

Digital Switchover in Broadcasting

**A BIPE study for the European Commission, Directorate
General Information Society**

Executive Summary

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Executive Summary

This study was commissioned by the European Commission (Directorate General Information Society) and undertaken by BIPE Consulting in 2001. The executive summary provides a synthesis of the Final Report and a more general view of the study, its assumptions, approach and results. This paper is aimed at readers that are not necessarily familiar with the switchover issues and the television background, and for that purpose it has been kept intentionally simple.

We will first examine the context and the objectives of the study, and then describe our approach and structure of the deliverables. Finally, we highlight our **20 main findings and recommendations** to policymakers.

The context

After the introduction of digital broadcasting in television and radio (“turn-on”), we define « switchover » as the progressive migration of households, from analogue-only reception to digital reception. « Analogue turn-off » (ATO), or « switch-off », refers to the termination of analogue broadcasting, which is considered to be possible when most TV households are equipped to receive digital signals.

Digital broadcasting has already been introduced in the Union. At the end of 2001, 27 million households were receiving television in digital format¹ (18% of European television households).

To date, these households access digital TV mainly by satellite (19 of the 27 million). On the supply side, there are more than 600 digital television channels, though many channels are still broadcast in analogue mode too. During 2001 the satellite platforms *Viasat* and *Sky* have completed their digital switchovers and turned off their analogue

¹ Source: Seventh Report on the Implementation of the Telecommunications Regulatory Package (annex 2.1). See study introduction for full reference.

broadcasts ; now nearly all European, satellite-based, pay TV platforms are transmitting in digital format only.

About 80% of European cable systems have been upgraded to support digital transmissions and digital services but, to date, only some cable operators actually commercialise digital access and few households are actually receiving digital signals through cable connection (the United Kingdom being the only country where a significant part of cable subscribers – 2 million - are already “digitised”).

Regarding the third delivery mechanism, terrestrial broadcasting, digitisation has started to be implemented commercially in four Member States (Spain, Sweden, Finland and the United Kingdom) and there are plans to launch in nearly all other Member States. It should be kept in mind that about 50% of European households currently receive television only through terrestrial reception, while 30% receive it through cable and 20% through satellite dishes. This breakdown reflects the delivery mechanism used for reception on the primary set in the house, but many households who use cable or satellite for their primary set also use terrestrial reception for their secondary or tertiary sets.

The objectives of the study

With regard to various Community policies (information society, consumer interests, promotion of open competition and the single market), the European Commission seeks to have a thorough understanding of the issues related to the switchover. European Commission services wish to be ready to anticipate what could come out of the combined actions of industry players and Governments, and assess what could be their impact on markets and on spectrum management. Finally, the Commission would like to explore what could or should be its role during the switchover; this could range from a limited role that would include European ‘guidelines’ on best practices, to a greater involvement in co-ordinating the switchover process, if there were overriding Community interests justifying European co-ordination and synchronisation of the switchover/turn-off and spectrum re-farming processes.

BIPE approach

To provide the Commission with a thorough understanding of the issues at stake, BIPE Consulting has carried out a survey to gather first-hand information on players’ objectives, concerns, expectations, plans and strategies for the switchover.

This included interviews with about 80 entities from virtually all categories of players : free-to-air broadcasters, incumbents and new entrants, public and commercial broadcasters, pay-TV operators, radio operators, cable operators, transmission service providers by satellite or terrestrial means, consumer electronics manufacturers, other spectrum users like mobile telecommunications operators, Government officials and regulatory bodies. Directorate General Information Society and BIPE Consulting organised in April 2001 a workshop in which all those categories of players were invited to express their views about the switchover.

And last, Directorate General Information Society and BIPE Consulting constructed and distributed a questionnaire that resulted in about 30 contributions. We not only considered the *official* statements made by entities but also assessed what may be the actual - sometimes « hidden » - strategic agendas of the players, deriving from their long-term interests.

The Final Report and other deliverables

First, in the **Market Chapter**, we analyse the drivers and obstacles to the digital TV migration. To build a complete understanding of these, we refer to historical precedents of technological adoption-migration. Then we focus on consumer behaviour regarding television, new technologies, and turn-off announcements. Last, we widen the scope by describing the strategies of *all* the categories of players involved in the process, and we focus on what appears to be the most controversial issue : digital terrestrial television and the way it is introduced. At the end of this Chapter we have a clearer vision of **how far the switchover can go if driven by market forces alone** under current regulatory/market rules, and what kind of market failures imply new policy action.

In the **Spectrum Chapter**, we first recall the basis of spectrum management and spectrum efficiency. We analyse the **consequences of the introduction of digital terrestrial broadcasting** (TV and radio) on spectrum management, describe and compare the different options taken in Europe. We then analyse the potential re-use of frequencies released after the terrestrial analogue turn-off, and the options for re-farming and licensing policy.

The **Public Policy Chapter** addresses the policy and regulatory stakes related to TV switchover and spectrum management. We analyse the general interest objectives that are related to TV switchover and spectrum management, and the other drivers of government policy. Then we systematically describe and comment on the whole range of **policy measures that can be taken in order to encourage the digital**

switchover. Last, we develop a cost-benefit analysis of some policy options concerning the digital switchover: the infrastructure policy (role of terrestrial broadcasting in the global digital TV market), the timing policy (pros and cons of a policy which seeks to accelerate the pace of switchover). We analyse qualitatively the benefits, costs and risks associated with the main policy options, then we use a quantitative model to simulate and assess the areas of macro-economic efficiency, depending on market environments and other hypothesis (spectrum valuation).

After the three chapters, we can draw general conclusions from which we derive recommendations to policy makers, at national and European levels.

Digital Radio issues (obstacles, possible solutions) are addressed in a separate chapter.

In addition to the main report, two volumes of annexed documents are available : one volume for Country Profiles (focus on digital switchover in the EU, applicant countries, Japan and the USA); one volume for additional developments on spectrum, cost-benefit methodology, case studies from past technological migrations, and the issue of secondary TV sets.

Issues at stake

The termination of analogue broadcasting may be considered as the future *consequence* of the introduction of digital broadcasting. **Digital broadcasting indeed brings many advantages compared to analogue broadcasting** : opportunities to provide a better image (including wide-screen aspect ratio and possibly high definition) and sound quality; lower transmission costs or the ability to transmit *more* channels or services for the same cost; better efficiency in spectrum use (as more data can be transmitted within the same bandwidth); the ability to transmit associated data allowing for enhanced television or fully interactive applications when associated with a return-path facility.

These benefits from digital broadcasting can be achieved whatever delivery network is used, though **some benefits are more specific to a particular network**. Wireless indoor reception and mobile reception can be implemented through digital *terrestrial* broadcasting only. The better spectrum efficiency expected from digitisation has much wider consequences in the case of a scarce *public* resource like the UHF and VHF spectrum bands used for terrestrial broadcasting, than in the case of radio-electric frequencies used in 'closed' systems like those used by cable operators, or the high frequency bands used by satellite transmission operators.

Digital broadband cable is the delivery mechanism that offers the largest potential bandwidth, the greater diversity of services and the highest interactive capacity ; and satellite reception is the delivery mechanism which is the most cost-effective for the delivery of nation-wide or pan-European services.

Some of the expected benefits from the digital migration come at the very start of the introduction and adoption of digital broadcasting (i.e. the *turn-on* and *switchover* period), while other benefits, like the release of spectrum and more efficient spectrum management, would specifically derive from the *turn-off*.

All those advantages (that benefit broadcasters, or consumers, or policymakers), would make analogue broadcasting *redundant* when digital reception is widely available, so that the simultaneous broadcast in analogue and digital (« simulcast ») would certainly be abandoned (“turned-off”). Then the **turn-off will have impacts on spectrum management**, as it would release sections of the frequency bands currently used for terrestrial broadcasting. This raises the question : « what to do with the released frequencies ? », i.e. the re-farming issue.

This is the story of a **market-driven technological migration**, namely the progressive replacement of a technology by another, better one. But we shall also consider the process in a *reverse* story : analogue turn-off being not only the *consequence* of a widespread switchover to digital, but can be also viewed as one of the main *reasons for* switchover.

More specifically, some of the players involved - like Governments, regulators, and spectrum users - could benefit from the analogue turn-off. Governments are **interested in achieving a better use of spectrum** and are or may be interested in increasing budget resources out of the sale or leasing of the released frequencies. The precedent of UMTS auctions is evoked by some Member States, in debate about the future re-farming of the released frequencies. Finally, spectrum users, be they television broadcasters or not, would be interested in using released spectrum to support services and programmes.

As a result, policy makers (i.e. Governments and/or regulators) are likely to accelerate the introduction of digital transmission, and to encourage digital reception penetration, in order to achieve a faster turn-off, especially for terrestrial television. Market players (broadcasters, pay TV operators, and consumers) do benefit from the switch to digital, so **this switch is likely to happen under market forces, though at a moderate speed**, which will be determined by transition and switching costs (like the upgrade of networks to support digital broadcasting ; the equipment of every household with digital-compliant receivers).

However, the possibility to turn-off as soon as possible then resulting in better spectrum efficiency would benefit entities that are *not* directly involved as players in the television market, like Governments, non-television spectrum users and Society as a whole. On the other hand, *direct* market players, either free-to-air broadcasters, pay-television operators or consumers, would not benefit directly, individually, from the release of some additional spectrum, so that they have little incentive to optimise spectrum use. They are therefore not likely to take future spectrum benefits into account in their spontaneous behaviour, i.e. to accept the costs necessary to accelerate the switchover/turn-off process.

When it is proven that there are benefits which are « external » to market players, economic theory suggests that the action of market forces alone cannot result in an optimal situation (“market failure” situation). Therefore the intervention of public authorities can be recommended in order to influence the market forces. This can be done by creating incentives or imposing obligations on players so that market forces act in a way that is more beneficial to the general interest. However, potentially negative “side-effects” of public intervention (e.g. competition distortions, moral hazard, etc) must be considered as well, and the **expected benefits from public intervention must be compared with the potential costs and risks.**

Key findings and recommendations

1. Structural obstacles to the digital migration

The study of past technological migrations and market mechanisms at work in television (market chapter) teach us that **four types of structural market failures** prevent a faster and a wider switchover for DTV equipments and services. These market failures are : (i) **chicken-and-egg situations** (DTV services, equipments and networks are totally inter-dependent), (ii) the **situation rents** of incumbents (oligopolistic revenues derived from spectrum/licence scarcity always encourage status quo), (iii) the **free-rider** syndrome (which requires co-ordination of investments when collective benefits are at stake), (iv) **external benefits** (some of the benefits expected from a faster or more universal switchover affect the economy or the Society as a whole and not the players involved in television markets), (v) **threshold effects** (full benefits are achieved only when switchover is almost complete and analogue turn-off possible).

2. General interests in reaching a faster, wider migration

There are **general interest objectives at stake**, which are social and economic (extension of the information society, more efficient spectrum management, as seen in the spectrum chapter, etc).

3. Therefore the need for policy intervention

Since there are structural obstacles to more rapid or wider market development under the action of market forces alone (point 1), and since there are general interest objectives from a faster/ wider migration (point 2), **policy intervention can be justified** (see policy chapter).

4. Cost-benefit analysis assesses the relevance and limits of policy intervention

Our cost-benefit analysis confirms this at macro-economic level. An analysis of the macro-economic costs and benefits of a policy aiming at accelerating the switchover shows that optimal decisions derive from national situations (initial digitisation level, cost of converters, cost of analogue broadcasting), policy trade-offs between conflicting switchover benefits, and spectrum valuations (opportunity cost of not being able to release/refarm frequencies earlier). In most circumstances, **accelerating the process can be indeed a optimal policy** (see cost-benefit subsection of Policy chapter).

5. A wide range of regulatory tools and incentive

If policy intervention is justified, the question remains as to **what regulatory tools should be used** to achieve a faster/ wider digital switchover. There is indeed a wide variety of measures that could be taken and only a few of them are actually used today by national policymakers (policy chapter).

6. Risks in policy intervention on TV markets

This question is all the more critical because there are **risks related to any new policy intervention** on these complex and intricate markets. Any new intervention, or even its anticipation by market players can potentially trigger market distortions (like investment inhibition) or competition distortions (some market players favoured over others).

7. Switchover roadmaps to help co-ordination of market forces

In order to overcome the “free-rider” and “chicken-and-egg” syndromes and to help players co-ordinate their expectations and investments, policymakers could give political signals and improve legal and business certainty. Therefore the recommendation of national **Switchover roadmaps** and related action plans (R1).

8. Public debate on post-ATO policy and DTV/broadband consistency

More generally, Governments should publicise their vision of long-term spectrum management and information society developments. Therefore the recommendation on **Post-ATO public debate** (R4) and the **linkage of broadband policy to DTV policy** (R5) to prevent the policy dilemma that could arise : pushing DTV too far and at any price in the short-to-medium term could jeopardize the development of broadband networks and services and therefore the information society in the long term.

9. Spectrum tax to encourage digitisation and spectrum efficiency

Tax measures could make spectrum users internalise the costs from inefficient spectrum management and contribute to overcome the inhibitions caused by situation rents. Therefore the recommendation R7 on a tax on spectrum. A tax based on the quantity of spectrum used could change the attitude of incumbent terrestrial broadcasters, who have no compelling reason to work for a fast digital switchover today. Indeed, although turn-off would result in transmission savings for them (simply because transmission in digital uses six-times less spectrum than in analogue), the released spectrum capacity will attract new market entrants that could challenge the oligopolistic situation of the incumbents.

10. Encourage consumer switchover by reducing their switchover cost

The most effective way of accelerating the switchover would be to lower the cost which is borne by consumers in the process, i.e. acquiring or renting digital TV equipment. Therefore the recommendation R12 to **encourage consumer switchover by reducing their switchover cost**. Here again tax incentives could be implemented : discounted rate on audiovisual licence-fee for households who have switched to digital, general VAT reduction on all DTV equipments and services (converters, IDTVs, digital pay TV subscriptions).

11. A reservation mechanism to reveal economic utility

It should be made clear whether the **apparent lack of interest of telecom operators for UHF-broadcast frequencies**, even in the long term, comes from

technical/economic reasons, or from a financial/strategic/regulatory analysis as a result of which they renounce to claim these bands because they are pessimistic over their political chances to get them anyway, any time soon. Economic theory (Coase...) suggests that monetisation of resources is often a good way to reveal true economic utility (spectrum chapter). A mechanism of reservation, i.e. **option to buy or lease future “releasable” frequencies**, could provide such information, and help policymakers appreciate the proportionality of their switchover measures, with reference to the potential market value for releasable frequencies (R11).

12. Proportionate regulation on standards

Policymakers may be tempted to regulate standards in order to help industrial co-ordination (on Application Programme Interface – APIs - for instance) or to stop the growth of the non-digital installed base of equipments (with a “mandatory digital tuner” measure). The latter measure would be effective by mechanically converting the receivers installed base at renewal pace, but would entail risks of markets distortions, and implications on the single European market if it was not co-ordinated at European level. Therefore our recommendation R9 of **proportionate regulation on standards for receiving equipments and facilities**, and on a special cost-benefit study led at European level on this specific issue.

13. Drive competition by allowing more freedom for DTV players and consumers

Some DTV and broadband players have to bear heavy regulations on programming (“must carry” rules) and pricing. These regulatory burdens prevent them from investing more systematically in networks and services to deliver digital television and other digital services. Therefore we recommend **ensuring increased commercial freedom to DTV players and removing regulatory obstacles** in order to allow/encourage them to drive the switchover process (R6). At the same time, consumers should be given a wider choice in terms of access to delivery mechanisms. In particular, excessive installation restrictions on satellite dishes and rooftop terrestrial aerials should be removed. Indoor reception for DTT could be encouraged as a solution for consumers to be able to bypass such restrictions. Therefore our recommendation to **ensure multiplatform access to all consumers** (R14) : all consumers should be able to access all the available delivery mechanisms of their area (satellite, terrestrial and cable when there networks are rolled out). These measures in R14, aimed at increasing actual competition and encourage operators to be more commercially aggressive, will only be efficient if operators on their side really have the sufficient business and commercial freedom we recommend in R6.

14. Surveys and information campaigns

In order to encourage a faster, more cost-efficient switchover, public and market players must have some degree of certainty and common information about each others. Therefore we recommend that **policymakers at national and European levels monitor DTV development** (R3) and encourage market players to conduct **common research on consumer behaviour** and expectations (R10). And because the concepts of digital television, digital sets or analogue turn-off remain often confusing or even frightening, for some population groups (see market chapter), policymakers could also encourage or partly finance **information/awareness and equipment labelling campaigns** (R11).

15. A Digital Switchover Fund

In the previous points, we recommend a number of actions that should be implemented or at least encouraged by public authorities (in addition to the direct, spontaneous actions from market players), partly because co-ordination is often needed or even indispensable for certain actions. These actions would cost money. We also underlined that some other measures, aimed at making players reveal their economic utility from future spectrum use (spectrum options mechanism, R8) or optimise their spectrum use (spectrum tax, R7), could provide public revenues, even if this should not be their primary purpose. Therefore our recommendation to set up a **Switchover Fund** (R2) that could **consolidate the macro-economic transfers**. The funds raised from some of the players that will ultimately benefit from the switchover and/or turn-off (terrestrial broadcasting players, other spectrum users, Governments themselves) would be used to finance some of the measures that will help accelerate the process and thus achieve the benefits from it. Compared with financial transfers through the general public budget, a dedicated Fund would provide some specific advantages : higher guarantees of transparency, platform neutrality and proportionality, consensual private/public decision-making.

16. Horizontal recommendations to prevent market distortions

Precisely in order to limit the above-mentioned risks inherent to public intervention on markets, all incentive measures should respect some **horizontal recommendations for public intervention** : platform and technological neutrality in order to avoid excessive competition distortions, transparency of objectives, proportionality of actions and consistency with objectives. We should add synchronisation with market developments ; public intervention could be necessary in take-up phases to help break chicken-and-egg problems and in turn-off phases because of threshold effects and in order to overcome structural divides. Indeed we recommend **ex-post, targeted**

measures to deal with the structural, permanent, component of the “digital divide” risk (R13).

17. Need for European co-ordination

All the above recommendations are aimed at national policymakers, but in many cases there is a European dimension that requires intervention of European public authorities. In the name of efficiency and under subsidiarity principles, the European Union should ensure certain co-ordination of several intervention measures above mentioned. The **need for European action** in this area derives in particular from : (i) the transnational nature of spectrum management, (ii) the free circulation of goods and services in the single European market, (iii) the promotion of global European competitiveness in all the industries involved (television services, consumer electronics, advanced television technologies...), which requires co-ordination and synchronisation of developments.

18. Optimising the economic efficiency of spectrum management

The EU should encourage an **evolutionary process in approaching spectrum management** at national and European levels. As seen in the Spectrum Chapter, spectrum management should indeed evolve from the current administrative approach to an approach based on the economic optimisation of spectrum use, so as to better reflect its economic and social value, through the use of more sophisticated tools (spectrum tax, reservation or option mechanisms...). The recent EU *Spectrum Decision* has paved the way for a *Spectrum Policy Experts Group* which will be entitled to discuss these issues : better spectrum management, more efficient spectrum planning, alternatives for pre and post-ATO scenarios, etc. Moreover, the UMTS auctions have shown the need for more preparation and greater co-ordination at EU level on these matters.

19. European actions required by Law

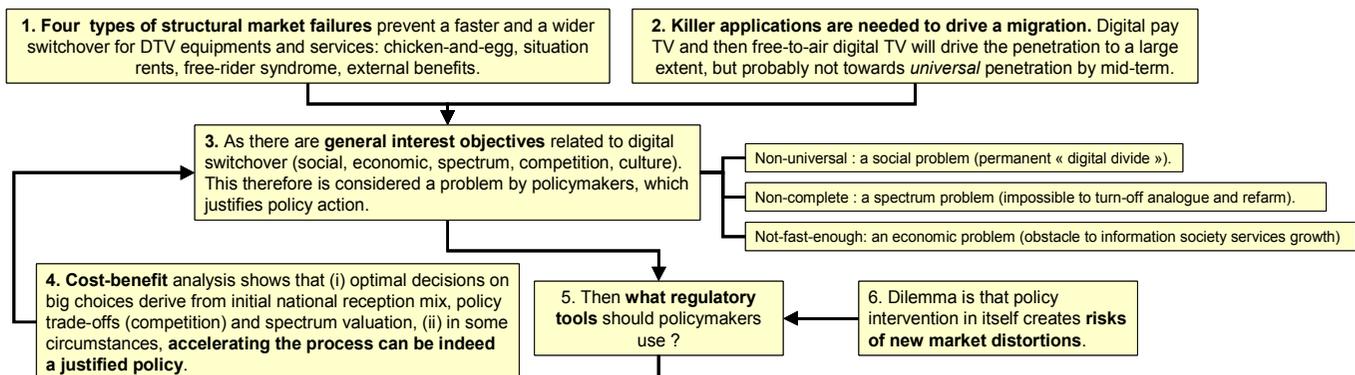
In addition to the actions justified in terms of added value from European intervention, there are matters in which EU has responsibilities *by Law and Treaties*. This comprises its competence in **competition law, notably State aids** (compatibility of national measures with fair competition on the European single market); the control of **technical specifications** for products sold within the EU (e.g. specifications for hardware and middleware of broadcasting receivers), to guarantee the free movement of goods within the European single market; **cross-border spectrum planning** (negotiated in the CEPT).

20. Digital radio needs political signal to overcome chicken-and-egg

Digital radio is much less advanced than digital television in the switchover path. Though licences have been granted and services are broadcast in some countries, actual penetration of reception is close to zero. Many specific obstacles explain this “chicken-and-egg” situation : the price of the receivers is still much too high compared with the perceived added value of digital radio over the analogue FM/RDS proposition ; there are no spectrum incentives to encourage switchover as analogue radio uses little spectrum today and digital requires *additional* bands ; some key players like car manufacturers, who could trigger price drop with factory-fitted digital radios, are not really committed to the process today ; electronics manufacturers, too, are much less committed than they are on digital TV. Lastly, while many European players support DAB-T as “the” technical standard for digital radio, some broadcasters still feel sceptical or foresee a variety of complementary delivery mechanisms (DAB-S, DRM, DVB, internet...). To overcome these obstacles and be able to look for a viable business model, radio broadcasters and other digital radio supporters may need to receive a **political signal**, at national and European levels, in order to build **confidence among their relevant partners** (carmakers, electronics manufacturers).

SUMMARY OF THE MAIN FINDINGS AND RECOMMENDATIONS ON SPECTRUM AND DIGITAL TV

FINDINGS



RECOMMENDATIONS

