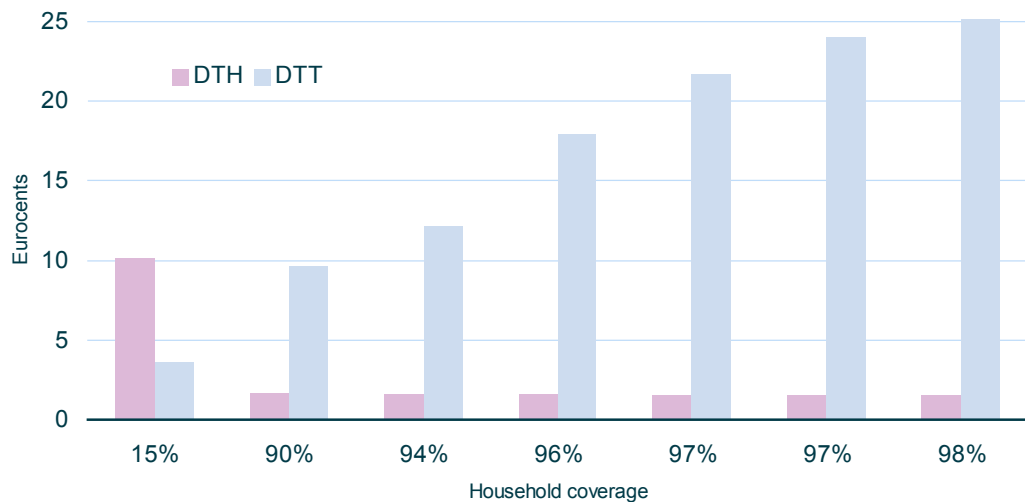
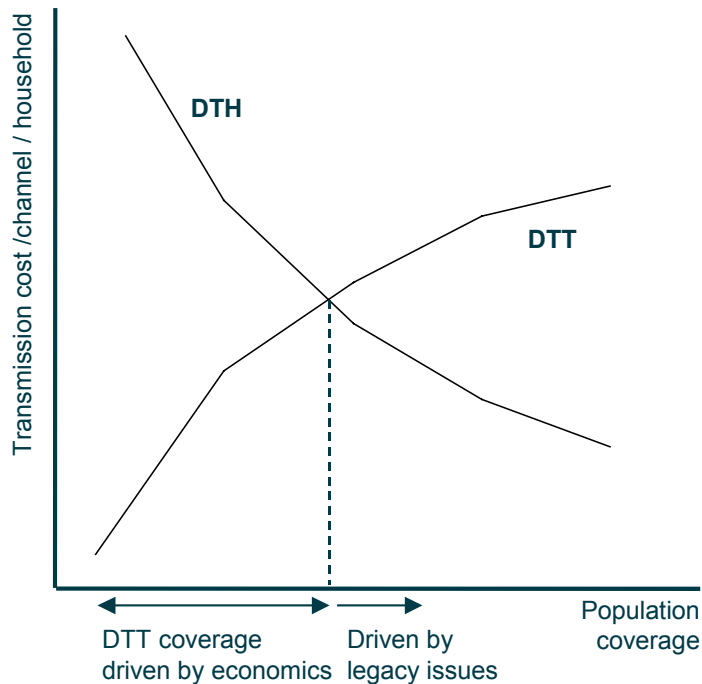


Exhibit 2.14: Transmission cost per channel per household [Source: Analysys]

In many Member States, significant DTT coverage may be driven by market forces up to a certain threshold (of population coverage), terrestrial is an economic means of providing digital television coverage. Indeed, broadcasters may voluntarily provide even higher coverage where terrestrial remains an important transmission platform (as shown in Exhibit 2.15 below as legacy issues), or in the interest of having competing transmission platforms. Thus, the relevant comparison is between the cost of extending terrestrial coverage beyond areas where it is the commercial choice and the use of alternative platforms to cover such regions.

³⁴ Note that 15% household coverage via DTT may be achieved by a single transmitter, as is the case with the Crystal Palace transmitter in the UK.

**Exhibit 2.15:**

*Indicative
transmission costs*

[Source: Analysys]

In the case of a medium or large country, DTH is cheaper even when considering a two-platform scenario (i.e. broadcasters using DTT to cover part of the population, and DTH used to provide full coverage). This reflects the fact that DTT costs increase non-linearly with the coverage. Considering this case does however narrow the difference between DTH and DTT, especially for medium countries (where fewer rural transmitters are required), as shown below: the chart compares the annual transmission costs under three scenarios:

- considering full DTT coverage costs
- considering the DTT costs for an increase in coverage from 70% to 100%
- considering the costs of an alternative platform (DTH).³⁵

³⁵ Note that the DTH costs do not scale with required coverage.

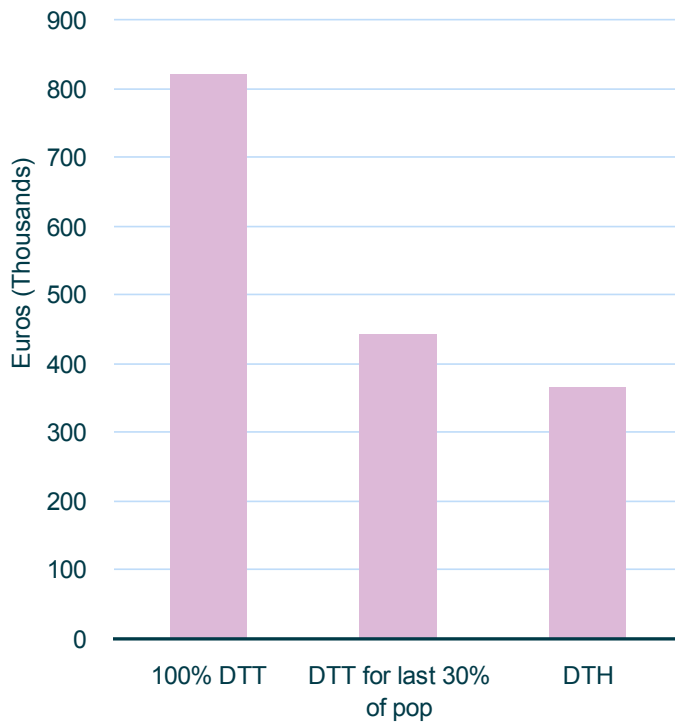


Exhibit 2.16:
Indicative annual
transmission costs
(per channel) for a
medium-sized
country [Source:
Analysys]

Thus, from an economic perspective, the cost advantage of DTH is much reduced in a scenario where broadcasters are willing to fund DTT coverage to a significant proportion of households, in medium-sized countries. However, we need to note that DTH remains significantly more cost efficient for large countries, even if broadcasters are willing to finance DTT rollout to a large section of the population.

Exhibit 2.17 below compares the annual transmission costs under the following scenarios:

- providing 98% DTT coverage
- the DTT costs for an increase in coverage from 90% to 98%
- use of an alternative platform (DTH).

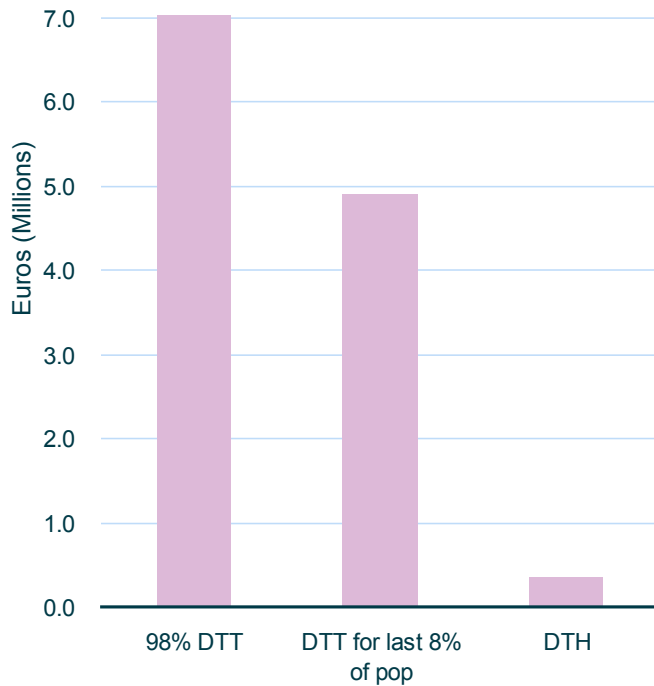


Exhibit 2.17:
Indicative annual transmission costs (per channel) for a large country
 [Source: Analysys]

The chart clearly shows that DTH is significantly cheaper, even when comparing DTH costs against those that would be incurred from increasing DTT coverage to 98% (from 90%, which, in this case, we assume may be voluntarily provided by broadcasters).³⁶

2.3 Implications for public policy

The various digital television platforms possess different characteristics that make some platforms more appropriate than others, depending on the objectives. DTT and DTH may be used to deliver a wide coverage of multi-channel offerings (though DTH can deliver many more channels), as they are significantly cheaper than cable and IPTV (wireline) per household in cases where high coverage is required. Although wireline platforms may help to achieve universal availability of digital television by providing services where

³⁶ Note that in the UK 80 DTT transmitters provide approximately 80% household coverage for the PSB multiplexes. Upon analogue switch-off, the same number of transmitters are expected to provide 94% coverage.

households are willing to contribute towards the costs of deployment, they differentiate themselves by enabling other services including advanced interactivity.³⁷

These differences between platforms have some implications on public policy for digital television. However, the implications depend on various country-specific factors, including the country size, the current status of the television market (particularly the level of dependence on analogue terrestrial) and the public policy objectives in developing DTT.³⁸

For small countries, DTH may not represent an economically viable alternative for the provision of digital television coverage by comparison to DTT. Given these key constraints, DTT may represent an appropriate platform for achieving full digital television coverage.

For medium and large countries, providing widespread digital television coverage is both easier and cheaper (per household covered) via DTH than DTT. DTH may also enable more content to be broadcast than DTT, which is constrained by the spectrum available. However, other factors apart from cost also need to be considered:

- DTT enables the broadcast of local content (including local advertising), a factor of significant importance in many European countries
- DTT provides greater robustness than DTH: the risk of a catastrophic satellite failure needs to be addressed where DTH is the primary means of providing television services³⁹
- delivery of FTA content via DTH may result in content rights issues though encryption may address this⁴⁰
- DTH reception is likely to be less than 100%, as steep cliffs and high buildings create shadow areas. Reception in these areas is much more difficult with DTH than DTT⁴¹

³⁷ Note that availability of wireline platforms is greater in densely populated areas where terrestrial coverage is easy and cost-effective.

³⁸ As observed in our review of public policy objectives, significant differences in objectives may be observed between countries.

³⁹ Note that satellite transponder services are available with the option of pre-emption, i.e. the satellite operator undertakes to find a solution for service continuation in case of satellite failure. However, this may imply a significant additional cost.

⁴⁰ Where the DTH signal goes beyond areas for which the broadcaster has acquired content rights, the broadcaster may need to compensate the content owners.

⁴¹ The DTT modulation system is designed to take advantage of reflected signals. Furthermore, in the case of DTT, gap-fillers may be easily installed.

- in some European countries, much value is being placed upon portable and indoor television reception enabled by DTT, which is not easily possible via DTH.

Crucially, in a scenario of migration from analogue terrestrial television, continuity may be valued: unsurprisingly, DTT is the closest to analogue television in terms of its strengths and weaknesses (as shown by Exhibit 2.1 above).

From the perspective of policymakers in countries with a high terrestrial dependence, a rapid shift towards alternative platforms (for example, DTH) may be considered risky. Although STB costs may be broadly similar for the different platforms (in the medium term), the need for antennas implies a higher end-user cost for DTH. The greater difficulty in explaining the migration to a less familiar platform to households and differences in the costs implied for households between platforms may make a migration to a non-terrestrial platform politically difficult to sell. Incumbent commercial broadcasters may also have reason to be cautious, as any discontent or reception difficulties experienced by households may affect viewing and advertising revenues.⁴²

Some countries (such as Poland and Slovakia) have highlighted ICT development as a key objective in DTT development. Although DTT may allow interactive services and can make a contribution towards ICT development, it is constrained by the need for a return channel. Wireline platforms are more appropriate for ICT development.⁴³ IPTV is considerably more expensive to deploy per household than DTT, thus limiting the extent to which IPTV can contribute towards ICT development. However, where fixed telephony penetration is significant, focus on the fixed telephony infrastructure instead of DTT will enable higher quality interactive services. It will also enable valuable spectrum resources to be used for other applications.

⁴² Transmission represents a relatively small proportion of broadcaster costs, which are dominated by content. In 2004, 71% of the operating costs of the UK broadcaster, ITV, were content or staff-related (excluding general and administration costs, advertising costs, etc.). The Spanish broadcaster, Antena3, had operating costs of 67% for 2004. In 2003, transmission costs accounted for only 9% of the operating costs of Channel4 in the UK.

⁴³ Although dial-up can provide better interactive services than DTT, PC penetration is limited in some Member States. As with DTT, IPTV may enable interactive services via the television and does not require a PC.

3 DTT development in Europe

In this chapter⁴⁴, we commence by reviewing the correlation, if any, between the DTT business model and DTT take-up. We then identify some key factors leading to the DTT platform success (or lack of it) and finally briefly introduce some digital transition issues.

A more detailed description of DTT developments in the European Union may be found in Annex A.

3.1 DTT business models

*UK saw the first
DTT launch*

In November 1998, Ondigital launched in the UK offering a Pay-TV package in direct competition with the direct-to-the-home (DTH) and cable operators. As shown in Exhibit 3.1 below, this was followed by Sweden and Spain. Finland was the last amongst the first wave of DTT countries, with a simulcast of analogue channels starting in September 2000 and commercial services in August 2001.

⁴⁴ The deliverable on this issue was drafted in November 2004.

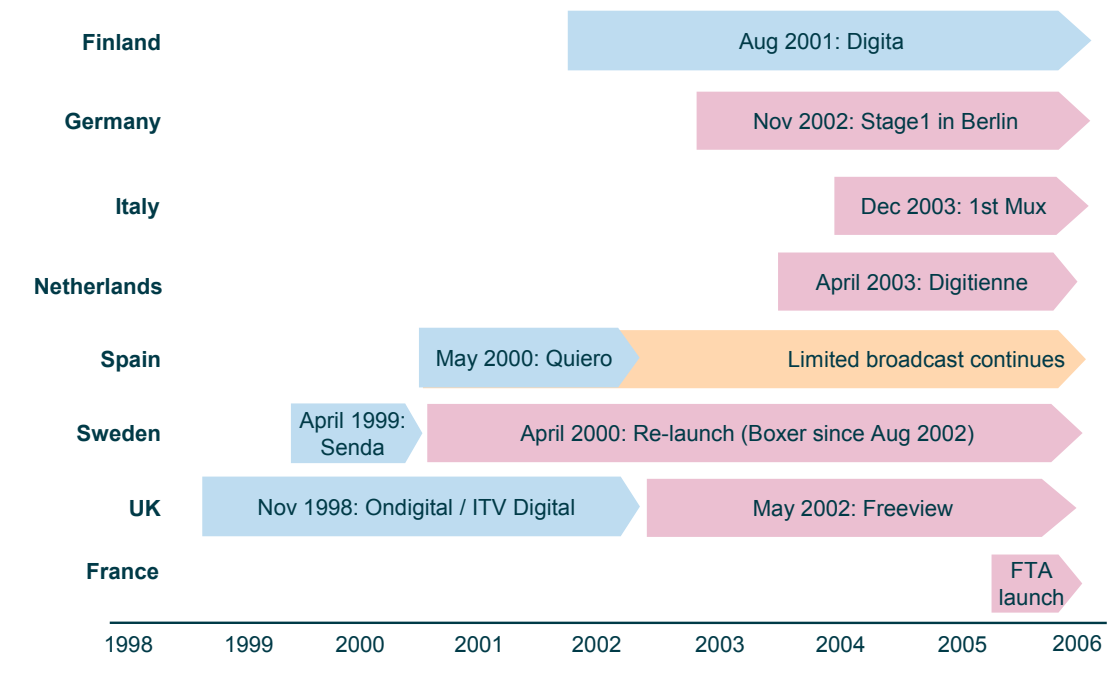


Exhibit 3.1: Launch of commercial DTT services [Source: Analysys]

After a relaunch, UK has gained the most DTT subscribers, followed by Italy

The table below shows an estimated 3.9 million DTT households in the UK. This represents the largest DTT subscriber base in Europe. Sweden and Finland have also seen a significant take-up in DTT, with 18% and 34% penetration of households that use terrestrial means to watch television respectively.⁴⁵ On the other hand, developments in Spain, part of the first wave of countries where DTT was launched, have stalled, with less than 2% of terrestrial households using DTT.

Despite being the latest arrivals on the DTT scene, Germany and Italy have seen rapid developments. In the Berlin-Brandenburg area of Germany, a complete migration from analogue to digital terrestrial has been achieved⁴⁶. Also after the UK, Italy has the highest number of DTT households despite launching in December 2003.

⁴⁵ Although not all subscribers migrate from a background of analogue terrestrial to DTT; DTT as a % of terrestrial households is a better measure of DTT penetration than DTT as a % of TV households, given structural differences between countries. In some countries, high cable and DTH have large subscriber bases of which only a small proportion are likely to migrate to DTT.

⁴⁶ Since the drafting of this document, several other Länder have also completed the analogue switch-off.

Country	DTT households (millions)	Terrestrial only households (millions)	DTT as % of terrestrial only households	DTT as % of TV households
UK	3.9	14.1	28%	16%
Sweden	0.23	1.3	18%	6%
Spain	0.2	10.0	2%	1%
Finland	0.37	1.1	33.6%	15%
Germany (Berlin)	0.17	0.17	100%	6-7%
Italy	0.5	18.7	3%	2%
The Netherlands	0.04	0.1	40%	0.6%
France	-	15.7	-	-
Austria	-	0.5	-	-
Slovenia	-	0.34	-	-

Exhibit 3.2: DTT take-up in selected countries [Source: Analysys, November 2004]

Three business models have emerged for DTT

Essentially, three business models for DTT have emerged:

- **Pay-TV platform** – DTT multiplexes used to develop a premium content offering in direct competition with cable and satellite (DTH)⁴⁷ platforms and primarily financed by subscription revenues. This was the original business model in the UK, Spain and Sweden. A DTT Pay-TV platform also exists in the Netherlands, though it does not compete directly against premium pay offerings.⁴⁸
- **FTA platform** – DTT multiplexes used to offer a variety of free-to-air (FTA) channels, financed either by public funds (in the case of public service broadcasters) or advertising revenues.⁴⁹ This was the original business model in Italy, Finland and Germany, and has been the business model in the UK since May 2002.
- **Hybrid DTT** – An offering combining a number of FTA channels supported by public funds or advertising revenues, together with a limited pay offering. Migration to a hybrid DTT model has taken place in the UK, Sweden and Finland.

⁴⁷ DTH refers to television via satellite, and stands for direct-to-home.

⁴⁸ It may be noted that a Pay-TV offering currently exists in the Netherlands. However, it does not compete directly with DTH. Instead, it is priced so close to cable charges that most households in the Netherlands consider it as a normal utility-like expense.

⁴⁹ Broadcasters refer to content providers and not network operators.

Most pure pay-TV models have not succeeded

The strong subscriber growth in the UK is more a result of the change in business model that took place in spring 2002, from pay-TV to FTA (and the migration to a hybrid model since March 2004) than of the early start of DTT developments in the UK. At roughly the same time that ITV Digital collapsed in the UK, so did the pay-TV operator Quiero in Spain. However, Spain has not redesigned the DTT framework⁵⁰ and hence DTT take-up is currently limited. Finally, Sweden also changed its DTT model to include FTA in 2000, after very limited subscriber growth.

FTA has been key to take-up, with migration to a hybrid model now taking place

A review of DTT evolution across the selected countries shows that a FTA offering has been crucial to the take-up of the platform, but also that there is a trend emerging towards a hybrid model combining FTA with some form of pay-TV (although the pay-TV component has yet to prove significant market traction), as shown in Exhibit 3.3 below:

⁵⁰ The Spanish Government approved on 29th July 2005 the decrees regarding the technical plan for the DTT as well as other issues such as the creation of a new analogue channel, the conversion of the Canal+ channel to an FTA one, and changes on the law of the public radio and television broadcasting operator. The DTT plan grants, for the transition phase, 1 full multiplex (5 nationwide programmes with capacity for regional programming insertion) for RTVE (PSB), plus 14 other nationwide SFN channels, all of them assigned to:

- 1 channel + 2 additional ones (the latter subject to certain conditions) to each of the existing ATV private operators, Antena 3, Telecinco and Canal+
- 1 channel + 1 additional one (the latter subject to certain conditions) to each of the existing DTT operators, Veo TV and Net TV .
- 1 channel to RTVE
- 2 channels to the new ATV operator to be assigned through a beauty contest.

After the Analogue Switch Off, scheduled for 3rd April 2010, RTVE will be granted an additional SFN multiplex and each of the national TV operators at the time (Antena3, Telecinco, Canal Plus, Veo TV, Net TV, as well as the new analogue TV operator) will be granted a full multiplex. An additional multiplex would be assigned to DVB-H services

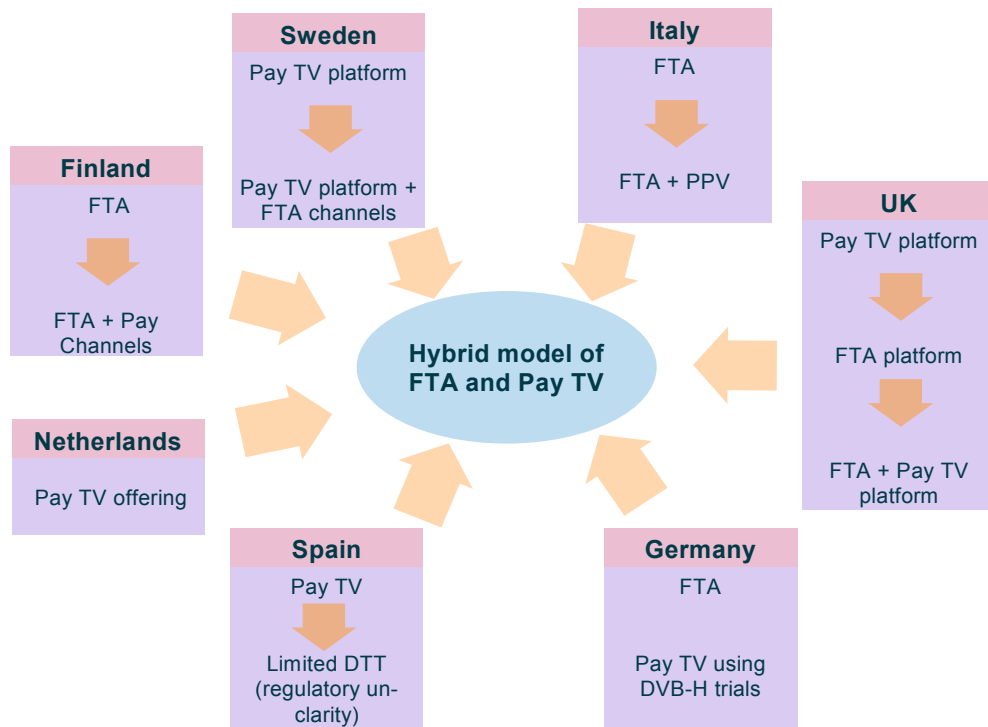


Exhibit 3.3: Evolution of DTT in selected European countries [Source: Analysys]

Format of pay offering varies between countries

The models differ between countries in terms of the pay content available: bouquets of channels, individual channels, pay-per-view (PPV), etc. Pay-TV bouquets or individual pay channels are currently available in the Netherlands, Finland, UK (from Top Up TV) and Sweden (Boxer).

In Germany, talks of individual pay-TV channels on DTT have not yet resulted in an actual offering. However, pay content on mobiles is being trialled using the DVB-H standard.

In Italy, although pay-TV is not currently available on DTT, PPV events are offered via DTT.⁵¹

⁵¹ PPV services were launched in January 2005. More than 500 000 scratchcards were sold in the first month.

3.2 Key lessons and reasons for DTT success

Common factors for DTT development have been identified

From experience to date, the following have been identified as the key factors leading to the market take-up of DTT services:

- **attractive offering** – the DTT platform should provide viewers with tangible benefits at an affordable cost. What is considered as an attractive offering will depend on market conditions and varies between countries (see below)⁵²
- **cheap set-top-boxes (STBs)** – low cost and widely available STBs are required. This condition is dependent on market factors including the DTT business model adopted, availability of subsidies and technology developments. Recent price falls mean that in many countries the requirement of cheap STBs has been met
- **strong communication** – experience from various countries has demonstrated the importance of strong market communication. However, clear market communication is only possible where a clear and stable regulatory regime exists
- **co-operation** – a variety of different organisations have a stake in the future of DTT: the success of DTT requires co-operation between key stakeholders.

⁵²

It may be noted that an attractive offering may require a particular business model. A FTA business model has been key to DTT take-up in some countries as it provides tangible benefits (i.e. increased content) at an affordable cost (i.e. only low-cost STB required).

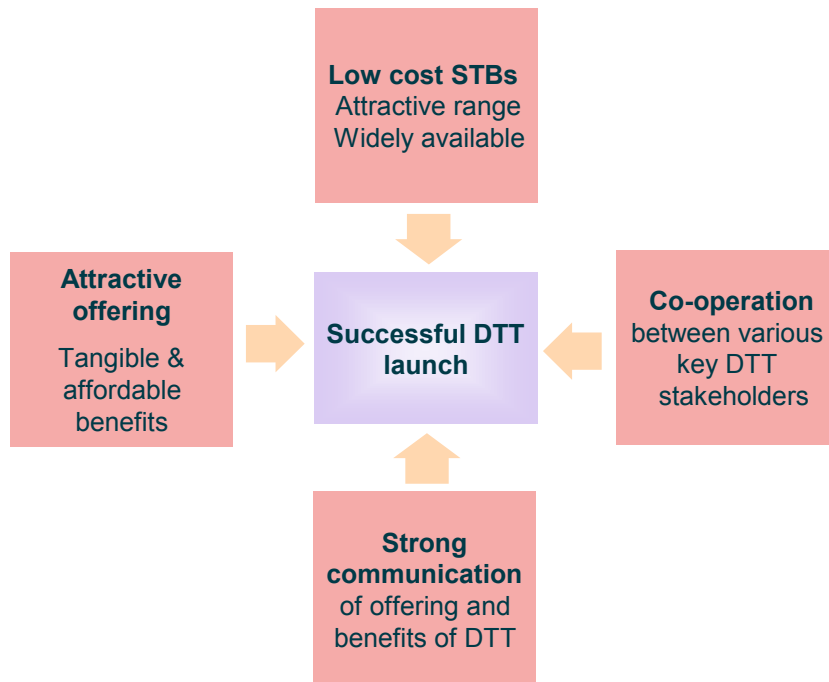


Exhibit 3.4: Key elements for successful DTT launch [Source: Analysys]

Attractiveness of offering depends on market situation

The attractiveness of the offering depends on:

- **content** – offered content (including interactive content) that is not already available at the same price, both in quantity and quality
- **technology improvements** – better sound and picture quality, portable indoor reception, etc
- **cost** – total cost of the platform, including subscription charges and one-off costs (for example, the STB).

As discussed above, an FTA offering has played a key role in driving take-up of DTT services. However, variances exist between countries, not least because of the content already available via existing platforms. In Italy, 12 national FTA analogue terrestrial channels exist with limited penetration of cable and DTH. On the other hand, in Sweden there are only three analogue terrestrial channels, with high penetration of alternative platforms. The FTA content already available and the competitive dynamics in each television market will impact the way

DTT differentiates itself, in some cases based on content and in others based on technology improvements.

Multi-channel has been a key attraction ...

Experience to date indicates that a FTA multi-channel offering is a key driver of DTT demand. DTT take-up has accelerated in countries where the platform has offered a bouquet of channels that has significantly increased the number of FTA channels available. This has been the case in the UK with the introduction of Freeview, as well as in the case of the re-launched platform in Sweden⁵³. The focus on multi-channel also exists in Germany (Berlin), where the original objective of 20 channels has already been exceeded and 27 are currently being offered.⁵⁴

... even though viewing is dominated by the simulcast channels

Although channels already available via analogue FTA may account for a disproportionate share of viewing in multi-channel households, viewers value the choice of a broader range of channels. The value that viewers place on the choice of a broader range of channels is similar to the value attributed to widespread coverage in the early days of the cellular industry. Even if most calls were made from the home town, mobile subscribers valued extensive network coverage.

Furthermore, it takes time for new channels to develop the right offering, and for customers to develop a loyalty to such channels. Evidence exists of increased viewing of the digital-only channels in the UK, with their viewing figures having overtaken that of BBC1's for the first time in Q2 2004.⁵⁵

Technology can be a differentiator for DTT in some cases...

In countries with strong existing analogue terrestrial or other platform offerings (cable or DTH), DTT can differentiate itself by means of technology improvements. In the case of Germany or the Netherlands, consumers have had access to a variety of FTA or low-

⁵³ In the UK, five analogue terrestrial channels can be viewed nationally. In Sweden, only three such channels are available.

⁵⁴ Only limited interactive services are available.

⁵⁵ Digital television was first introduced in the 1990s.

cases...

cost cable content even before the introduction of DTT. In entering such a market environment, DTT has had to provide a comparable multi-channel offering. However, it has differentiated itself on the grounds of portable reception.

... but success of interactivity to date has been mixed

At launch, the UK, Spain and Finland heavily promoted the potential of the DTT platforms to offer interactive services. However, the early experience in these countries has been that of limited DTT take-up due to the lack of sufficient content of interest. Although this was due to a combination of factors, in all cases interactivity was insufficient by itself to drive DTT penetration.

In Finland, DTT penetration accelerated once the platform emphasised the multi-channel benefit and moved away from focusing on the multimedia-home-platform (MHP) functionalities (intended to support advanced interactive services). That move also meant lower prices for entry level STBs and the availability of a wider range of models.

It may be noted that the focus in some new Member States such as Slovenia may be different from Western Europe where emphasis is placed on the contribution that DTT can make to ICT development.

The Netherlands may provide guidance to the future

The Netherlands provides the first example of a DTT platform whose key selling proposition is technological (portable indoor reception). As multi-channel offerings become ubiquitous, the next phase of development may focus on technology innovations and different DTV platforms may capitalise on their unique technical advantages. Although uncertainty remains about the viability and future of the DTT platform in the Netherlands, it may provide some guidance for future developments in the digital television arena.

Some correlation exists between digital television and wide screen

Some correlation can be examined between the take-up of wide screen television and digital television, most notably in the UK where wide screen penetration has risen to 27% of TV households, and more than 50% of digital television households (compared with an average penetration of 11% across the EU). Widescreen has

TV take-up

helped digital television differentiate itself from analogue television. However, despite the fact that the UK is the only EC member state where DTT has been accompanied with wide-screen broadcasts, no clear evidence exists to show that wide-screen TV has driven the take-up of DTT in particular.

Cheap STBs have contributed to DTT growth

Significant falls in the price of STBs have helped drive DTT growth. As shown in Exhibit 3.5 there is a wide price range for STBs in most countries, with top-end models including hard disks and personal video recorders (PVR). However, the market is driven by the low-cost STBs. In the UK, by early 2004, the most common price range of Freeview STBs was EUR90–120, down from EUR120–150 in 2003 as a result of competition in the STB market (though as indicated in Section 2.1, this has subsequently increased, as consumers opt for models with greater functionality).

	<i>Current price range (EUR)</i>	<i>Details</i>
UK	Lowest priced STB: GBP40 (EUR60). Most STBs in GBP60–80 range (EUR90–120)	More than 50 STB models on sale, from 26 manufacturers
Sweden	EUR100 upwards ⁵⁶	Nokia is key supplier of STBs for Boxer
Spain	EUR199 upwards	Nokia & Philips are the key vendors. Emphasis on sound and picture quality
Finland	EUR59 upwards. Up to EUR700 for STBs with hard disks	Key vendors are Nokia, Finlux and Humax. The first two also offer MHP boxes. Approximately 5% of STBs are MHP
Germany	EUR89 upwards. EUR499 for STB with PVR	Cheapest STBs from Neusat, Nobelux, Hyundai and Humax
Italy	EUR199 upwards ⁵⁷	Government subsidy for MHP compatible STBs
The Netherlands	EUR100–200	Digitienne certified manufacturers include: Rebox, Panasonic, Samsung, Topfield, Hauppauge, Strong and Brainwave

Exhibit 3.5: STB availability [Source: Analysys, Informa, Screen Digest, EPRA]

Variety in STB types is driven by business models, policy decisions

Variance in STB types and prices between countries are due to:

- **DTT business model** – where a strong Pay-TV business model exists, the need for conditional access in STBs may shape STB

⁵⁶ Not including subsidy : Boxer subsidises the STB if it has a Boxer smart-card. Such a smart-card is required to watch the popular MTG channels that have been encrypted since September 2004. Previously, these channels were FTA, and a variety of STBs in the SEK800–1000 range (EUR80–115) were available.

⁵⁷ High cost of STBs is offset by a government subsidy of EUR150 per box (ie. net cost to end user EUR49).

and technology convergence

market. In Sweden, for example, Boxer STBs are required to watch encrypted content. In markets that have primarily an FTA DTT business model, a variety of low-cost STBs are available.

- **Policy decisions** – policies to adopt a certain technology (for example, MHP) or to subsidise STBs as in Italy, also affect the variety and prices of STBs available.
- **Technology convergence** – some demand exists for STBs that bring together various technology innovations, typically PVRs for recording broadcast content and large hard disks for storage.

Take-up of advanced STBs is limited unless specific driver

Take-up of advanced STBs that enable sophisticated interactive services or have conditional access facilities has been limited unless driven by specific factors. In Finland, for instance, where the MHP standard had been heavily promoted, the more expensive MHP compatible STBs account for only an estimated 5% of STBs sold. However, in Italy the government's subsidy on STBs has meant that the majority are MHP compatible.

Market communication is important...

All successful implementations of DTT have required a strong campaign of market communication. Consumers are largely unaware of the value of DTT, and need information on:

- presence and contents of the offering
- benefits to consumers
- technical issues (coverage, STBs, etc.)
- precise switch-over dates.

Different organisations have led the market education and communication. The BBC's strong promotion of DTT in the UK led to a sharp increase in awareness of the Freeview platform. However, it may be noted that such successful market communication requires a clear and stable regulatory environment that does not allow for uncertainties. Spain and France⁵⁸ provide examples of DTT markets

⁵⁸ Since the drafting of this document, DTT was launched on 1 April 2005. 400 000 STBs were sold in two months, despite the current limited DTT coverage.

where regulatory uncertainty has hindered the DTT industry and prevented them from effective market communication.

...and stakeholder co-operation is essential

DTT development requires that a range of stakeholders need to be brought together. This includes policy makers, regulators, content owners, as well as multiplex and network owners. The interests of each stakeholder needs to be considered, and a framework for DTT developed that aligns these interests.

This requires a DTT enabler

Experience demonstrates that market education and co-operation between a disparate group of organisations requires an enabling organisation that leads the cause of DTT. This role has been performed by different organisations in different countries, and has been fundamental in kick-starting mass DTT adoption:

<i>Country</i>	<i>DTT Enabler</i>	<i>Type of organisation</i>
UK	BBC	Public service broadcaster (PSB)
Sweden	Teracom	Network operator/DTT pay platform
Spain	None (formerly Quiero)	DTT pay platform
Finland	Digita	Network operator (supported by PSB, YLE)
Germany	MABB	Media authority
Italy	RAI + Mediaset	PSB, and leading commercial broadcaster (CSB)
The Netherlands	Digitenne	Platform operator

Exhibit 3.6: *DTT Enabler [Source: Analysys]*

Policy makers need to incentivise incumbent broadcasters DTT...

In most of the countries under study, a limited number of channels from the public service broadcaster (PSB) and the leading commercial service broadcaster (CSB) dominate viewing. The inclusion of content from such players is important for the DTT platform.

One means to ensuring PSB support has been to provide them with a

DTT... significant stake in DTT. In all countries studied except Spain, PSBs have been awarded at least one multiplex. In the UK, DTT provides the BBC an opportunity to maintain its share of audience in the face of increased competition from Pay-TV on cable and DTH.

...and commercial broadcasters as well It can be more difficult to get the commitment from CSBs since they need a viable business case to develop DTT. The transition from an analogue to a digital environment carries the risk of lower advertising revenues in the face of fragmenting TV audiences, and increased transmission costs where simulcast is required. The participation of CSBs has been secured via a variety of mechanisms, as shown by the following table⁵⁹:

<i>Incentive</i>	<i>Details</i>
Significant stake in DTT	As with PSBs, the award of multiple channels or multiplexes has been used to secure CSB interest, for example Mediaset in Italy. This helps CSBs maintain their share of viewers and advertising revenues. Where CSBs do not have a significant stake, DTT risks diluting their advertising revenues and they may oppose its development. These considerations need to be balanced with ensuring a fair access to spectrum by all users and the need for pluralism
'Must-carry' obligations	In some countries, terrestrial broadcasters have a 'must-carry' status on alternative networks, thus enabling them to reach a wider audience. This has been important in Berlin but may place a burden on cable operators (See Annex E)
Lower transmission costs	Per channel, transmission costs are lower with digital technology. Incumbent broadcasters stand to gain if all viewers can receive a digital signal, and the transmission costs are reduced
Competing with alternative platforms	DTT provides some broadcasters (for example, Mediaset in Italy) with the opportunity to compete against cable and DTH pay offerings
Subsidies	Subsidies can facilitate CSB co-operation, as in Berlin, where MABB has subsidised transmission costs. However, such subsidies are controversial and have raised competition concerns in several countries, including Germany

Exhibit 3.7: *Incentives for CSBs to promote DTT [Source: Analysys]*

Appropriate incentives depend on the market situation The appropriate incentives that may be used depend on the dynamics of the television market of each country. Greater or fewer incentives will be required, depending on the inherent value of the DTT commercial opportunity, that will depend on the terrestrial share of viewers amongst other factors.

⁵⁹ In Spain, the lack of any strong incentives has resulted in that major CSBs have been, and still are, against any serious moves towards DTT.

share of viewers amongst other factors.

Note that regulatory intervention should be limited to the minimum necessary: as explained in Chapter 6 below, technology neutrality should be observed unless specific circumstances allow an exception to be made.

The policy environment needs to respond to market conditions

The appropriate flexibility and dynamism of the policy environment has triggered rapid developments in the UK and Germany. The UK regulator (ITC, now Ofcom) rapidly responded to the failure of ITV Digital and reassigned the DTT multiplexes. In Germany, MABB's strategy and its efforts in convincing the PSB and CSB to accept the risks involved in DTT were crucial to the success of the Berlin analogue turn off (ATO), though their compatibility with EU State aid rules is an issue. By comparison, the lack of a regulatory change in Spain has led to DTT stagnation since the collapse of Quiero in Spring 2002.

The same objective can be achieved by different means

To promote pluralism, for instance, Sweden and Finland have chosen to assign DTT licences on a per-channel (instead of per-multiplex) basis. An alternative model for ensuring pluralism, such as that deployed in Italy (40% of multiplex capacity is offered to third-party channels), may also be considered.⁶⁰

Moreover, since a per-channel licensing regime is potentially less flexible than a multiplex licensing regime, the latter method of ensuring pluralism has some advantages. In both Sweden and Finland, the failure of some licensed broadcasters to launch channels caused delays in the development of the platform.

A holistic approach is more likely to balance the various goals

The appropriate incentives need to be considered, together with the content to be provided, coverage obligations and technical parameters that impact revenues and costs. Policies that deal with these parameters in a holistic way are more likely to succeed. This

⁶⁰ Such a regime may also be designed to ensure that part of the capacity is used by non-incumbent broadcasters.

the various goals is exemplified by MABB in Berlin, where contracts were signed with leading commercial broadcasters, enabling a variety of issues to be dealt with collectively.

3.3 Key technical issues

Technical issues have been largely surmountable The technical challenges in implementing DTT have been largely surmountable. Problems have been experienced in different areas, including the DTT planning parameters chosen, early STB's technical issues and reception of the signal.

Such problems have been more prominent in the first implementations of technical solutions. Other countries have benefited from the experience gained from the UK and Spain, though technical problems have not been avoided altogether.

Planning assumptions were not sufficiently proved, and this led to unsatisfactory coverage...

The first DTT implementation took place in the UK, and this implementation tested the suitability of the planning parameters adopted in 1995–96.⁶¹

It was soon realised that the adopted parameters were inadequate for a universal stable and quality reception, due to a higher level of receiver noise figure than anticipated and a low C/N value adopted⁶². A higher field strength was required to compensate for these parameters. However, such a field strength was further limited by the need to preserve existing analogue TV services from interference. This problem was solved in the short term by reducing the DTT coverage area.

The solution that was adopted subsequently was to increase transmitter power where possible and change the modulation system (from 64QAM2/3 to 16QAM3/4), at the expenses of a reduced number of channels. This option was applied to only four of the six multiplexes, as some multiplex operators were unwilling to reduce the number of channels and consequently the number of channels broadcast.⁶³

... accentuated by the network planning approach adopted ...

DTT planning has assumed the use of analogue TV infrastructure in order to minimise infrastructure costs and allows shared use of receiving antennas. However, it also imposes constraints in the frequencies available for DTT and the transmitter radiated power given the need to protect the existing analogue services. In the UK, the consequences of these constraints were:

- unbalanced coverage of the various multiplexes
- uneven field strength within the coverage area
- areas with channel interference problems and multi-path variation problems.

⁶¹ These parameters were mainly based on laboratory tests (Projects IBA Spectre and CCETT Sterne, later on integrated in the European project dTTb), field trials in the UK (IBA-NTL and BBC), and extrapolations of previous experiences with the T-DAB system.

⁶² Network planning was based on a 5 dB (UK planning and Chester 97) receiver noise figure, but this was insufficient as the actual receiver noise figure was 7-8dB in 1998. The choice of a C/N (Carrier to noise) ratio of 20dB was taken based on laboratory tests, and had not been sufficiently proved.

⁶³ The change in modulation permitted a reduction of 4dB in the minimum required C/N ratio.

Such difficulties have been overcome by the same technical changes (increased transmitter power and change in modulation) described above. Solutions that may also have been adopted (but were not used) include the use of low power gap-fillers, or modifications in the analogue TV network.

... and other implementation issues have arisen

Spain saw the first implementation of a Single Frequency Network (SFN). Interference issues arose, with some households experiencing interference between signals received from different transmitters. This has been solved by making adjustments at the transmitters sites involved, and subsequent SFN implementations have benefited from the experience of Spain.⁶⁴

Similarly, Germany (Berlin-Brandenburg) provides the first example of a DTT network planned for widespread portable indoor reception. Technical lessons may be learnt from the values adopted for some parameters (such as location corrector factor, height loss and building penetration loss), with verification and modifications if required.

Poor receiver installations affected the marketing of DTT as a 'plug and play' offering

UK network planning was based on a 3-5 dB feeder losses (losses in the cable connecting the antenna and the STB). Although reasonable (established at Chester 97), it was insufficient in a significant number of houses due to several reasons: poor state of feeder cables, cables inappropriate for higher frequency channels, splitter and outlet mismatches, or antenna mispointing.

All solutions require costly modifications at the user's premises. Such problems experienced in several countries (UK, Spain, etc.) have affected the marketing of DTT as a 'plug and play' offering.⁶⁵

⁶⁴ It may be noted that many of the solutions to correct interference issues in SFN are specific to particular transmitters and are implemented at the transmitter level. Although general principles may be learnt and applied elsewhere, specific implementation cannot be applied similarly.

⁶⁵ Another receiver problem arises from the shared use of antennas by analogue and digital signals. This may produce interferences that may impair the analogue, the digital or both signals. The solution is the installation of a filter that separates the signals, allowing for separate channel amplification.

*STB problems
have also affected
DTT viewing*

STB problems have also been experienced in some countries, affecting DTT viewing. Such problems can be classified into two principal types:

- **Software** – software used in some STBs upon introduction to the market has not been sufficiently debugged, causing problems in channel reception or picture display. Typically, random or permanent picture freezing has resulted. Such problems have been experienced in various countries, including recent implementations such as in Cologne (Germany). However, they are easily solved by over-the-air downloading of updated software.
- **Chip implementation** – some chip implementation problems have been experienced with SFN reception, for example in the case of Spain, resulting in apparent interference issues even though the transmission parameters are adequate. Such problems are more difficult to solve and may imply the replacement of large numbers of receivers. In some countries, such issues have been avoided with DTT platforms undertaking checks on DTT receivers before widespread distribution.

*The ‘cliff effect’ is
more difficult to
address*

Unlike with analogue TV, DTT experiences an undesirable steep failure characteristic, popularly known as the ‘cliff effect’. This results in an on-off effect at the border of DTT covered areas due to variations in the propagation conditions (or presence of multi-path propagation): the signal turns on and off in an unpredictable manner and may cause freezing effects. Although some technical possibilities exist to address this problem such as hierarchical coding or allowing for a decoding margin, this remains an unsolved problem (see Annex D for more details).

*Mobile DTT
commercial
deployments are*

Trials of DVB-H via mobile handset are currently being undertaken in Finland and Germany, and similar plans exist in the UK. These trials are helping address technical and business model issues in the

*still far, despite
several trials taking
place*

provision of DTT via handsets.

For example, the German trial has established that the DVB-H signal does not impede the quality of parallel DVB-T broadcast. In the UK, Mm02 and ntl are planning a trial using DVB-H starting in July 2005 with 500 of their customers in Oxfordshire. The trial is to determine which TV services are preferred by consumers.

Despite the progress being made, commercial deployments of DTT on mobile handsets are still more than three years away, primarily because the current investments by mobile operators in 3G, the fact that spectrum required in most countries will only be available upon analogue switch-off, and also because of the current mobile handsets technical limitations (power consumption, screens, etc).

3.3.1 Digital switchover issues

*The UK has
opted for full
DTT coverage...*

Ofcom (the UK regulator) believes that the best option for the public service DTT multiplexes is full rollout, such that coverage matches analogue terrestrial coverage. No dependence on satellite for universal availability is planned. Ofcom's argument is based on⁶⁶:

- **full availability** – some households cannot receive DTH signal
- **consumer costs** – DTT customer premise equipment is cheaper
- **equity** – costs of migration to digital are the same for all consumers, irrespective of location
- **communication** – facilitates market communication if all households can receive DTT.

*...using a
regional rollout*

Ofcom has decided that the migration from analogue to digital will take place on a region-by-region basis. Ofcom has agreed with the broadcasters that this will take place on a (ITV) region by region basis. Analogue turn off in each region is planned to be phased over

⁶⁶

The proposal has been made in the recent consultation on the Digital Replacement Licences for the national analogue terrestrial Channels 3, 4 and 5 (and Teletext). At present two of the six DTT multiplexes are considered public service multiplexes.

six months, starting with a single analogue channel first (probably BBC2 and finishing with Channel 3 and 4).

This contrast with approaches taken elsewhere

Full DTT coverage is not expected to be provided in Germany. Instead, a mix of platforms are collectively expected to provide digital television services, and thus enable an analogue switch-off (which is already taking place in some regions, with Berlin-Brandenburg leading the way). Such an approach in Germany is facilitated by the already high penetration of cable and satellite services. Upon switch-off, DTT is expected to be available in most urban areas, with the remaining areas dependent on such alternative platforms.

Berlin has shown that regional switchover is feasible...

Ofcom's proposal follows the example of Berlin-Brandenburg. Apart from the disputed role of state funding, Berlin may be seen as a successful model for analogue switch-off that overcomes many of the difficulties in the transition to digital, and can educate DTT developments in other countries.

Berlin has experienced the first implementation of regional switch-off. Focusing on a limited area has helped distribution of STBs and has also lowered the risk for broadcasters (of losing a large percentage of their audience through technical problems or insufficient STBs).

...though other regions may provide greater challenges

The process in Berlin has also been facilitated by the very low percentage of households (about 7%) that were still dependant on the analogue terrestrial TV. In other countries, including the UK, this percentage is substantially higher: migrating a substantially larger population to DTT will be a greater challenge in terms of market communication and ensuring STB availability. Nonetheless, relevant authorities (for example, Ofcom in the UK) believe such challenges can be overcome.⁶⁷

The analogue switch-off may require controversial

Supply-side intervention using public funds has taken place in Berlin in order to incentivise CSBs to participate in DTT, and is alleged to have also occurred in Sweden. At the same time, Italy provides the first example of a demand-side intervention by the government, with

⁶⁷

In Berlin, approximately 170 000 analogue-terrestrial-only households existed before the digital switchover. In the UK, switchover will follow the ITV regions: there are 15 such regions, implying millions of analogue-terrestrial-only households per region.

intervention

subsidies for MHP STBs creating DTT demand.

Although such interventions aid DTT, government agencies need to consider their impact on the competition between various multi-channel platforms. Investigations by the European Commission (EC) are currently underway into the MABB transmission subsidies in Berlin and transmission fees paid by the PSB (SVT) to the network operator Teracom in Sweden. Such investigations have prompted some Member States to proceed more slowly with DTT plans (for example, in Austria, DTT development was on hold for some months, subject to approval of plans by the European Commission).

4 Regulatory context for digital television

Regulatory decisions have had a significant impact on the outcome of past and current DTT projects. The choice of regulatory regime has guided industry's contribution to DTT and has led towards certain DTT business and technology choices. In doing so, it may or may not have provided key stakeholders with the right balance between incentives and obligations to make DTT a success.

In general, the latest regulatory developments in the EU address the shortcomings of the first DTT ventures in Europe and support the future development of DTT. Early DTT ventures suffered from the specification of an unviable Pay-TV business model, imposition of high-coverage obligations on commercial broadcasters and technical specifications leading to expensive STBs. These issues have been largely addressed by recent regulatory developments:

- In most countries, either the choice of business model has been left to industry or an FTA business model has been chosen by policymakers.
- Although policymakers widely continue to expect widespread DTT coverage of the PSB channels, coverage obligations for commercial broadcasters have typically been softened or lifted altogether.
- Furthermore, despite strong continuing interest in developing interactive services and the MHP standard, with a few exceptions policymakers do not plan to impose specific services or standards on the market.

Some exceptions to the general regulatory trends exist. For example, France imposes a specific business model combining FTA channels with Pay-TV channels selected by the

regulator, and it plans to mandate the use of the MHP standard. Also, French policymakers have opted for the MPEG4 standard for Pay-TV.

Furthermore, some Member States differ substantially in their DTT objectives. Some Member States consider that having multiple transmission platforms is a key objective of developing DTT. Other countries, such as several Southern and Eastern Member States expect DTT to contribute to ICT development. This is the case in Italy, where this issue has been mentioned as a key reason for introducing subsidies for certain types of STBs.

The increase in transmission platforms and capacity should lead to expansion of the media sector, and thus contribute to growth of the EC broadcasting market. If and where DTT also aids ICT development, the impact of DTT on the overall economy should be greater. However, policymakers will need to ensure that any obligations or constraints in the benefits of ICT do not hinder DTT development. They will also need to consider the impact on competition of measures such as the introduction of subsidies, as well as the impact that any policy interventions may have on other markets. After all, a DTT network may be used for other applications in the future and thus any measures may affect new markets.

Some difficult regulatory challenges remain un-addressed in many Member States, including how to ensure full digital television coverage, i.e. which platforms may be used. Although some countries such as the UK have opted for full DTT coverage by the public service broadcasters (PSBs), other countries such as Italy and France still do not have a detailed plan for achieving full digital television coverage. Another difficult regulatory challenge will be ensuring take-up of STBs. Although falling STB prices are helping, further regulatory measures may be required in Member States with large terrestrial-only populations to ensure that all segments of the population are equipped with STBs at the planned switch-off date.

Different EU Member States are at different levels of DTT development, as can be seen from Exhibit 4.1 below. Inevitably, the policy towards DTT adopted in leading countries influences others in the development process. However, significant variances exist in the approach towards DTT between countries, reflecting the historical development of their television market, size of country and level of ICT development, amongst other factors.

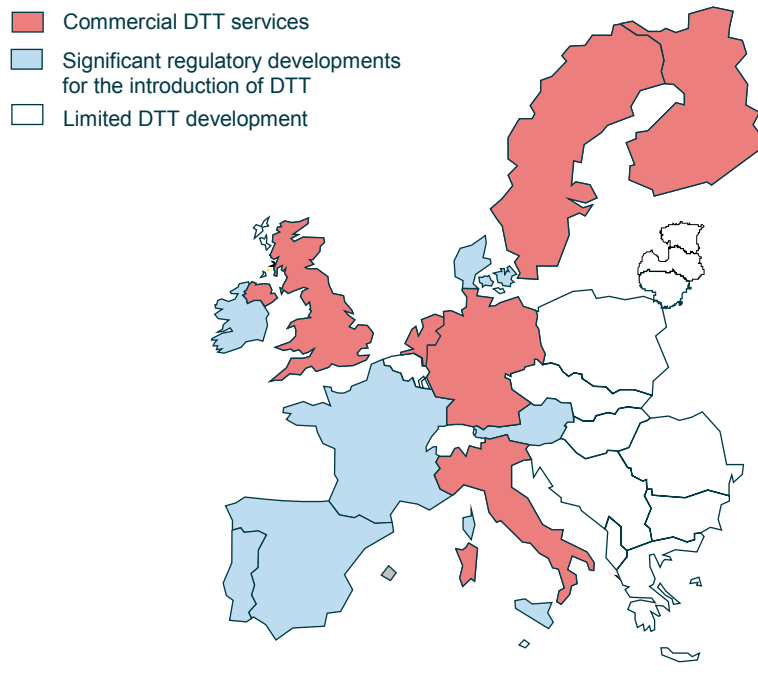


Exhibit 4.1: *Development of DTT across EU Member States [Source: Analysys, Feb 2005]⁶⁸*

As can be seen from the exhibit above, significant work still needs to be done across the EU to create the appropriate environment for digital television and, more specifically, for DTT to flourish. Even in leading countries such as Italy, some key policy decisions are still outstanding, including how to ensure universal digital television coverage before analogue switchover can take place. This chapter⁶⁹ synthesises the current thinking and policy approaches that are being adopted to the above questions.

⁶⁸ The map shows countries where commercial DTT services are available, where significant work has been undertaken to create the required legal and policy environment for the introduction of DTT and where only limited moves towards DTT have taken place. We have chosen this classification over a map that shows actual and planned launch dates as the latter is uncertain in many countries and is subject to slippage.

⁶⁹ The deliverable on this issue was drafted in February 2005.

4.1 Public objectives and perceived benefits of DTT

Spectrum efficiency and Pluralism are common policy objectives

Exhibit 4.2 below summarises the policy objectives of Member States' policymakers in developing DTT, and their perceived consumers benefits. The table shows that a greater range of content and a more efficient use of spectrum are public objectives that are shared across a majority of Member States. For example, the Finnish regulator Ficora states:

“At the political level, the increased capacity for content and the possibility to offer interactive services has been important. Ficora is the administrator of public frequencies and the better use of spectrum has also been a key factor.”

The availability of more channels than in the analogue regime is seen in many countries as a way of facilitating TV pluralism.

Interactivity and better service quality are key perceived benefits

In addition to the policy objectives described above, interactivity and a better service quality are considered key consumer benefits of DTT. This is the case despite limited developments of interactive services in DTT implementations to date; interactivity is also popular with policy makers.

However, differences exist between the expectations from interactivity. Countries such as Finland, Italy, Austria and Poland emphasise sophisticated applications, including e-government services, based on the MHP standard. By contrast, other countries such as Denmark and Latvia focus on advanced teletext, EPG, sign language and other similar services.

	<i>More content</i>	<i>Better quality</i>	<i>Interactive services incl. e-gov</i>	<i>Competition between Platforms</i>	<i>Efficient spectrum use</i>	<i>ICT dev</i>	<i>Other (specify)</i>
UK*	✓				✓		Good for economy
Sweden	✓	✓			✓		Ensuring PSB reception
Spain	✓	✓	✓		✓	✓	
Finland	✓		✓		✓		
Germany	✓			✓	✓		Portability
Italy	✓		✓		✓	✓	
Netherlands				✓	✓		Innovation
France	✓	✓			✓		
Austria	✓		✓		✓		Prevent digital divide
Slovenia					✓	✓	
Denmark		✓	✓	✓			
Ireland	✓	✓					
Malta	✓			✓	✓		
Latvia	✓		✓		✓		
Poland			✓		✓	✓	
Estonia					✓		
Lithuania					✓		
Czech Republic		✓			✓		
Belgium							Competitor to cable
Cyprus		✓	✓		✓		Better coverage
					✓		
Hungary					✓	✓	
Luxembourg	✓		✓		✓		
Portugal					✓	✓	Competition
Slovakia				Not yet defined			

Exhibit 4.2: Policy objectives and perceived benefits in developing DTT [Source: Analysys]⁷⁰

⁷⁰ Countries ordered chronologically (launch date) or according to degree of DTT development.

However, significant policy differences exist

Behind the similarities in policy objectives as described above, significant differences also exist between the objectives of different countries. These can be grouped into the three following categories:

- **Competition between platforms**⁷¹ – as can be seen in the exhibit above, some (four) Member States consider that having multiple competing transmission platforms is a key objective of developing DTT. For example, in Germany a representative of the Directors' Conference of the Lander Media Authorities (DLM) states:

“Despite a low penetration of terrestrial television, Germany is interested in keeping a third transmission system for television to foster competition between the three platforms (terrestrial, cable and satellite). This is the political goal and it makes the industry more competitive in terms of distribution and transmission.”

All Member States that have expressed platform competition as an objective are countries where household penetration of cable television is high (above 55%). In such a scenario, broadcasters have limited choice and negotiating power when seeking transmission of their content, and policymakers believe that the television sector can benefit from greater competition between transmission platforms.

An increase in transmission platforms and capacity is likely to lead to expansion of the media sector, and thus contribute to growth of the EC broadcasting market. However, where policymakers desire for competing platforms translates into measures that favour the terrestrial platform, competition and technology neutrality concerns may arise.

- **ICT development** – a number of countries (five) see ICT development as a policy objective of DTT. These countries,

⁷¹

Platform in this context refers to the different means of TV transmission, namely terrestrial, cable (DSL) and satellite.

primarily in Southern and Eastern Europe, include Portugal, Spain, Italy, Slovenia and Poland. For example, the Italian regulator Agcom states:

“Promoting access to new content and information without the need to own a PC is a key objective. PC penetration is limited: given the high penetration of TV instead of pushing PC sales, it has been decided that interactive services may be best delivered via TV.”

The ICT focus of some countries affects their policy towards DTT. This has so far manifested itself in terms of the promotion of the MHP standard. For instance, in Italy public funding has been made available for the development of applications as well as subsidies for interactive STBs.⁷²

- **Public control** – in Austria and Ireland, one of the objectives of DTT development is to provide the State with some leverage over broadcasters and thus help achieve national objectives such as broadcasting of local content. Both Austria and Ireland are affected by the television markets of large neighbouring countries with linguistic and cultural ties. In this context, a large proportion of content offered to viewers via cable and satellite platforms is imported⁷³.

Switching costs for consumers is the primary disadvantage of DTT

Policymakers expect that the benefits that DTT will bring to consumers will be strongly correlated with the DTT objectives identified above. In addition to these, portability and mobility are expected to be key benefits to consumers in some countries, notably in those countries with a high cable and/or satellite penetration, such as Belgium or Germany. In these countries, portability, and hence

⁷² It may be noted that apart from the terrestrial platform, interactivity may be delivered via alternative platforms (cable, satellite, DSL).

⁷³ Note that one approach to ensure that broadcast content reflects cultural and linguistic priorities is to invest in the appropriate content and make sure that it is available via the most appropriate transmission platform. The question then becomes whether the terrestrial platform has any cost or other advantages. As discussed in Chapter 2, for small countries/regions, DTT may be a more economic transmission solution.

the ease of servicing second TV sets in the homes, can help differentiate DTT from the dominant transmission technology and thus raise its chances of succeeding.

In the longer term, HDTV and DVB-H-based mobility are also expected to benefit consumers. Policymakers do not perceive that DTT has any major disadvantages for consumers beyond the switching costs, both in terms of acquiring STBs and adapting the antenna systems (where relevant). It may be noted that the falling price of STBs since the first launched of DTT in Europe has helped address this issue.

4.2 Influence of analogue terrestrial on DTT policymaking

Analogue PSB terrestrial has typically been considered a universal service...

In most Member States, access by all citizens to a free-to-air (FTA) analogue terrestrial television service for at least the PSBs' channels is considered to be a "right".

This reflects the historical role played by analogue terrestrial television and its development by the State. In many countries, the requirement of nationwide (or near nationwide) coverage is enshrined in Law.

Greater variance exists with respect to FTA services from commercial broadcasters (CSBs), with the coverage requirement depending on the status of the broadcaster (in some countries, such as in the UK, CSBs are considered to have a public service role), market conditions at the time of the launch of the commercial broadcast and other parameters.

...and many States have the same approach towards DTT

The historical role played by terrestrial television impacts the policy towards DTT in many Member States.

Exhibit 4.3 below shows that most countries that consider that the analogue PSB broadcast should be available nationwide are adopting a similar attitude towards DTT.

In the UK, the regulator Ofcom has argued that DTT coverage should match analogue terrestrial coverage primarily on the basis that some households cannot receive DTH signal and that DTT end-user costs are lower. Additionally, an argument has been made that the costs of migration to digital should be same for all consumers, irrespective of location.⁷⁴

In Sweden and Finland, extensive DTT coverage has been required partly due to the lack of satellite reception in some regions.

In Spain, the original DTT plan foresaw DTT coverage of 95% of population by the year 2012. Although the Government has not yet published the details of its new DTT plan, it is expected that near full coverage, at least for the PSB channels, will be required.

...though some exceptions exist...

A number of countries have decided that full coverage by DTT is not required in a multi-platform environment, with alternative (cable and satellite) platforms being able to help achieve full digital television availability. Such countries include Germany, the Netherlands, Luxembourg, Italy and France.

Of these countries, Germany, the Netherlands and Luxembourg already have widely deployed cable networks. This diminishes the need for a full DTT coverage as most households can access television via cable (although, in some cases such as Germany, a large proportion of cable is still analogue). Despite this, the small size and relative ease of coverage of the Netherlands means that nationwide DTT coverage is expected.

Italy and France have not fully addressed how to get universal DTV coverage

France and Italy recognise that the cost of providing DTT coverage to the last 10-15% of population is high and may be provided by alternative means. However, in neither country detailed plans exist for achieving full digital television coverage.

In Italy, the expectations are that DTT coverage will approach 90% of the population and satellite may be used to provide coverage to

⁷⁴ Ofcom has also argued that focusing on DTT facilitates market communication. Communicating to the market may be significantly harder where in a DTV migration scenario where several platforms are used to achieve this.

those areas not receiving DTT. In France, a coverage obligation exists in terms of the number of transmission sites to be used for DTT and signal strength. These obligations are estimated to provide 85% population coverage.

	<i>Universal access to PSB analogue TV?</i>	<i>PSB DTT coverage similar to current one for analogue TV?</i>
UK	Yes ⁷⁵	Yes
Sweden	Yes	Yes
Spain	Yes	Not yet decided but likely
Finland	Yes	Yes
Germany		No
Italy	Yes	No
Netherlands		No
France	Yes	No
Austria	Yes	No
Slovenia	No (min 90% for PSB)	Not yet decided but likely
Denmark		Yes
Ireland	Yes	Yes
Malta	No	Not yet decided but likely
Latvia	Yes	Yes
Poland	Yes	Not yet decided
Estonia	Yes	Yes
Lithuania	Yes	Yes (98% of population)
Czech Republic	Yes	No
Belgium	Yes	Not yet decided
Cyprus	Yes	Not yet decided
Greece		Not yet decided
Hungary		Not yet decided
Luxembourg	No	No
Portugal	Yes (>95% territory)	Possibly (under evaluation)
Slovakia		Not yet decided

Exhibit 4.3: *Policy towards PSB terrestrial broadcasts [Source: Analysys]*

⁷⁵ Ofcom: "An obligation to provide full coverage (99.5%) was placed upon the analogue terrestrial channels up until 1996 (BBC, ITV and Channel 4). However, this obligation was withdrawn thereafter as no significant community was left un-served".

⁷⁶ Historically, the public broadcasters have been required to cover the whole country. See Annex F for more details.

⁷⁷ Note that 80% area coverage is considered as nationwide coverage.

As in the analogue world, CSB DTT broadcasts are typically subject to less stringent coverage obligations than PSB broadcasts: in Italy, the PSB RAI is the only broadcaster to have coverage obligations. In Finland and Sweden, analogue terrestrial broadcasters have full or near-full coverage obligations, although other commercial broadcasters are free from coverage requirements.⁷⁸ Another example is Portugal, where half of the planned multiplexes (six) will not have a full national coverage, but rather regional coverage.⁷⁹ This reflects the balance between obligations and incentives acceptable to the CSBs.

4.3 The licensing regime

In the DTT arena, various licensing regimes exist that complicate the usually clear distinction between a broadcast licence (content related) and the granting of the right to radio frequency use:

- In the UK, different types of organisations (broadcasters, network operators, etc.) are assigned multiplexes (frequencies). Broadcasters may then obtain separate content licences from Ofcom. In this case, a clear separation between content licence and frequency rights may be maintained.
- In France, the CSA (regulator) selects individual channels via a beauty contest for inclusion in a specific DTT multiplex. An association of the broadcasters on each multiplex then selects the network operator. Thus, content licensing and assignment of frequency rights are intertwined in France.
- In other countries such as Italy or Spain, multiplexes (frequencies) have been assigned to individual broadcasters. Thus, content licensing and assignment of frequency rights are again intertwined.

This chapter is primarily concerned with frequency assignments. However, where the broadcast content licence and the frequency assignments are intertwined, content criteria may be important in the frequency assignment decisions.

⁷⁸ Commercial broadcasters that do not currently have an analogue terrestrial service.

⁷⁹ In each coverage region there will be six multiplexes, of which three will be available at a national level. The three regional multiplexes may or may not be the same in the three regions. Note that Portuguese policy on DTT is still being developed, so any information herein referring to Portugal may change.

Regulators and Ministries share licensing authority

As shown by Exhibit 4.4 below, DTT licences are issued in some countries by a regulatory agency, whereas in other countries a Government Ministry is responsible for this. Whilst DTT policy decisions are typically taken nationally,⁸⁰ in Germany the media regulator in each Land (region) is the relevant body for content authorisations.

*Beauty contests are the dominant licensing process...*⁸¹

The table also shows that beauty contests are the most common mechanism for assigning DTT frequencies. Some exceptions to this exist: in Italy, for example, all broadcasters that have a national analogue terrestrial broadcast frequency can switch to DTT broadcasting (and trading of broadcasting spectrum has been allowed in order to facilitate the creation of further national TV broadcasting networks). In Germany, negotiations between the media regulators of each Land and principle broadcasters have been a key mechanism for authorising the content: beauty contests have been used for the assignment of frequencies.

...placing particular emphasis on the broadcaster viability and content pluralism

In many countries (though not all), frequencies are assigned to broadcasters. The criteria used in assigning frequencies in the beauty contests are typically financial viability, content offering (pluralism), population coverage and technical capabilities. For example, in Finland, the regulator Ficora states:

“The most important criteria has been to chose broadcasters that are viable and will be able to continue services over time. The need for pluralism has been the other key criteria.”

Content pluralism in some countries (for example Austria) also means ensuring significant representation of local content, and is a key beauty contest selection criteria as well.

⁸⁰ Where regional and local channels are envisaged, the DTT license allocation process at those level is not necessarily carried out at national level (for instance, in Spain, this is done by the Regional Governments).

⁸¹ By beauty contest we refer to a process whereby broadcasters submit bids to the public administration for a licence and these bids are judged against a predefined list of criteria. Beauty contests enable administrations to exert more influence in the assignment process than auctions, thus ensuring that certain policy goals are fulfilled.

	<i>Licensing Authority</i>	<i>Licensing process</i>	<i>Licensing regime</i>	<i>PSB capacity reserved</i>	<i>Restrictions on use of capacity⁸²</i>
UK	Reg	Beauty contest	Per multiplex	Yes	Yes
Sweden	Regulator	Beauty contest	Per channel	Yes	Yes
Spain	Min	Beauty contest	Per channel	Yes	Yes
Finland	Ministry	Beauty contest	Per channel	Yes	Yes
Germany	Regional	Beauty contest	Per multiplex ^a	Yes	No
Italy	Ministry	Analogue broadcasters	Per multiplex	Yes	Yes
Netherlands	Regulator	Beauty contest ⁸³	Per multiplex	Yes	Yes
France	Regulator	Beauty contest	Per channel	Yes	No
	Regulator	Beauty contest	Per multiplex and per channel	Yes	No
Slovenia	Regulator	Beauty contest	Per channel	Not decided	Separate services
Denmark	Regulator	-	Per channel	Yes	EPG, teletext required
Ireland ⁸⁴	Regulator	Beauty contest	Per multiplex	Yes	Yes
Malta	Ministry	Beauty contest	-	Yes	-
Latvia	-	Beauty contest likely	-	-	-
Poland	Regulator	Beauty contest	el	Not decided	Not decided
Estonia	Ministry	-	Per channel likely	-	No
Lithuania		Beauty contest	-	Yes	Yes
Czech Republic	Regulator	Beauty contest	-	Yes	Yes
Belgium	Regulator	Not decided	Multiplex	Yes	Not decided
Cyprus	Not decided	Not decided	Not decided	Yes	Not decided
Greece		Not decided	Not decided	Yes	Not decided
Hungary	Regulator	Not decided	Not decided	Yes	Not decided
Luxembourg	Ministry	-	Per channel	-	-
Portugal	Regulator	Beauty Contest	Not decided	Yes	Not decided
Slovakia	Regulator	-	-	-	-

Exhibit 4.4: *Frequency assignment regimes [Source: Analysys]*

⁸² Refers to restrictions that may be placed on licensees with respect to the use of multiplex capacity.

⁸³ Planned but not used as only one applicant.

⁸⁴ Refers to 2001 plan that is being revised.

Per channel and per multiplex regimes are both common

As can be seen in Exhibit 4.4 above, both per-multiplex and per-channel licensing regimes are commonplace. A per-channel licensing regime gives the licensing authority greater control over the content of each channel. Pluralism has been a key factor in the choice by some policymakers of a per-channel regime, for example in Sweden.⁸⁵

Pluralism (content) is addressed via diverse measures...

In addition to per-channel licensing as in France, other measures are being taken in Member States to address the need for pluralism:

- **Licence commitments** help ensure pluralism. In the UK, multiplex applications made commitments in terms of the content to be offered, and Ofcom refers back to these as part of licence conditions.
- **Reserving DTT capacity for the PSB** that has specific content obligations is seen as a means to ensure pluralism in some countries (such as the Netherlands, Sweden, etc.).

...and is aided by rules that imply multiple broadcasters

Specify rules exist in many countries designed to lead to a variety of broadcasters using the DTT platform. A diversity of broadcasters may also contribute towards content pluralism.

- **Ownership rules** help ensure broadcaster pluralism. In many countries (for example, the UK, Italy, etc.) there are limits on how many television licences a broadcaster can have. On the other hand, in some other countries such as Spain, the fact that more TV channels will be available in the DTT context is seen as a guarantee of greater pluralism.
- **Specific rules**, as those in Italy, that stipulate that at least 40% of a “commercial” multiplex should be used by third-party broadcasters.⁸⁶
- **General competition laws** have also been highlighted as a means towards ensuring broadcaster pluralism.

⁸⁵ For more details on the licensing regimes, please refer to Annex A.[]

⁸⁶ Third party broadcasters refers to broadcasters other than the multiplex operator. As a result of this rule, some Mediaset channels appear on a non-Mediaset multiplex.

Some restrictions on non-TV capacity are common Exhibit 4.4 above shows that some restrictions on the use of multiplex capacity are widespread. As can be shown by Exhibit 4.5 below, these restrictions are primarily to ensure that a minimum amount of television content is broadcast (with the remaining capacity used for EPG's, radio, teletext, etc.).

	<i>Upper bound on non-TV broadcast content</i>	<i>Other restrictions</i>
UK	Less than 10% of multiplex capacity	
Sweden	Less than 20% of multiplex capacity	
Spain	Less than 20% of multiplex capacity	
Finland	Less than 15% of multiplex capacity	
Italy		TV channels and one interactive channel
Netherlands	Less than 20% of multiplex capacity	
France	None (content specified in license)	
Slovenia		Separate licences for broadcasting and data services planned
Denmark		EPG, etc
Berlin (Germany)	Less than 15% of multiplex capacity (1 out of 9 multiplexes)	
Ireland	Less than 15% of multiplex capacity in previous policy regime. Not decide	
Lithuania	Less than 15% of multiplex capacity	
Czech Republic	Less than 20% of multiplex capacity (only applies to PSB)	

Exhibit 4.5: *Restrictions on the use of multiplex capacity [Source: Analysys]⁸⁷*

⁸⁷ Countries where decisions have not been taken yet have been excluded from the table

4.4 Public funding of DTT development

PSB analogue terrestrial networks have typically been funded using public finances...

The original analogue terrestrial television networks used by PSBs in most countries have been rolled out using public finances – either end-user licence fees or Government budgets. In fact, in many cases (for example, the UK, Austria, Finland, France and Spain), the PSB and the network operator were the same organisation. In some other countries, such as the Czech Republic, it was the incumbent telecommunications operator that rolled out and operated the broadcasting networks.

In many such countries including as the UK, Finland, France and Spain, the PSB and the network operator have since been separated. In the DTT arena, network operators are independent of broadcasters in the majority of cases (as shown by the table below)⁸⁸. However, the table presents a mixed picture with respect to State ownership of DTT network operators. This has contributed to some controversy surrounding State involvement in the funding of DTT (see below).

⁸⁸ However, it may be noted that for analogue transmission networks, the PSB still operates their own network in several countries (including ORF in Austria, RAI in Italy and ARD in Germany).

Country	DTT Network operator	Owned by PSB / CSB?	Fully or majority State owned?
Finland	Digi	No	No ⁸⁹
Germany	T systems	No ⁹⁰	No ⁹¹
Italy	thers	Yes ⁹²	Yes for RAIway only
Netherlands	Nozema	No	Yes
Spain	Abertis	No	No
Sweden	Teracom	No	Yes
UK	National Grid Transco Group ⁹³ / NTL Broadcast	No	No

Exhibit 4.6: *Relationship between DTT network operator, the State and broadcasters*
[Source: Analysys]

...though differences exist between countries in the funding of CSB analogue networks

The roll-out of the analogue terrestrial networks used by the CSBs is more varied: in some countries such as Spain, the State-owned network operator has provided services to CSBs (for a transmission fee), whereas in others such as Italy CSBs have deployed their own networks. In Portugal, on the other hand, one of the two CSBs uses the same network as the PSB (operated by PT Comunicações), whereas the other CSB rolled out its own network, although it relies on the main broadcasting networks for the more remote coverage.

Public finances may also play a role in developing DTT...

The development of DTT networks involves substantial switching costs, both to the network operators (and therefore indirectly to the broadcasters) and to the consumers⁹⁴. Given the benefits to consumers and society (as discussed above), some Member States believe that public finances have a role to play that may include:

⁸⁹ Digita is 100% owned by TDF.

⁹⁰ With some exceptions in Western parts of Germany.

⁹¹ T Systems is 100% owned by Deutsche Telekom which in turn is 17% State owned.

⁹² The Italian market is unique in that complete vertical integration exists: all national broadcasters own their own transmission network. This includes the RAIway network owned by RAI, the state owned broadcaster.

⁹³ Formerly Crown Castle UK. Merged with Gridcom in September 2004.

⁹⁴ The higher costs stem from the need for new network infrastructure investments. The actual operating cost per channel should be lower for digital terrestrial television (compared to analogue terrestrial on a per channel basis).

- **Funding of PSBs** – Some Governments have taken measures that provide the PSBs with additional funds to be used to develop DTT. In many cases, this is a continuation of the role that the public administration has played in the analogue television arena.
- **Funding of CSBs** – In order to incentivise CSBs to contribute to DTT, some policymakers have decided to or are considering subsidising transition costs of CSBs
- **Network operator** – Some governments may contribute directly towards the roll-out costs of the network operator.
- **Consumers** – Adoption of DTT requires that viewers acquire a digital STB. In order to facilitate a migration to DTT, some Governments have or are considering subsidising to varying extents the costs of such STBs.

The following table summarises current or planned use of public funds in the EU for DTT development:

	<i>Additional funds to PSB</i>	<i>CSB subsidy</i>	<i>Network operator funding</i>	<i>Consumers STBs</i>
UK		-	-	-
Sweden	✓ Licence fee increased	-	✓ Loan provided	-
Finland	✓ License fee in	-	-	-
Germany	✓ License fee increased	✓ (in some Lander)	-	✓ (limited)
It	✓ (from sale of R)	-	-	✓
Netherlands	-	-	-	-
France			✓	-
Austria	✓	✓	✓	✓
Denmark	✓		Not yet decided	
Ireland	Gov. considering PSB financing	-	-	-
Latvia				
Poland		Not yet decided		Limited measures being considered
Estonia		-	-	-
Lithuania		Not yet decided		Excl. of VAT on STB being considered
Czech Republic	-	Not yet decided	Not yet decided	Not yet decided
Belgium	✓	-	✓	-
C		Not yet decided		
Greece		Not yet decided		
Hungary				
Portugal		Not yet decided		

Exhibit 4.7: *Public funding of DTT [Source: Analysys]⁹⁵*

⁹⁵ Table excludes countries where decisions on the use of public funds have not been taken yet. In the case of Austria, the measures are subject to EC approval.

...with PSB funding drawn from a variety of sources

The Exhibit 4.7 shows that public funds are planned to be raised from a variety of sources to develop DTT, with limited commonality between the different Member States:

- **Higher license fees** – In Sweden and Finland for example, the end-user licence fee has been increased to provide the PSBs with greater funds. In Germany, some funds raised through the licence fee were earmarked to help with the digital transition.
- **Network sale** – In Finland, the PSB has been allowed to use money raised from the sale of its transmission network to fund DTT. In Italy, part of the proceeds (up to 25%) from the privatisation of the PSB network (RAIway) may contribute towards DTT development.
- **Government budget** – Austria, on the other hand, has created a ‘Digitisation Fund’ in order to finance a variety of digital TV activities across all platforms (subject to EC approval). In Denmark, plans exist for the launch of one nationwide multiplex in June 2005 and the Government has pledged to ensure that the broadcasters have sufficient funds for the roll-out of the transmission network.⁹⁶

State funding of DTT can be controversial...

The use of public funds to finance the contributions of the PSB to DTT is a continuation of the traditional policy adopted towards analogue television in most Member States, where analogue television has been considered to serve public interest objectives.

However, in a multi-platform world, DTT represents a significant competitor to cable and satellite operators that may complain about additional PSB funding for DTT. In Spain, Sweden and the United Kingdom, concerns exist in the industry with regard to a possible significant PSB contribution to DTT. In Spain, this concern is compounded by the PSB’s substantial public debt.

⁹⁶ Details of the Danish Government’s pledge are unavailable.

Also, State funding of DTT should be placed in the context of DTT transmission typically being cheaper than analogue transmission (on a per channel basis). Such concerns are placed in the context of Community Law and addressed in Chapter 6 below.

...and limited transparency exists in the use of PSB funds

Controversy surrounds the use of state funds for DTT in part due to the limited transparency in the use of funds. In countries such as Sweden, Finland and Germany, for example, the TV license fee has been increased for DTT development. However, in many cases it is unclear what part of the license fee revenues are used towards providing the analogue terrestrial service and what is used for DTT development.

Furthermore, DTT funding can be directed towards content or the transmission network. This is consistent with the current use of public funds for the PSB analogue terrestrial service. However, where funds are used for developing the transmission network, the benefits and disadvantages may spill over into the wider electronic communications market.⁹⁷

Use of public funds for CSB subsidies is more controversial

The use of public funds to incentivise CSBs to participate in DTT is proving to be highly controversial and an EC investigation is ongoing into subsidies provided in Berlin. In Berlin the local media authority has used money from the PSBs' licence fee to fund infrastructure to be used by CSBs.⁹⁸ The German media authorities have a legal obligation to foster development of broadcast infrastructure, which is however put in general terms and not limited to the promotion of DVB-T. The outcome of the Commission's investigation of the Berlin DTT may give some guidance on how to assess public funding to CSBs under State aid rules.

⁹⁷ If and where public funds are used to finance DTT infrastructure that also benefits commercial operators, market distortion concerns may arise. However, no reasons for such concerns have emerged from our discussions with regulatory authorities.

⁹⁸ The media authorities' budget is made up of two percent of the PSB licence fee revenues.

EC's decision on the use of public funds is key...

As mentioned, the CSB subsidies provided in Berlin are currently being investigated by the EC. Other regions of Germany as well as other countries are paying close attention to the outcome of this investigation. Another EC investigation is underway into the transmission fees paid by the PSB (SVT) to the network operator Teracom in Sweden. The EC policy with regards to the use of public funds will have a major impact on the way such funds are used for DTT development.

...and will directly impact the DTT policies in Germany and Austria

In the German Land of North Westphalia, DTT roll-out began in November 2004 with the major PSBs and CSBs launching channels on the new platform. The Local Media Authority has agreed to subsidise CSBs (as in Berlin) subject to the approval of the EC. Also, Austria's above mentioned plans to use public funds for a variety of DTT development activities are also subject to EC approval.⁹⁹

An EC ruling against CSB subsidies could place an upper bound on DTT coverage

In the case that the EC rules against the use of public money to facilitate commercial DTT services (via subsidies to CSBs or funding of infrastructure to be used by CSBs), Member States may need to consider alternative means to achieve high coverage of commercial broadcasts. For example, in the case of Germany, individual Landers have negotiated with broadcasters the coverage that they will provide in exchange for incentives, including transmission subsidies in some cases. If these subsidies are withdrawn, commercial broadcasters may be less willing to provide the same level of coverage and service.¹⁰⁰

It may be noted that the conditions change from area to area: high-population density areas are intrinsically more attractive for commercial broadcasters (as greater population coverage is gained for less cost). Without incentives, commercial broadcasters will choose not to serve areas that have a low population density and/or a low average income (given impact on advertising revenues).

⁹⁹ This has been since resolved.

¹⁰⁰ Although in Berlin, for instance, the impact of removing the subsidies would be mitigated by the good take-up of DTT.

Widespread concern about STB costs are leading to various measures

DTT success requires not only substantial network coverage, but also a high level of STB ownership among the population. Therefore, different measures to facilitate end-user take-up of STBs have been implemented and others are being considered.

This ranges from subsidising MHP compatible STBs sold as in Italy to only subsidising STB take-up by specific segments of the population. The Italian subsidy (a one-off subsidy to consumers towards the purchase price of a set top box) is aimed at reaching a critical mass of DTT adopters in the market that can educate others on the benefits of DTT. In Berlin, the subsidy schemes were created for low-income families and similar measures are being considered in Poland. Other examples include a 0% VAT rate on STBs, which is being considered in Lithuania in order to make the STB more affordable to end-user.

It must be noted, however, that the reduction in STB prices means that this is now less of an issue than it was at the very beginning of the DTT launch: Accordingly, although low-income family subsidies were offered in Berlin, in several other regions of Germany such subsidies are not being considered. However, similar measures have not been put in place to reduce the cost of adapting external antenna systems.

4.5 Other public measures to promote DTT

Policymakers are using a range of measures to promote DTT

In addition to the above described funding mechanism, policymakers are aiding DTT development in a number of other ways. The most prominent are:

- **Spectrum/Concession Fees** – In some countries such as the UK, no charge is made for the DTT spectrum. In Finland, all commercial broadcasters are obliged to pay a concession fee related to turnover related from analogue transmissions only, thus providing an incentive for commercial broadcasters to migrate to DTT.

- **‘Must carry’ on cable** – In France, FTA DTT channels have a ‘must-carry’ right on cable for five years (through the “service antenna”). As in Germany, where DTT broadcasters were awarded a ‘must-carry’ status in Berlin and North-Rhine Westfalia, this provides a major incentive for some broadcasters to participate in DTT.
- The use of cable resources to promote DTT may be considered unfair given that DTT has the potential to compete against cable offerings. Legal issues surrounding the use of ‘must carry’ on cable as an incentive to promote DTT are addressed in Chapter 6.¹⁰¹
- **Funding of trials and applications** – In some countries including Belgium, Luxembourg, Spain¹⁰² and Slovakia, public funds contribute towards the funding of DTT trials, thus establishing the technical feasibility and appropriate technical parameters. In Italy and Austria, some interactive application development is funded by the Government.

In addition to the above measures, some policymakers (Ofcom, Agcom, etc.) have emphasised the key role played by pro-active regulation. Ofcom highlights the importance of the early technical work done by the then UK regulator, the Independent Television Commission (ITC), and the rapid reassignment of multiplexes upon the failure of ITV Digital in the UK.

¹⁰¹ In France, DTT FTA channels are to be included in the “service antenna” and will thus be delivered via the cable network free of charge. For details on the terms of the ‘must-carry’ obligations in Germany please refer to Annex E

¹⁰² Trial in Alcázar de San Juan.

4.6 Role of public service and commercial broadcasters

PSBs widely have reserved DTT channels or multiplexes

In many countries, DTT spectrum (whole multiplex or a number of channels) has been reserved for the use of PSBs by policymakers. Apart from the contribution to pluralism that PSBs may make (as mentioned above), the reservation of capacity is meant to reflect the importance placed on PSBs presence on the DTT platform in order to attract consumer interest. For example, in the region of North Westphalia of Germany the local media authority states:

“...at the time DTT was going to be introduced, audience was evenly shared between CSB and PSB programs. To guarantee that people were going to buy STBs, it was necessary to take into account the existing viewing habits.”

This is partly due to their ability to lead DTT development...

PSBs also provide a vehicle for Member States to achieve their DTT objectives. For example in Estonia, CSBs have shown limited interest in DTT as it represents additional costs that are beyond their resources. In the Czech Republic, PSB is also expected to lead DTT development given its superior technical competence. Policymakers consider that DTT will deliver greater spectrum efficiency and technology development, and regard the PSB as a vehicle to achieve these objectives.

... and in some cases is driven by the desire to promote the local culture

The importance of promoting local culture via television is also important in some smaller Member States, for example in Malta:

“More than one multiplex may be assigned to the PSB. Such a move may be taken in order to promote and maintain the local culture and language.”

PSB key roles have been in providing content and promoting DTT

Exhibit 4.8 below shows the role of PSBs in developing DTT and the rationale behind their contribution (as understood by the policymakers interviewed). It can be seen from the table that the key roles that PSBs are playing are in the provision of content and the promotion of DTT. PSBs are ideally suited to these roles given their content libraries and their typically high viewing in households. In less developed DTT markets, PSBs are contributing by leading trials or developing applications.

*PSBs' contribution
is driven by
several factors*

PSBs have various reasons for contributing to DTT. Principally:

- **Public service** – DTT may enable PSBs to better meet their public service obligations by using the additional broadcasting capacity to cover a variety of interests.
- **Maintain audience share** – DTT enables PSBs to maintain share of audience in face of cable and satellite competition (where PSBs are given significant DTT capacity).
- **Digital vision/deploy leading technology** – Some PSBs aim to play a major role in developing digital television and deploying leading technology in their country.

Other reasons cited include delivery of better quality services and cost savings (DTT transmission is typically cheaper than analogue transmission on a per channel basis).

	<i>Role of PSB in DTT</i>	<i>Rationale</i>
UK	Content, Promotion	Maintain audience share Public remit
Sweden	Content, new services	Opportunity to expand offering
Spain	Content	Public remit Use of archive material
Finland	Content, promotion	First mover advantage in DTV
Germany	Content, promotion	Desire for competing distribution platforms
Italy	Content, promotion	Maintain audience share Analogue switch-off announced
Netherlands	Content	Digital vision
France	Content, promotion	Modernising the TV offering, justification of the TV tax, opportunity to expand offering, cost savings
Austria	-	Maintain audience share Cost Savings
Slovenia	DTT Trial, MHP applications development	Public remit
Denmark	Content	Political objectives
Ireland	DTT Trial	Digital vision Need to replace transmission equipment Cost savings
Malta	Content	Better quality Deploy leading technology
Latvia	-	Better quality Opportunity to expand offering
Estonia	Content, promotion	Deploy leading technology
Lithuania		Public remit
Czech Republic	Champion DTT take-up	Maintain audience share Better quality
Belgium	DTT Trial	-
Cyprus	-	Public remit
Greece	-	-
Hungary	-	-
Portugal	Similar to that of current CSB FTA operators	Not commented upon
Luxembourg	-	Deploy leading technology

Exhibit 4.8: *Policymakers' opinion on the role and rationale of PSBs [Source: Analysys]*

Some CSBs also actively participate in DTT...

In some countries CSBs are playing a prominent role in developing DTT. The primary contribution of such broadcasters has been that of providing content required to make an attractive DTT offering. However, some CSBs such as MTV3 in Finland and Mediaset in Italy have also played a major role in market education and promotion, and in Lithuania, a leading CSB is undertaking the (only) DTT trials.

...driven by a variety of incentives

Commercial broadcasters contributions to DTT have various motivations that offset the cost of transmission (which in any case should be lower on a per channel basis). In some countries, these include a significant number of channels (or multiplexes), ‘must-carry’ rights on other platforms and transmission cost subsidies as in Berlin. Other motivations include the desire to maintain several competing distribution networks (as in Germany) and the opportunity to launch pay-TV services.

However, others are less likely to participate

However, some CSBs are less inclined to participate in the development of DTT. The following reasons have been identified:

- **High cable and satellite penetration** – In countries where alternative platforms have high penetrations, limited commercial incentive exists for CSBs to invest in a terrestrial network. This is particularly the case for low density areas such as some Landers in Germany.
- **Participation in DTT competing platform** – In France, some of the analogue terrestrial CSBs belong to the same organisation as the DTH pay-TV services. These broadcasters do not form part of the organisation created to promote DTT in France, TNT
- **Limited resources** – In countries such as Estonia and Slovenia, the analogue terrestrial CSBs are relatively small with limited financial resources to contribute to DTT development.

5 New digital television technologies

With the migration towards digital television, broadcasting transmission capacity can increase, and spectrum will be released upon analogue switch-off that can be used for broadcasting or other applications. These factors should contribute to the growth of European industry, in media and other sectors.

Two new services are leading contenders for deployment using the increased transmission capacity of digital television: High Definition television (HDTV) and mobile broadcast television (DVB-H). Furthermore, the deployment of these technologies will be facilitated by yet another technical innovation: advanced video coding (AVC) offers a much higher coding efficiency than the incumbent coding technology (MPEG2), and facilitates HDTV and DVB-H by reducing the transmission capacity required for these services.

This chapter addresses the latest developments in these technologies and explores their contribution to the development of digital television and the challenges that exist in their implementation.

5.1 High-definition television (HDTV)

Analogue HDTV was developed in the early 1980s, but by the early 1990s it was abandoned in Europe due to lack of interest from broadcasters and lack of a clear migration path to digital. However, recent market and technology developments have created renewed interest in HDTV using digital technology.

Major broadcasters are now attracted by the prospect of extra revenues from premium HDTV services, and the contribution HDTV can make towards retaining existing

subscribers in the face of growing multi-platform competition. Developments that are likely to drive HDTV deployments include:

- rapid sales of flat screen televisions
- high penetration of multi-channel television, leading to the search for the next innovation in broadcasting
- consumers increasingly accustomed to pay for innovations like high-definition, such as home cinema and widescreen television.

These developments will soon be followed by a second wave of drivers, which are likely to assist several HDTV launches from 2006–2008.

- high-definition DVDs are expected to be launched and may help drive demand for HDTV¹⁰³
- advances in coding technology will reduce the investment required by broadcasters.

The development of HDTV may require broadcasters to make substantial investments in HDTV broadcasts over a significant period of time, although penetration of receivers (and therefore benefits to the broadcaster) may be limited during this time.

The success of HDTV depends on relevant content being produced, the availability of means of transmission and availability of affordable receivers for viewers. This will require significant industry co-operation, as these requisites are interdependent – for example, if receivers are not available for purchase, broadcasters may not invest in transmission, and without broadcasts, manufacturers may not promote the receivers.

Although HDTV is suitable for distribution via all delivery platforms, satellite and cable platforms have certain advantages. An HDTV channel distributed via satellite is already available in Europe, and satellite and cable are likely to see several more European HDTV launches over the next few years.¹⁰⁴ Insufficient terrestrial spectrum is available for HDTV

¹⁰³ An analogy may be drawn here with the relationship between DVDs and widescreen television. Each technology has helped to create demand for the other: the DVD industry uses widescreen to differentiate DVDs from VHS.

¹⁰⁴ See www.hd-1.tv for further details on the HDTV channel.

in most European countries and this is expected to be the case until analogue switch-off, allowing terrestrial to also be used for HDTV delivery.

A number of technical issues surrounding HDTV are yet to be resolved and the industry needs to ensure that developments are future-proof. Issues to be resolved include the format in which the HDTV signal may be transmitted; given the current lack of clarity on this issue the industry may need to ensure that receivers can cope with both the leading candidate formats.¹⁰⁵ Also, replacement of the current analogue interfaces between the high-definition displays and receivers with digital high-definition multimedia interfaces (HDMI) needs to be achieved.

HDTV is explored in greater detail in Annex B.

5.2 Mobile broadcast TV (DVB-H)

DVB-H is a technology developed by the European DVB Project to provide TV and multimedia broadcasts¹⁰⁶. DVB-H enables mobile reception and benefits from convergence between broadcasting and mobile telecoms networks. It is expected that there will be a strong demand for services on handheld terminals, though a variety of other terminals may also be used.

The technical specification of DVB-H was completed in 2004. However, even before its specification, there was a strong interest from industry in its potential applications. In spite of the short time that has elapsed since its specification, several trials have begun (Finland, Berlin) or are planned (UK, Spain) and manufacturers are racing to develop appropriate terminals.

However, some key challenges lie ahead in DVB-H development:

¹⁰⁵ Current industry opinions are divided regarding the format that should be used for signal distribution: 1920 horizontal pixels x 1080 active lines with interlaced scanning (1080I) or an intermediate format 1280 horizontal pixels x 720 lines with progressive scanning (720P). By contrast, standard definition television (SDTV) contains only 720 horizontal pixels x 576 vertical active lines.

¹⁰⁶ The Digital Video Broadcasting Project (DVB) is an industry-led consortium of over 300 broadcasters, manufacturers, network operators, software developers, regulatory bodies and others in over 35 countries committed to designing global standards for the delivery of digital television and data services.

- **GSM900 incompatibility** – incompatibility with GSM900 terminals may prevent the use of the upper UHF band (the band in which DVB-T services are implemented in many countries).¹⁰⁷ This may restrict DVB-H deployments prior to analogue switch-off.
- **Spectrum** – DVB-H services may use the broadcasting UHF band or the mobile telecom bands. However, such spectrum is unlikely to be widely available before analogue switch-off, limiting DVB-H deployment.

Given spectrum limitations prior to analogue switch-off, DVB-H may be able to share some multiplexes with DVB-T (DTT). However, multiplex sharing implies a number of limitations: some enhancements of the DVB-H standard will not be possible (for example, use of 4k modulation) and a more expensive cellular structure network will be required. Further, such sharing will only be easily achieved where the DTT services have been designed for indoor portable reception. Multiplex sharing with standard DTT services will require use of hierarchical modulation and this may imply legacy STB problems in countries where DTT has already been launched.

In addition to the above challenges, one of the crucial issues is finding a viable business model. DVB-H service rollout will require significant network investments; at present, it is not clear how the deployment of DVB-H networks will be funded. In addition to network investments, incorporating receivers into handsets implies an incremental cost that the mobile industry may need to support. However, the mobile industry is unlikely to support the development of mobile TV via DVB-H as mobile operators have recently made large 3G investments and will be focusing on achieving a return on these. They may therefore be unwilling to invest in another technology before the potential of their current investment is realised, despite DVB-H providing a much cheaper implementation for point-to-multipoint content delivery than a 3G network. Indeed, mobile TV via 3G may help operators achieve greater 3G penetration and the introduction of mobile TV via DVB-H may put this 3G growth at risk. Consequently, even where spectrum is available (Finland, for example, where a multiplex has been reserved for DVB-H), commercial deployments may be more than three years away.

¹⁰⁷ All GSM900 backwards compatible terminals are affected.

Some alternative technologies for the provision of multimedia mobile services exist. The most prominent of these is DAB (and the related DMB), followed by technologies such as TMM and ISDB-T that are being developed beyond Europe¹⁰⁸. However, for various reasons, these technologies are unlikely to substitute DVB-H (though multimedia via DAB may complement it).

DVB-H is explored in greater detail in Annex C.

5.3 Advanced video coding (AVC)

It outlines the developments in video coding technology, and addresses their relevance to digital television development in Europe.

Video coding technology is a fundamental enabler of digital television which, by compressing content, allows a more efficient use to be made of transmission networks. Since being adopted by the Digital Video Broadcasting (DVB) project¹⁰⁹ in 1995, MPEG2 has established itself as the key video encoding standard. The coding efficiency of MPEG2 has experienced a series of enhancements since then, however, little room remains for further improvements.¹¹⁰

A new coding algorithm, advanced video coding (AVC),¹¹¹ offers a much higher coding efficiency and allows plenty of room for enhancement. Furthermore, the benefits of AVC may be enjoyed by both low and high bit rate applications. Consequently, AVC may be used for low bit rate applications such as DVB-H and videoconferencing, medium bit rate

¹⁰⁸ Terrestrial Mobile Multimedia Multicast and Integrated Services Digital Broadcasting-Terrestrial.

¹⁰⁹ The Digital Video Broadcasting Project (DVB) is an industry-led consortium of over 300 broadcasters, manufacturers, network operators, software developers, regulatory bodies and others in over 35 countries committed to designing global standards for the delivery of digital television and data services.

¹¹⁰ MPEG2 video coding is also known as ITU-T H262, and MPEG2 transport structure as ITU-T H222. Coding efficiency refers to the ratio between raw and compressed file size/bit rate.

¹¹¹ AVC is also known as ITU-T H264 or MPEG4 pt10.

applications such as HDTV and DVD, as well as high bit rate applications such as film production and processing.¹¹²

VC1 (developed by Microsoft) represents another new generation coding system that is competing with AVC. Although VC1 is easier to implement than AVC, it is less bit-rate efficient. Additionally, given industry concerns about the dependence on Microsoft, AVC is likely to become the standard for the next generation of broadcasting, though VC1 may retain an edge for specific applications such as Internet streaming. However, equipment manufacturers are likely to enable both AVC and VC1 coding technology in their equipment, leaving the choice of which system to adopt by content producers and broadcasters.

The coding efficiency of AVC will facilitate the development of digital television where capacity is constrained, as is the case with DTT in many Member States. However, AVC is not compatible with MPEG2 (which is used by almost all digital television set top boxes (STBs), raising migration issues where applications with a large established base of MPEG2 receivers exist. As a result, AVC is best suited to launch new TV platforms, or applications that require a new terminal (such as DVB-H or HDTV) with no need for backwards compatibility.¹¹³

AVC adoption may start with the pay-TV sector as Pay-TV operators have more incentives to subsidise decoders; typically, they offer large amounts of content to customers with whom they have a stronger relationship.

AVC is explored in greater detail in Annex D.

¹¹² As with MPEG2, use of AVC results in a net loss, with some information not being retrieved upon decoding. As a result, the bit rate for each application should be kept over a certain threshold to avoid perceivable picture impairment.

¹¹³ Note that at present a HDTV satellite service is available in Europe (Euro1080) that makes use of MPEG2. However, take-up is currently limited and a migration to AVC is planned.

6 Community Law and DTT development

Digital television developments in Europe take place within the context of the legal framework established by Community Law. In this chapter we review the impact of existing legislation affecting DTT and identify opportunities where further European initiatives may facilitate the development of DTT. The existing legislation affecting DTT includes specific media legislation, various directives in the field of electronics communications, and competition law, but is itself constrained by the contribution of DTT to services of general economic interest.

Existing media legislation may need to be modified to address in more detail new forms of programming (such as video-on-demand) which are growing in importance with the penetration of digital television services. Any changes to the media legislation will need to avoid inconsistencies between the regulation of broadcasting and other information society services.

Few Member States have fully implemented all aspects of the various directives in the field of electronics communications to the broadcast transmission market. Where such directives have been implemented, Member States interpret them in different ways. For example, in the five Member States (see Section 6.1.2 below) where the *Framework Directive* has been applied to define broadcast transmission markets eligible for *ex-ante* regulation, different approaches have been adopted. While some of the variations may be explained by differences in national markets and circumstances, we believe that such differences indicate that Member States would benefit from Commission support in disseminating best practice and providing guidelines for regulatory measures.

Some of the plans regarding the promotion of DTT in a few Member States have also raised competition-law issues, mainly in terms of State aid to incumbent PSBs and CSBs. Several investigation proceedings are under way and some Member States may have

slowed DTT migration plans waiting for EC rulings or approvals to ensure that they are not in breach of competition law.

Further, in some Member States (such as the UK, Sweden, etc.), the subsidised activities of incumbent analogue terrestrial broadcasters are being expanded, given the greater transmission capacity of digital platforms. We believe that any such extension beyond that in the analogue terrestrial environment must be justified by the Member State where this occurs.

The Commission has issued two Switchover Communications that, amongst other matters, have recalled that the requirement of making regulation technologically neutral does not preclude to promote certain specific services where this is justified, for example digital television as a means for increasing spectrum efficiency. We nevertheless believe that the definition of some further guidelines as to what is likely to be acceptable from the Community's point of view for State subsidies to DTT in particular may aid analogue switchover. This guidance also may involve expeditious treatment of pending State aid complaints concerning DTT subsidies in order to assist those Member States that have not yet implemented measures.

The remainder of this chapter is structured as follows:

- Section 6.1 explores in greater detail the impact of existing legislation that affects DTT
- Section 6.2 specifically addresses how general interest objectives impact the application of the existing legislation.

6.1 Impact of existing legislation affecting DTT

At the Community level, basic legislation affecting DTT may be split into three groups:

- **media regulation** – principally, the *Television without Frontiers Directive*
- **electronic communications** – the *Electronic Communications Framework Directive*, associated directives and the *Radio Spectrum Decision* regulate transmission facilities and radio spectrum

- **competition law** – all areas of competition law impact DTT, including the Merger Control Regulation, Antitrust (Articles 81 and 82 EU Treaty), standards for services of general interest (Article 86 and State aid review (Article 87)).

Such legislation (and its precursors) is well established and has been frequently interpreted in the context of analogue television. However, its application to digital television is less established, and different interpretations exist amongst the Member States. Below, we explore aspects of media regulation, electronic communications and competition law that affect digital television and DTT in particular.

6.1.1 Media regulation

The Television without Frontier Directive is the centrepiece of media regulation

The *Television without Frontier Directive* is the centrepiece of the Community's legal structure in the media sector, among other matters, containing provisions on:

- access rights to events of general public interest ('events of major importance for society')
- measures to promote the production and dissemination of European and independently produced television programmes
- consumer protection as regards advertising, sponsorship and teleshopping, including unfair commercial practices
- protection of minors and public order, and
- the right of reply.

Media rules may be changing in ways that affect digital television platforms

The Commission is currently considering the revision of the *Television without Frontiers Directive* (in the medium term) to take account of technological developments and changes in the structure of the audiovisual market. However, it has been basic policy since 1999 that "services providing audiovisual content should be regulated according to their nature and not according to their means of delivery."¹¹⁴ Thus,

¹¹⁴ "Principles and Guidelines for the Community's Audiovisual Policy in the Digital Age," COM(1999) 657 final, 14 December 1999 at page 2.

these revisions would not necessarily affect DTT directly, or in ways different from other delivery platforms for digital television.

Any revision to the *Television without Frontiers Directive* may seek to further distinguish between linear programming, i.e., the traditional notion of television broadcasting, and new concepts of programming services, including video-on-demand. As these changes are currently under discussion, it is too early to predict possible effects on DTT. However, the impact on all platforms including DTT must be assessed when considering changes to the directive.

Future media and electronic communications regulation must be consistent

Digital television is likely to lead to growth in the markets for video-on-demand and other interactive services. Currently, these services are not addressed by the *Television without Frontiers Directive* and are instead subject to regulation under the structure set by the *Electronic Commerce Directive*.¹¹⁵ Any further changes to the *Television Without Frontiers Directive* should ensure, to the extent possible, that services provided via DTT and other digital delivery platforms are subject to a consistent regulatory structure, avoiding gaps or inconsistencies between the regulation of broadcasting versus information society services.

6.1.2 Electronic communications regulation

The electronic communications framework consists of a number of directives that address different aspects of electronic communications. The *Framework Directive*¹¹⁶ supplies the main definitions that apply to regulation of all television delivery platforms, including DTT. Other directives that form part of the electronic communications package concern

¹¹⁵ The *Electronic Commerce Directive* 2000/31/EC of 8 June 2000, on certain legal aspects of information society services, in particular electronic commerce, defines the liability of service providers and sets a legal framework for information society services ("*E-Commerce Directive*"), OJ L 178/1, 17.07.2000. Information society services are defined by reference in Article 2(a) to the *Transparency Directive* (98/34/EC as amended by 98/48/EC).

¹¹⁶ Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services ("*Framework Directive*"), OJ L 108/33, 24.04.2002.

access, universal service, local loop unbundling (LLU), liberalisation/competition and data protection, as well as a Commission decision on the regulatory framework for radio spectrum. The following directives are particularly relevant to the regulation of television platforms, which are explored below:

<i>Directive</i>	<i>Impact on digital television</i>
Framework	Identifies the <i>ex ante</i> regulation
Access	Deals with accessibility issues relating to digital television platforms
Universal service	Addresses
Authorisation	Deals with radio frequency rights of use, allocation and authorisations
Spectrum	A toolbox

Exhibit 1: *EC Directives of key relevance to digital television [Source: Hogan & Hartson]*

Framework Directive

<i>The regulatory framework for electronic communications sets objectives and principles ...</i>	The <i>Framework Directive</i> sets the Community's framework for the regulation of electronic communications, and is designed to reduce <i>ex ante</i> sector-specific regulation progressively as market competition develops. At the outset, Article 8 of the directive defines a set of objectives that Member States must aim to achieve when carrying out regulatory tasks. The article emphasises that national regulatory authorities shall "take the utmost account of the desirability of making regulations technologically neutral".
<i>... which amongst them require technology neutrality ...</i>	The principle of technology neutrality is stressed in various Commission documents. A recurring message in Commission texts, including the Switchover Communications, has been that Member States should not favour one technology over another for the provision of networks or services. This message has particular force in the context of digital television, where the Community policy is to achieve the transition from analogue to digital and its associated benefits – not to develop a particular technology or achieve a certain platform mix.
<i>... though acknowledges that,</i>	However, the Commission also acknowledges that under specific circumstances specific technologies may be promoted. The

under specific circumstances, specific technologies may be promoted

Commission's recent communication on the transition from analogue to digital broadcasting states "[t]he principle of technological neutrality enshrined in the EU regulatory framework means that regulation should neither impose nor discriminate in favour of the use of a particular type of technology, but it does not preclude a Member State from taking proportionate steps to promote specific technologies for transmission of digital television as a means for increasing spectrum efficiency".¹¹⁷

The Framework Directive requires Member States to define markets subject to ex ante regulation

A key part of the Framework Directive requires the Commission to recommend product and service markets that require *ex ante* regulation. Member States must then in turn review the defined markets that justify *ex ante* regulation and determine which undertakings have a position equivalent to dominance (significant market power (SMP)) in these markets. Sector-specific obligations will only be imposed on undertakings that the national regulatory authorities designate as having SMP consistent with competition principles through procedures established under Articles 7 and 16 of the directive¹¹⁸.

'Broadcasting transmission services' has been identified by the Commission as the eighteenth market in electronic communications

The Commission's February 2003 *Market Recommendation* on specific markets in the electronic communications field identifies the 18th (and last on the list) market as "broadcasting transmission services to deliver broadcast content to end users", which encompasses networks used to deliver DTT services.¹¹⁹ To date, five Member States have addressed the broadcasting transmission market:

- **Ireland** has identified four wholesale broadcast transmission markets, of which two are eligible for further competition analysis:

¹¹⁷ 2005 *Digital Switchover Communication*, at page 5, citing *Framework Directive* Recital 18.

¹¹⁸ Intervention in markets other than those identified in the *Market Recommendation* is possible only if the Commission agrees that the market has high barriers to entry, no dynamic competition and competition rules are not sufficient to address the market failures. New and emerging service markets should not be regulated, in order to stimulate investment.

¹¹⁹ "Commission Recommendation of 11 February 2003 on relevant product and service markets within the electronic communications sector susceptible to *ex ante* regulation," OJ L 114/45, 08.05.2003, page 45 ("*Market Recommendation*"). Also, see the "*Explanatory Memorandum*" to the Recommendation, published by DG COMP, undated and unnumbered, issued contemporaneously with the *Market Recommendation*.

television broadcasting transmission services on analogue terrestrial networks, and a radio broadcasting transmission market. Ireland did not find that broadcasting transmission services on cable and satellite networks should be further analysed.¹²⁰ It has not identified any market for terrestrial digital transmission, as DTT does not yet exist in Ireland and is not expected to have an impact within the timeframe of the review.

- **Austria** has divided television broadcasting transmission markets into cable, satellite and terrestrial, identifying only the market for terrestrial television broadcasting as being relevant for *ex ante* regulation – this currently consists only of analogue transmission.¹²¹
- **Finland** has divided the market into eight different broadcast wholesale markets, including the market for digital television transmission services in terrestrial digital television networks (in multiplexes A, B and C in compliance with the network licences). Only one operator has been deemed to have SMP in the relevant markets.¹²²

120 Commission letter to the Irish Commission for Communications Regulation, Case IE/2004/0042, “*Markets in Ireland for Broadcasting Transmission Services...*,” 2 March 2004. The Commission Web site for Article 7 procedures, notifications and Commission responses is maintained at http://europa.eu.int/information_society/topics/ecom/highlights/current_spotlights/art_7_task_force/index_en.htm .

121 See Commission letter to KommAustria, Case AT/2003/0018, “*Market definition in Austria for broadcasting transmission services...*,” 11 December 2003.

122 Commission letter to Ficora, Case F1/2004/0076, “*Finnish markets for television and radio broadcasting transmission services ...*,” 14 July 2004.

123 Ofcom, “*Review of competition: broadcasting transmission services consultation*,” 9 September 2003, Annex A, “*Relationship between the Commission’s list of markets and the markets being examined in this document*,” at page 43.

124 This determination had earlier been submitted through Article 7 procedures and the Commission issued a letter to Ofcom, Case UK/2004/0111, “*Broadcasting transmission services to deliver broadcast content to end users in the [UK]*”, 28 January 2005. The Commission noted that Ofcom’s narrower approach to market definition, by separating cable, satellite and terrestrial, is a deviation from the Recommendation “since in principle market 18 includes transmission services of all kinds regardless of the specific platform used.”

125 “*Summary of PTS’ Decision concerning broadcasting transmission services, to deliver broadcast content to end users – the market for [DTT]*”, 9 May 2005.

- **The UK** has concluded that the market for terrestrial transmission should be analysed separately:

“Cable and satellite cannot provide a pricing constraint on terrestrial transmission” and thus it is “appropriate to define the market for terrestrial transmission as discrete from other transmission platforms, and to proceed on that basis for the market definition for the UK.”¹²³

The UK regulator has distinguished between three levels of services associated with terrestrial transmission to end users: upstream, intermediate and downstream levels. In the upstream market, the UK maintains that there is no reason to distinguish between markets or remedies between digital and analogue terrestrial transmission (as there is in practice no demand-side substitution between them). In April 2005 the UK identified the market for provision by two operators of access to their masts, sites and shared or shareable antenna systems used for the purpose of providing analogue and/or digital terrestrial broadcasting transmission services within the UK.¹²⁴

- **Sweden** (in May 2005) submitted its determination that there exist seven candidate markets for broadcast transmission, of which three have been analysed.¹²⁵ DTT has been identified as one of these three markets, and the national transmission network provider (with 100% market share) is deemed to hold SMP.

Significant differences exist in approach ...

As can be seen above, each of these market determinations differs, often substantially, from the others. Moreover, each determination appears to separate, to one extent or another, the market characteristics of different platforms.

The fact that only five Member States have submitted market determinations in this sector may be due to the market being in flux, given that plans for switchover to digital transmission platforms have not been finalised. However, this represents only a partial explanation,

as analogue broadcasting transmission markets are well-established. The lack of a firm deadline for national determinations may be another explanation for the relative paucity of filings (the *Framework Directive* calls for such determinations “as soon as possible” after the Commission released its *Market Recommendation*).

... and this suggests that further EC guidance may be helpful

The variations amongst Member States’ assessments and the small number of determinations submitted suggests that further guidance from the Commission may be helpful with respect to the broadcasting transmission market. Such guidance may take the form of workshops, communications or exchanges of views through the Communications Committee established pursuant to the *Framework Directive*.

Universal Service Directive

The Universal Service Directive permits ‘must-carry’ rules

Article 31 of the *Universal Service Directive*¹²⁶ permits, but does not require, Member States to impose reasonable ‘must-carry’ obligations on undertakings providing electronic communications networks where a “significant number of end-users of such networks use them as their principal means to receive radio and television broadcasts”.

The *Universal Service Directive* provides that ‘must-carry’ obligations shall only be imposed where they are necessary to meet “clearly defined general interest objectives and shall be proportionate and transparent” as well as subject to periodical review.

Must-carry affects DTT in two ways

In the context of DTT, ‘must-carry’ rules are relevant in two ways:

- carriage of DTT channels on other platforms
- carriage of specific programming on DTT multiplexes.

Additionally, PSBs may be granted frequencies to be able to broadcast via DTT. However, such spectrum reservations are not

¹²⁶

Directive 2002/22/EC of the European Parliament and of the Council of 7 March 2002 on universal service and users’ rights relating to electronic communications networks and services (“*Universal Service Directive*”), OJ L108/51, 24.04.2002.

considered ‘must carry’, and are addressed separately below.

Significant differences exist between Member States

Historically, with some exceptions, ‘must-carry’ obligations have been applied to cable networks only, and not to satellite or terrestrial networks. However, ‘must carry’ has been contemplated in the context of DTT and differences exist between Member States in how ‘must carry’ has been applied:

- In Germany ‘must carry’ is regulated by the media authorities of each state. Analogue FTA terrestrial channels enjoyed ‘must-carry’ status on cable networks. In major DTT areas, including Berlin and North Rhine-Westfalia, those channels with analogue ‘must-carry’ status keep this status on the DTT platforms.
- In Sweden, DTT authorisations are issued to each broadcast channel, with one multiplex specifically reserved for the PSB. It is still under consideration as to whether DTT channels may have ‘must-carry’ rights on cable networks.
- In the UK, the law ensures that the analogue terrestrial channels have the right to be present on all platforms, which consequently gives PSB channels ‘must-carry’ rights on DTT (and DTT capacity has been reserved for PSBs). However, presence on DTT does not provide any specific ‘must-carry’ rights on other platforms.

These examples show that Member States have used the *Universal Service Directive* to reserve frequencies for PSBs and/or to provide DTT channels with ‘must-carry’ rights on digital platforms. This raises the question as to how much PSBs’ ‘must-carry’ capacity can be justified under the *Universal Service Directive*¹²⁷ and whether ‘must carry’ on alternative platforms is based on ‘clearly defined public

¹²⁷ If PSB objectives were met using 1 or 2 analogue frequencies in the past, Member States need to justify granting more capacity on DTT networks.

interest objectives’.

We do not seek to resolve this issue on a country by country basis, but note that there is the risk that current ‘must-carry’ regimes will be extended uncritically to new digital platforms, and to DTT in particular, without attention to whether that regime is any longer necessary or proportionate. It has been suggested that Member States are merely extending the legacy of existing analogue ‘must-carry’ rules to the digital environment, based on an untested assumption that it is appropriate to rely on terrestrial transmission platforms in order to reach the maximum (or the minimally acceptable) coverage. This risk is a real concern given the substantial changes in markets and services that will occur during the duration of the digital switchover.

The answer in each Member State as to which channels or services should be universally available to meet the general interest objectives may differ – depending on their market size, language groupings, cultural factors and likely many other factors, Member States may support different requirements. However, the question must be answered ‘clearly’ to satisfy the requirement of the *Universal Service Directive*. By requiring that the general interest objectives justifying ‘must-carry’ rules should be ‘clearly defined’, the *Universal Service Directive* requires Member States to assess the rationale for any such rules in advance. (We discuss the overall concept of general interest objectives in the following section.) This requirement for a clear definition of general interest objectives also provides an opportunity for the Commission to assist Member States in determining best practice and common principles for defining the objectives with respect to digital platforms.

The proportionality of ‘must-carry’ rules in the digital environment must also be addressed to ensure that those obligations do not substantially harm the business case for the rollout of digital platforms. However, note that given the significantly higher

transmission efficiency of digital systems (by comparison to respective analogue systems), ‘must-carry’ content may be more easily accommodated on digital systems (assuming the same amount of ‘must-carry’ content).

Emphasis on common practice may add value from the Community perspective

As with the market determinations under the *Framework Directive*, the variations in Member State practice relating to ‘must carry’, indicates that a broad exchange of views and emphasis on common practice may add value and help clarify the regulatory environment for DTT development.

As noted above, Article 31 of the *Universal Service Directive* calls for Member States to subject ‘must-carry’ obligations to periodical review. The Commission has initiated a review of the scope of universal service obligations in 2005 (but which did not relate to ‘must-carry’ rules).¹²⁸ Such a review could be expanded to include an assessment of the relevance of ‘must carry’ for DTT development and may provide guidance as to what measures may be considered as proportionate and transparent

The review of the Universal Service Directive should encompass ‘must carry’

We suggest that the review of the *Universal Service Directive* focuses, among other matters, on the justification for ‘must-carry’ rules in the digital environment. Further, the Commission, in its annual implementation reviews, should examine the extent to which Member States have complied with the requirement of the directive to subject all ‘must-carry’ rules to periodical review.¹²⁹ Additionally, the 2006 review of the *Universal Service Directive* should consider whether specific criteria may be defined for use in the ‘periodical review’ to

¹²⁸ “On the Review of the Scope of Universal Service in accordance with Article 15 of Directive 2002/22/EC”, COM (2005) 203, 24 May 2005.

¹²⁹ The Commission started the process of discussing the requirements for ‘must carry’ with its working document on this topic submitted to the ONP committee’s Digital Broadcasting Expert Group (doc. Reference ONP DBEG 02 10) and in the Communications Committee in July 2002. At that time, the Commission noted that ‘must-carry’ obligations impose a cost burden on network operators that can have a considerable impact, and in particular that DTT networks could have capacity constraints that draw into question the proportionality of carriage requirements. We recommend that this dialogue be maintained and expanded during the 2006 review.

assess this intrusion into the discretion of network operators.

‘Must offer’ is considered as an alternative approach ...

An alternative or complementary approach to ‘must carry’ has been suggested, and adopted in at least one Member State, of applying a ‘must-offer’ regime to certain PSB services.¹³⁰ Such a regime would require certain content providers to offer their programming services to certain network operators. On the most basic level, to the extent that PSBs are funded through public funds and the general interest objective is to ensure access to that programming, it seems appropriate that PSB programming be offered to all transmission networks to ensure the widest possible coverage.

... but raises many questions

Notably, a ‘must offer’ requirement changes the obligation from one on network operators under the electronic communications framework to an obligation on content providers, possibly under content regulation. Numerous and tricky questions must be answered for a ‘must-offer’ regime, including remuneration for carriage (who pays whom?) copyright and other rights payments (how far is the coverage and how are the rights affected?), exclusivity (how could platforms distinguish themselves?), which channels must be offered (basic PSBs, new services developed by PSBs, or commercial stations with significant market share?), and equivalence (can there be ‘must offer’ without ‘must carry’?). These are public policy questions – not legal questions – because the legal regime at the Community level to answer these questions does not yet exist beyond the most basic and high-level principles.

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We assume that the content is made available to end users via ‘must carry’ on some platforms or spectrum assignment enabling terrestrial broadcasts.

Authorisation Directive

The Authorisation Directive governs how rights of use for DTT are assigned ... The *Authorisation Directive*¹³¹ governs the public authorisation of networks and the rights of use of frequencies. It establishes a structure whereby most networks and services are subject only to a general authorisation that may be obtained without prior approval. The directive also provides that ‘rights of use’ to frequencies (the functional equivalent of licences) should be required where there is the risk of harmful interference.

As DTT networks depend on radio spectrum, frequency rights of use are required, and the provisions of the *Authorisation Directive* are thus of key relevance in their assignment.

...complementing other European legislation The *Authorisation Directive* complements other European legislation, including the Commission Directive 2002/77/EC on competition in the markets for electronic communications networks and services, which bars exclusive and special rights for networks and services (Article 2), and sets general competition standards for granting rights of use of frequencies (Article 4). Also, the *Spectrum Decision* (see below) provides specific guidance on allocation and assignment of frequencies.

Radio Spectrum Decision

The Radio Spectrum Decision provides standards for management The *Radio Spectrum Decision* (together with provisions in the *Framework and Authorisation Directives*) provides standards for how spectrum is allocated (i.e., designated or defined for particular purposes) and assigned (i.e., granted through a right of use to a particular user).¹³² As such, the system by which DTT operators

¹³¹ Directive 2002/20/EC of the European Parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services (“*Authorisation Directive*”), OJ L108/21, 24.04.2002.

¹³² Decision 676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in the European Community (“*Radio Spectrum Decision*”), OJ L108, 24.04.2002.

would obtain necessary radio spectrum is ensured to be based on objective, transparent, non-discriminatory and proportionate criteria.

Its principle aim is harmonisation across Europe

The principal aim of the *Radio Spectrum Decision* is to promote harmonisation across Europe in the use of radio frequencies. Using the Decision, the Commission may issue mandates to the CEPT to develop harmonised spectrum allocations, and may adopt binding Commission decisions based on the results.

The Commission is advised by an expert group ...

A Radio Spectrum Policy Group (RSPG) has been established (under this Decision) to advise the Commission on spectrum policy issues, based on advice from Member State experts. Among other issues, the RSPG has considered the spectrum implications of the switchover to digital broadcasting, on which the RSPG issued an opinion in November 2004.¹³³

... whose recommendations are relevant to DTT

The RSPG has considered areas where Community initiatives may promote a co-ordinated approach with respect to the switchover. These recommendations may provide guidance for other relevant aspects of DTT harmonisation beyond spectrum. The RSPG recommended examples of potential Community initiatives, including:

- information sharing, collection and distribution of information from and to Member States, such as regular reports on national plans and strategies for digital switchover
- arranging public workshops at which Member States and other stakeholders can discuss and provide guidance on best practices in areas such as bilateral co-ordination, transition issues, etc.
- promotion of additional services offered by digital broadcasting and advantages of switchover.

¹³³

Opinion on the spectrum implications of the switchover to digital broadcasting, RSPG04-55 Rev. (final), 19 November 2004.

The group is to contribute towards the World Radio Conference (WRC07)

The RSPG has also undertaken a consultation, with the aim of providing a further opinion, on priorities and objectives for the Community in the World Radio Conference scheduled for 2007 (WRC07). Issues considered at this International Telecommunication Union conference may shape the use of ex-analogue television frequency bands. This issue is important to help shape whatever ‘spectrum dividend’ will be gained from the release of spectrum used by analogue services because that spectrum is not needed by more efficient digital television applications.

The European Commission plays a limited role in international spectrum management

The manner in which Member States use broadcast radio spectrum (particular digital TV) is directly affected by international spectrum management activities. Member States actively participate in management activities via the CEPT, and efforts have been underway for several years to prepare for the ITU’s Regional Radio Conference in 2006 that will determine spectrum allotments for digital broadcasting.¹³⁴ The Commission acts as an observer at such ITU events and participates to the extent that Community issues are at stake. For instance, the Commission has issued mandates (under the authority of the Radio Spectrum Decision) on some aspects of ITU events. Also, the Commission has held a workshop on preparations for WRC07 and the RSPG is preparing an opinion to address issues on the WRC07 agenda that affects DTT.

Member States may benefit from greater involvement of the European Commission in such events

In some Member States, spectrum constraints are a key barrier in the migration from analogue terrestrial to DTT. Furthermore, spectrum is an even greater constraint for the development of DVB-H, given the lower priority it receives from policymakers. Direct Commission involvement in international spectrum management events may help achieve the Community’s objectives of harmonisation of radio spectrum in general, and efficient use of broadcasting spectrum in particular. This may facilitate the development of new services (for

¹³⁴

Such planning involves identifying national requirements, co-ordinating those requirements and then negotiating results with the entire ITU Region 1 (encompassing all of Europe, the Middle East and Africa) in order to incorporate those requirements into a regional plan.

example, HDTV and DVB-H) and thus help bring economic benefits to Europe. The Commission should consider whether existing policy statements are sufficient to support such participation, or whether additional political support or further mandates through the *Radio Spectrum Decision* are desirable.

The Access Directive

The Access Directive ensures that broadcasters have platform access

The *Access Directive* 2002/19/EC,¹³⁵ together with Article 18 of the *Framework Directive*, requires Member States to ensure access to conditional access services (by broadcasters) and *encourages* them to set access rules for application programme interface (API) and electronic programming guides (EPGs).

It applies to DTT, and has been extensively adopted

These rules apply to all forms of digital delivery platforms, and as such do not distinguish between DTT and other networks. All service operators must offer conditional access services to digital TV broadcasters on a fair, reasonable and non-discriminatory basis (FRND), unless the national regulatory authority determines that the conditions are not necessary.¹³⁶

The market and technical standards for conditional access have been extensively analysed in numerous fora, including a Commission workshop, consultation and communication. As these Community access rules would not apply in a manner radically different for DTT, we do not discuss them here any further.

¹³⁵ Directive 2002/19/EC of the European Parliament and of the Council of 7 March 2002, on access to, and interconnection of, electronic communications networks and associated facilities ("*Access Directive*"), OJ L108/7, 24.04.2002.

¹³⁶ The imposition of such regulatory requirements does not require that the conditional access service be identified as requiring remedies under the market definition procedures of the *Framework Directive*.

6.1.3 Competition rules

Numerous well-defined competition instruments exist that might apply to digital television ...

A variety of competition law instruments may apply to digital television, including the Merger Control Regulation, Antitrust (Articles 81 and 82 of the EU Treaty), and the State aid rules (Article 86, 87 and 88). The merger rules have, for example, been used with respect to the merger of the two Italian digital pay-TV satellite platforms, Telepiù and Stream, into Sky Italia.¹³⁷

For DTT, State aid may be the most relevant competition issue

The EU's State aid rules examine to what extent a specific measure constitutes State aid, which is in principle prohibited. Aid may however be considered compatible in certain circumstances, for example, if it is shown that the measure promotes an economic activity of general interest. This assessment of whether aid is permitted takes also into account whether the measure is necessary, proportionate to the objective pursued and does not unduly distort competition. Subsidies to broadcasters, network operators or consumers are likely to be caught by the State aid rules. In contrast, regulatory measures not involving any financial transfers may fall outside the State aid rules, but can still be caught by other EC legislation.

Criteria for determining State aid are clearly established

In order to determine if Member States' subsidies or funding constitute State aid, the Commission must assess whether they:

- are granted by the State or through state resources
- are capable of distorting competition by favouring certain undertakings or the production of certain goods, and
- affect trade between Member States.

137 Commission Decision of 02.04.2003 declaring a concentration to be compatible with the common market and the EEA Agreement (Case No COMP/M. 2876 – News Corp / Telepiù), OJ L 110/73, 14.04.2003. One particular commitment that was considered essential for the Commission to approve this merger in the digital satellite broadcast sector was that News Corp committed not to enter into any further DTT activities in Italy.

State aid rules may be applied beyond direct funding of broadcasters ...

State aid rules are generally applied to the context of funding or loan guarantees for broadcasters. The Commission has held that ‘must-carry’ rules do not involve State aid because they do not confer any financial advantage from state resources.¹³⁸ However, Article 87(1) on State aid applies to “any aid granted by a Member State or through state resources in any form whatsoever ...”. Thus, other forms of assistance from Member States that involve the granting of in-kind aid or the assessment of fees for access to State resources at less than market rates may be also potentially treated as State aid.¹³⁹

... and subsidies may take many other forms

Beyond direct funding, Member States have provided subsidies to low-income households, assisted with the price of decoders and supported broadcasters with the lease of terrestrial frequencies. These measures, as well as substantial educational and consumer campaigns to raise awareness of DTT, may also be viewed as subsidies where such measures fulfil the general definition of State aid. They may raise competition issues where other digital television platforms receive no such assistance.¹⁴⁰

It should be noted that decoder subsidies, when applicable to all of the digital television platforms, would normally not distort competition between technologies.

¹³⁸ Commission Decision of 19 May 2004 on measures No C2/2003 (ex NN 22.02) implemented by Denmark for TV2/Danmark, C(2004) 1814 final, para. 68 (appeals pending). See also Summary Assessment, No C2/04 (ex NN 170/03) ad hoc measures to Dutch public broadcasters and NOB, OJ C 61/8, 10.3.2004 (no state resources are involved in legal provision obliging private cable providers to relay PSB programming).

¹³⁹ In the TV2/Danmark decision, the Commission explicitly considered the impact of fees paid by the PSB for nationwide transmission frequencies, at paras. 28-31. To the extent that radio spectrum is considered a state resource, then the granting of access to that resource fits within the provision of Article 87(1).

¹⁴⁰ Such award of assistance to DTT platforms could implicate the principle of technological neutrality stressed not only in the Framework Directive (at Recital 31), but also in specific communications on the issue of the switchover from analogue to digital television, COM (2003) 541 final, 17 September 2003, at page 14; and on interoperability of interactive DTT, COM (2004) 541 final, 30 July 2004, at page 9.

*The so-called
Altmark ruling
provides some
further guidance
on determining
State aid*

The 2003 *Altmark* ruling by the European Court of Justice provides further guidance on determining State aid.¹⁴¹ According to the ruling, compensation for costs incurred in the discharge of a public service obligation is **not** characterised as State aid if the following conditions are all met:

- ‘clearly defined’ public service obligations are involved
- parameters for the compensation are established in advance in an objective and transparent manner
- no overcompensation is involved, and
- either the operator is selected through tender procedures or compensation is determined by reference to the costs of a typical, well-run undertaking, including a reasonable profit.

If a publicly funded project does not meet all these criteria, it requires notification to the Commission in order for it to assess the project’s compatibility with Community standards (based on standards of necessity and proportionality).

*The Commission
has also provided
guidance for
assessing State aid
for PSBs*

The manner in which the Commission assesses the context of State aid to PSBs has been refined and made transparent, via the Commission’s 2001 communication on the application of State aid rules to PSBs,¹⁴² and a series of recent determinations including the release of ‘frequently asked questions’ on PSBs and State aid.¹⁴³ In the communication, the Commission noted that in order for a measure to be compatible with State aid rules on the basis that it is a service of general economic interest, the service must be clearly defined by the Member State (definition), the undertaking receiving the aid must be explicitly entrusted by the Member State to provide that service (entrustment) and the measure must not affect Community trade and competition contrary to the common interest (proportionality).

¹⁴¹ *Altmark Trans GmbH et al. vs. Regierungspräsidium Magdeburg*, case C-280/00, European Court of Justice, 24 July 2003.

¹⁴² *Commission’s Communication on the application of State aid rules to public service broadcasting*, 2001/C 320/04, OJ C 320/5, 15.11.2001.

¹⁴³ Memo/05/73, 3 March 2005.

It should be noted that the Commission's communication focuses on the general interest objective of the "task of providing balanced and varied programming [...] while preserving a certain level of audience",¹⁴⁴ and does not explicitly deal with the manner in which that content is transmitted.

Despite this, uncertainty currently exists regarding how State aid may impact DTT

Despite the guidance from the *Altmark* ruling and the greater transparency from the Commission regarding PSB funding, uncertainty currently exists with respect to the extent to which State aid may impact DTT. At the time this study is written, a number of proceedings are underway to examine various types and levels of subsidies by Member States to DTT. The Commission has opened formal investigations in Sweden and Germany, and closed a State aid notification in Austria for DTT.¹⁴⁵ Expeditious treatment of these cases would provide guidance for other Member States considering programmes in aid of the digital switchover, particularly as the current guidance on State aid to PSBs does not address distribution of that programming.

The competitive impact of any State aid on distribution must be considered

Although policy intervention to assist broadcasters may be acceptable under certain circumstances, the impact of any measure taken on other electronic communications markets needs to be considered. For instance, while some subsidies towards DTT broadcasting by a PSB may be acceptable, Member States should ensure that this will not negatively impact other markets where the broadcasting network operator is present. Moreover, Member States must pay strict attention to how subsidies given to one platform will affect other means of distributing broadcasting content.

¹⁴⁴ Id. at para. 33.

¹⁴⁵ Case No. NN35/2004 (Sweden - introduction of digital terrestrial television), initiated 18 August 2004; Case No. NN36/2004 (Germany - DVB-T in Berlin-Brandenburg), initiated 18 August 2004; Case No. N622/03 (Austria - promotion and development of DTT - "Digitalisierungsfonds"), conclusion of State aid compatibility, 16 March 2005. These cases are reported at http://europa.eu.int/comm/competition/state_aid/decisions/additional_docs.html.

Clarity from the Commission may aid DTT development

We do not seek to define precisely the legal standards or predict the outcome of competition rulings for subsidies to DTT. The issues are contentious and there are ongoing complaints or investigation proceedings that will define these standards for the future. Details of these proceedings are confidential and speculating about them would add little value. However, an examination of the potential issues and the various proceedings indicates that further Commission action is required, if only to provide clarity on the standards that should be applied.

The importance given by Member States to the development of DTT, as well as our discussions with policymakers in Member States, provides evidence that the public promotion of DTT has become a political priority. Consequently, it may be expected that measures to promote DTT may increase as we approach analogue switch-off deadlines.

The Commission is currently actively encouraging the digital switchover in a technologically neutral way. This is in parallel, however, to a review of compliance with EC competition law in some individual cases. Guidance at the Community level as to what subsidies are permissible will assist national policymakers in determining the boundaries and benefits from best practice in other Member States. The provision of general guidance on permissible subsidies for DTT (much in the same manner that the Commission has provided general guidance on subsidies to PSBs) will thus help develop digital television in the Community and bring economic benefits resulting from new uses of the freed spectrum.

6.2 General interest objectives

As noted above, ‘must-carry’ rules and State aid must be justified by reference to general interest objectives. Thus, it is necessary to assess what those objectives are and how they relate

to DTT networks and services. The importance of general interest objectives in the broadcasting field is reflected in the Protocol on Public Broadcasting annexed to the EU Treaty (as revised in Amsterdam), which establishes that:

The provisions of the Treaty establishing the European Community shall be without prejudice to the competence of Member States to provide for the funding of public service broadcasting insofar as such funding is granted to broadcasting organisations for the fulfilment of the public service remit as conferred, defined and organised by each Member State, and insofar as such funding does not affect trading conditions and competition in the Community to an extent which would be contrary to the common interest, while the realisation of the remit of that public service shall be taken into account.

General interest objectives permit policy intervention in markets

For services deemed to be in the general economic interest, Community law permits some degree of policy intervention by Member States that otherwise might be inconsistent with competition rules. Article 86(2) of the EU Treaty provides that:

“undertakings entrusted with the operation of services of general economic interest [...] shall be subject to the rules contained in this Treaty, in particular to the rules on competition, insofar as the application of such rules does not obstruct the performance [...] of the particular tasks assigned to them.”

In sum, this provision of Article 86(2) is partially a derogation from the ban on State aid that may otherwise apply. Policy intervention under such circumstances is further underlined by Article 16 of the EU Treaty, that makes the facilitation of such services of general economic interest (SGEI) a community duty, with the implication that such intervention should take place even where the market may not have sufficient incentives to do so.¹⁴⁶

¹⁴⁶

Commission's Communication on Services of general interest in Europe, COM(2000) 580 final, 20.9.2000, published at O.J. C17/4, 19.1.2001, at para. 14.

Public service broadcasting is in the general interest ... Public service broadcasting is considered to be within the range of SGEI, and the term ‘public service’ in public service broadcasting is considered to refer to the term SGEI in Article 86(2).¹⁴⁷ Thus, some degree of policy intervention in public service broadcasting is accepted.

...as are some commercial broadcasts Furthermore, the Commission has noted that some commercial broadcasters (CSBs) are also subject to public service requirements and play a role in achieving public service objectives by contributing to pluralism, culture and political debate, as well as widening the choice of programmes.¹⁴⁸ Thus, some policy interventions in favour of CSBs may also be justified.

Member States decide what content is in the public interest Member States are given a wide remit to adopt a definition of SGEI in the broadcasting field¹⁴⁹ (though note that this mainly refers to content and not transmission). Thus, Member States need to clarify how many public service channels may be considered to be in the general interest and how these channels must be transmitted in general (i.e. the amount of coverage, whether by population, geography or other criteria).

Content deemed in the public interest requires widespread distribution For certain content to be considered a service of general economic interest, it is required to be widely distributed: it is the act of broadcasting content that makes it a service of general economic interest. Thus, public intervention to ensure that public service content is available to the largest possible audience may be considered necessary, but this intervention must always be proportionate to the objectives and should not distort competition.

¹⁴⁷ Commission's Communication on the application of State aid rules to public service broadcasting, at note 3. See also the Commission's White Paper on services of general interest, COM(2004) 374 final, 12.05.2004. In Annex 1 of the White Paper, the Commission notes the different terms used in the context of services of general interest. For the purposes of this report, we do not distinguish between SGEI (including ‘economic interests’) and general interest objectives. The White Paper notes the imprecision in the term ‘public service’. Nevertheless, as this is a common term in the broadcasting context, we refer consistently to PSBs as the traditional publicly funded national broadcasters, in contrast to the newer CSBs often aiming their services at a broader market, and not publicly funded.

¹⁴⁸ Commission Communication on the application of State aid rules to public service broadcasting, at para. 14.

¹⁴⁹ Id. at para. 33.

Competition is an important goal under the *Framework Directive* and under State aid rules. A variety of distribution platforms exist, including cable, satellite and terrestrial.

This may justify some intervention, such as ‘must-carry’ rules

A complete separation between content and the transmission means may not be possible. To a large extent, the service is inextricably linked to the means of distribution, because if a PSB service is not transmitted to the public, it is not a service of general economic interest (broadcast programming must be **distributed** to provide any type of service – it is the action of ‘broadcasting’ content that makes it a service of general economic interest).¹⁵⁰

This may justify ‘must-carry’ rules, which are clearly an intrusion into the otherwise discretionary ability of network providers to sell their capacity to whomever they chose. Nevertheless, the *Universal Service Directive* sets standards that Member States must meet to justify such an intrusion, as we discussed in detail above (see Section 6.1.2).¹⁵¹

The extent to which ‘must carry’ is applied must be justified

A significant difference between analogue and digital terrestrial broadcasting may lie in the number of channels. Incumbent broadcasters may create additional channels as the switchover to digital eases the spectrum capacity constraints. However, any expanded ‘must carry’ would need to be proportionate and clearly justified under the *Universal Service Directive*. If the general interest objectives have been met in the past through transmission of a specific number of channels, then the burden of showing why an expanded number of channels is justified is on Member States. This

¹⁵⁰ See *Framework Directive* Recital 5: “The separation between the regulation of transmission and the regulation of content does not prejudice the taking into account of the links existing between them, in particular in order to guarantee media pluralism, cultural diversity and consumer protection.”

¹⁵¹ Instead of spectrum reservation for public service broadcasts via DTT, ‘must-carry’ rules may be applied to achieve the widest availability of the PSB channels. However, this is only applicable in countries that have adopted a per multiplex licensing model. Furthermore, implementation of must carry on DTT is complicated by the fact that multiplexes may be operated by different undertakings and the capacity of DTT platforms may remain limited compared to other digital TV platforms.

consideration was noted in the recent Commission staff working paper annexed to the communication on the digital switchover.¹⁵²

Digital switchover is also in the general interest ...

The Commission recognises that digital switchover can contribute to achieve general interest goals, having noted in its 2003 communication on the digital switchover that “*policy intervention can facilitate the switchover process under certain circumstances, contributing to achieve general interest goals*”.¹⁵³ In its recent and updated communication on the digital switchover (May 2005), the Commission again refers to how the switchover process may contribute to new or improved broadcasting services, which in turn contribute to fulfilment of objectives of general interest “*such as cultural diversity and media pluralism*”.¹⁵⁴ DTT is only one possible transmission platform that can contribute to these objectives.

... and this may also impact policy towards networks

The objective of ensuring widespread digital distribution of public service broadcasting to the widest audience does not automatically require public authorities to define the transmission method. It could be considered sufficient for authorities to require a certain target of coverage for certain programming that is defined to be a service of general economic interest. The choice of transmission mechanisms including, for example, a mix of DTT and DTH or other means, could be left to market allocation.

As explained above, in countries where a specific analogue transmission platform is heavily relied upon to provide broadcasting services, it may be difficult to achieve the general interest objective of digital switchover within the target timeframe. This stems from

152 SEC(2005) 661, 24 May 2005, at page 12, noting “[i]f the change in the transmission technique as such however is used as a justification to extend obligations relating to general interest and thereby to increase existing ‘must-carry’ obligations, it has to be made transparent why this is reasonable and why such additional obligations are necessary to meet clearly defined public interest objectives and that such obligations are proportionate.”

153 COM(2003) 541 at page 25.

154 “2005 Digital Switchover Communication”, at page 6.

the need to achieve not only coverage, but also penetration (without which switch-off may be politically unacceptable).

Spectrum reservation may also be justified

In many Member States, terrestrial television remains a key television platform. Ensuring widespread penetration of public service broadcasts in such countries (that may help achieve the general interest of switchover) may require spectrum to be reserved for terrestrial broadcast.

From a regulatory perspective, the assignment of frequencies directly to providers of television broadcasting content services is possible under Article 5 (2) (second paragraph) of the *Authorisation Directive*; but this would be an exception from the general principle that frequencies have to be granted through open, transparent and non-discriminatory procedures.¹⁵⁵

This also follows traditional practices

The reservation of spectrum for DTT, and its assignment to PSBs, is consistent with traditional practice. Radio spectrum historically has been allocated to broadcasting services, and in turn assigned to transmission networks or directly to the broadcasters.

Recent debate in the field of spectrum management and trading, however, has raised the issue of whether broadcasters in general should automatically be entitled to spectrum or whether they should pay for spectrum rights like everybody else – this is a topic beyond the scope of this study, but one that requires a careful balance of the public interest objectives of broadcasting versus other general interest objectives, such as achieving efficiency in spectrum management. Such a balance is necessary to meet the requirement that measures to support public service broadcasting be proportionate.

Again, much of the debate hinges on how much spectrum may be reserved for broadcasting that helps achieve public service

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This Article is consistent with provisions of both the electronic communications *Framework Directive* and the *Spectrum Decision* that they are without prejudice measures taken at Community or national level to pursue general interest objectives relating to audio-visual policy. The *Framework Directive*, Article 1(3); *Radio Spectrum Decision*, Article 1(4).

objectives (which may possibly include commercial broadcasting). Crucially, as with the ‘must-carry’ issue, this depends on an initial determination of how many public service channels may be considered to be in the general interest, rather than on the actual amount of spectrum available to broadcasters before and after analogue switch-off.

*The Commission
may assist by
providing greater
legal clarity*

The Commission may contribute by providing greater legal clarity or at least noting that these issue must be resolved in national proceedings at the outset. The recent consultation on SGEI highlights that in certain areas the application of Community rules to SGEI is not sufficiently clear.¹⁵⁶ Based on that consultation, the Commission has noted its intention to review the situation of SGEI: explicit guidelines for Member States regarding the treatment of such issues in the context of DTT may facilitate digital switchover.

¹⁵⁶

White Paper on services of general interest, COM(2004) 374 final, at sec. 3.9, page 11. See also the section in the White Paper noting that the consultation confirmed demand for greater legal certainty and predictability when it comes to application of state aid rules to public service compensation, at Section 4.2, page 13. This reinforces our earlier conclusion that greater certainty in this area for the DTT area should be useful.

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