

STRATEGY OF THE REPUBLIC OF SLOVENIA FOR THE SWITCHOVER FROM ANALOGUE TO
DIGITAL BROADCASTING



REPUBLIC OF SLOVENIA

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At its session of 16 February 2006, the Government of the Republic of Slovenia adopted the Strategy of the Republic of Slovenia for the switchover from analogue to digital broadcasting. More than two years after the adoption of the Strategy, adoption and entry into force of the Digital Broadcasting Act as well as the activities performed by the Post and Electronic Communications Agency, the present Strategy represents an upgrading of the Strategy adopted in 2006.

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1 INTRODUCTION

The document entitled the Strategy of the Republic of Slovenia for the switchover from analogue to digital broadcasting is intended for industry, civil society, national bodies and public administration bodies of the Republic of Slovenia, and all participants who will, actively or passively, directly or indirectly, be involved in the switchover to digital broadcasting and reception.

1.1 Purpose of the document

The purpose of the presented Strategy of the Republic of Slovenia for the switchover from analogue to digital broadcasting is to inform and prepare in good time, all those operators involved in the switchover, to implement it as efficiently as possible, and to gain the resulting benefits of the switchover as quickly as possible.

The demand for radio frequencies is continually growing, because modern society depends on advanced electronic communications. The frequency spectrum is a basic companion of daily life, whether it involves mobile telephony, wireless internet access or radio and television broadcasting. Traditional solutions regarding the competing demands for frequencies are based on the planning of who is entitled to use the spectrum, and how.

Today the rapid development of technology and the convergence of electronic communications, media content and electronic devices are creating a dynamic environment in which the spectrum is becoming an increasingly important resource. Its management has not kept up with this development, thus contributing to an increasing risk that the traditional method, if left unchanged, will prevent our society from enjoying the fruits of this new dynamic environment.

Although Europe introduced mobile communications to the world, it is now in danger of becoming a mere user of those technologies developed elsewhere, rather than being an innovator. The member states have therefore concluded that more efficient use of the spectrum and realisation of European Union policy objectives, such as developing the internal market, competition, innovation, and growth, cannot be achieved by a fragmented analogue spectrum.

The European Union member states have set themselves the objective of switching over to digital broadcasting and thus releasing the frequency spectrum. This proposal will enable growth, jobs and actual use of the amended Lisbon Strategy's objectives. It also includes part of the strategy for efficient spectrum management as foreseen by Initiative i2020, which sets out a vision of joint and coordinated elimination of restrictions regarding use of the spectrum in all member states, in order to promote open and competitive economies. European citizens would gain direct benefits from this in the form of faster access to new technologies, and lower prices for communication.

The above-mentioned may only be achieved with a gradual switch from the analogue terrestrial broadcasting of TV and radio programmes to digital broadcasting, which uses the spectrum more efficiently. The obtained spectrum would be dedicated to new TV and radio contents, to broadcasting of better quality and, foremost, to broadcasting other services in the released part of the spectrum.

1.2 Content framework of the document

The switchover strategy is based on the following documents: The e-Europe 2005 Action Plan, which defines the Digital Switchover and provides guidelines for the preparation of transparent instructions, and conditions for its implementation; The report of the EU Commission on the switchover from analogue to digital broadcasting of 2003, COM (2003) 541; on the proposed deadlines for the withdrawal of analogue terrestrial broadcasting throughout the EU; on respecting the plans of member states for the switchover published within the framework of the e-Europe Action Plan; and Communication from the EU Commission on accelerating the transition from analogue to digital broadcasting COM (2005) 204.

All the above-mentioned programming documents gained additional importance after the Regional Radiocommunication Conference (RRC-06) and the World Radiocommunication Conference in 2007 (WRC-07), where discussions were held and agreements signed. At the RRC-06 conference, a digital plan for radiofrequency bands 174–230 MHz and 470–862 MHz was adopted as a basis for establishing new digital television networks; an analogue plan for radiofrequency bands 174–230 MHz and 470–862 MHz which would apply during the transitional period, and which would protect the existing analogue networks; and a new agreement which would replace the existing one, adopted in Stockholm in 1961, prescribing the manner of harmonizing additional digital networks, harmonized or amended by countries

during the period following the conference. Similarly, at the WRC-07, which is the highest body for determining ITU general guidelines and policies in the field of radiocommunications – predominately concerning the distribution and deployment of radiofrequency spectrum and the allocation of radio frequencies, part of the meeting was especially dedicated to the transition of sound and video signals to digitalisation.

Important imprint and guidelines are found in the conclusions of the Council on the topic of "Reaping the full benefits of the digital dividend in Europe: A common approach to the use of the spectrum released by the digital switchover" (Doc. 10410/08 (Presse 165)), which were, at the time of Slovenia's EU Presidency, adopted by the EU Council following proposal from the presiding country.

The switchover will promote innovation and growth in the equipment market, and will contribute to the amended Lisbon agenda. The benefits of digital broadcasting for consumers include improved image quality, better sound, better portable and mobile reception, more television and radio channels and more information services.

These benefits are derived primarily from the possibility of processing and compressing digital data, enabling much more efficient use of network capacities than with analogue signals.

The switchover will also enable better fulfilment of special needs of older people and those with disabilities, by ensuring ancillary services, such as improved subtitling, audio commentary, and signing. Attention must be paid to incorporating requirements regarding user access to interfaces (for example EPG – electronic programme guide), and receivers.

In addition, the switchover also involves reduction of future costs for operators of broadcasting networks. It also creates the possibility of increased sales of digital receivers, and easier storage and processing of content. The market for digital TV receivers (exterior or built-in the TV-receiver) in Europe is estimated to be up to 20 million units per year. These effects could substantially contribute to growth and employment within ICT markets.

The second important benefit brought by the switchover will be greater spectrum capacity, particularly due to the withdrawal of analogue terrestrial television. According to data provided by member states within their national switchover plans, digital terrestrial TV is 4 to 10 times more efficient when using the spectrum than analogue terrestrial TV.

This provides the possibility of reusing the highly valued part of the radiofrequency spectrum to introduce new convergence services combining mobile telephony and terrestrial broadcasting, and other new cross-border and pan-European electronic communication services.

The Switchover Strategy of the Republic of Slovenia was prepared on the basis of analysing best foreign practices, taking account of consumer information strategies, financial aspects, network capacity aspects, transmission obligations, and the state of broadcasting in the Republic of Slovenia as a whole.

This strategy takes account of the switchover benefits to digital broadcasting and research regarding various political guidelines and debates on EU policy guidelines on the value and future use of the spectrum, as would be made available by the withdrawal of analogue terrestrial television broadcasting.

This strategy also takes account of study findings conducted for the services of the EU Commission regarding marketing the spectrum, and releasing the management of spare frequency spectrum.

1.3 Timeframe of the document

The sooner the switchover from analogue to digital broadcasting begins on the national level, and the shorter the transition period, the earlier the benefits will be realised. The economic and social benefits for Slovenia, and the EU as a whole, will be fully achieved once all member states have completed their transitions.

The Republic of Slovenia adopted the proposal of the European Commission to set the beginning of 2012 as the deadline for the final withdrawal of analogue broadcasting in all member states, while undertaking in the Digital Broadcasting Act (Official Gazette of the RS, No. 102/07, hereinafter: the Act)), which came into force on 24 November 2007, to abolish analogue broadcasting by the end of 2010. The Act regulates digital broadcasting, conditions for implementing digital broadcasting, the rights and obligations of providers, changes in radio frequency spectrum management, the gradual transition from analogue to digital broadcasting, inclusion and introduction of complementary and innovative services, the gradual phasing out of analogue

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broadcasting and incentive measures for facilitating the transition to digital broadcasting. The detailed time schedule and geographic plans of the networks are, in line with Articles 5(1) and 6 of the Act, within the competence of the Post and Electronic Communications Agency, hereinafter: the APEK.

By means of the presented document, the Republic of Slovenia defines the method and timeframe for compliance with European Union directives.

2 OBJECTIVES OF THE STRATEGY

The objectives of the switchover strategy must, as far as possible, suit Slovenian users, therefore, the switchover to digital broadcasting must be non-discriminatory against consumers, content providers, and content carriers (network operators, operators).

One of the basic objectives is to create new and added values for all participants compared to the current method of analogue broadcasting.

These are (separately for each group of participants):

– *Consumers:*

- enhanced image and sound quality (HDTV, Dolby Digital 5.1),
- greater choice of content, and more television and radio stations,
- Possibility of new services for people with special needs, and the elderly,
- improved additional services (user-friendly interface, multi-lingual broadcasting, subtitles, special signs, adjustable size, interactivity),
- mobility,
- convergence of services (all on one terminal).
- introduction of new services on the released part of the spectrum, for example, wireless broadband communications, additional terrestrial broadcasting services and mobile multimedia services, as a consequence of the introduction and use of the digital dividend.

– *Providers:*

- possibility of increased content differentiation (different programmes, targeted public),
- extra options for content broadcasting (interactivity),
- providing content on demand (against payment),
- lower transmission costs,
- convergence of services (convergence of television, telephony and data services),
- new sales opportunities for equipment providers (transmitters and receivers).

- introduction of new services on the released part of the spectrum, for example wireless broadband communications, additional terrestrial broadcasting services and mobile multimedia services as a consequence of the introduction and use of the digital dividend.

– *State:*

- more efficient use of the frequency spectrum,
- use of the released part of the spectrum for new services,
- market opportunities from releasing part of the spectrum,
- creation of new economic opportunities and jobs,
- promoting the development of new technologies,
- increased competition among providers, and media pluralism,
- greater opportunities for establishing the creativity, language, and culture of Slovenia.

All the objectives of the switchover strategy must, as far as possible, enable the development and competitiveness of the broadcasting sector, which should be reflected in technical, systems, legislative, financial, economic, public and environmental coordination.

The Republic of Slovenia will strive to take full advantage of the switchover to new broadcasting technology by maximising media pluralism, and the diversity of programme content.

Once analogue broadcasting is withdrawn, part of the possibly released frequency spectrum will be given over to new services.

The switchover must ensure the compatibility of appliances currently owned by the population with new appliances, and that the various providers are mutually compatible. The objective of the Republic of Slovenia is for the switchover to digital broadcasting to provide an affordable option for the majority of the population. We must particularly ensure that those interested solely in receiving public radio and television programmes can access digitally broadcast programmes without disproportionate costs.

An important objective is to strive for the lowest possible transfer costs for service providers, and to achieve optimum usability of the infrastructure.

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All objectives are defined on the basis of clear starting points, a logical procedure, and specific objectives and effects, which will be reflected in the social, cultural, economic and political spheres.

3 ENVISAGED PLAN OF SWITCHOVER

The envisaged switchover plan has been harmonised with the recommendations of the European Union and at the EU level. It likewise respects the final deadline for withdrawal of analogue terrestrial broadcasting in all member states.

The Republic of Slovenia undertakes to require, during the switchover to digital broadcasting technology, that multiplex operators (network operators) ensure maximum coverage of the population using terrestrial digital broadcasting on public radio and television channels. At the end of the transition period, coverage must be as defined by legislation and the criteria.

Envisaged timeframe for the switchover to digital broadcasting:

- by 2007 (preparation of the relevant legislation),
- by the end of 2008 (execution of public tenders for the implementation of digital broadcasting, determination of the necessary technical frameworks for digital broadcasting, commencement of broadcasting in the digital technique),
- from 2009 to the end of 2010 (transitional period under the strategy prepared),
- the deadline for the end of broadcasting in the analogue technique is set for the end of 2010. It has to be underlined that, with the consent of stakeholders (multiplex operators, content providers or television programmes, APEK and the RS), the deadline may be shortened, and consequently the transition costs will be lower.

In line with these planned dynamics for the switchover to digital broadcasting, the Republic of Slovenia undertakes to inform – in line with the timeframe and the switchover strategy of the digital broadcasting – citizens and other residents, enabling them to make their consumer decisions at a sufficiently early stage of the switchover on the basis of information available.

For rapid and effective switchover from analogue to digital broadcasting technology, it is vital that consumers are well informed and early enough about the benefits of digital broadcasting and the new services enabled by the switchover.

Given an effective and coordinated operation by all those involved, the final date for the switchover and withdrawal of all analogue terrestrial television

transmitters could be even earlier; this would significantly reduce costs and bring in the benefits and added-value brought about by digital terrestrial broadcasting, earlier.

4 ANALYSIS OF ENVIRONMENT AND STATUS

4.1 Summary of situation in the EU

In September 2003, the European Commission published a Communication on the transition from analogue to digital broadcasting (from digital 'switchover' to analogue 'switch-off'), which set out the benefits of the switchover to digital broadcasting, researched various policy guidelines and triggered a debate on the guidelines of European Union policy on the value and future use of the spectrum released by the withdrawal of analogue terrestrial television transmission.

In November 2003, the Radio Spectrum Policy Group of the European Commission published an opinion on how the switchover to digital terrestrial broadcasting would affect the spectrum. This report developed the positions by taking account of an analysis of the switchover plans of member states published within the framework of the e-Europe 2005 Action Plan, and the opinions of the RSPG. The communication also indicates the findings of studies conducted on behalf of the Spectrum trading and liberalisation service of the EU Commission, and management of the spectrum in the area of broadcasting. This communication was accompanied by a commission staff working document SEC (2005) 661 with more details on the switchover plans in member states, and the consequences of spectrum planning, financing and digital radio.

Many suppliers of broadcast transmission services in individual countries have already switched to digital transmission or plan to introduce such measures in the near future. Where users have a choice, they increasingly opt for digital reception and abandon analogue.

Due to these trends in supply and demand, the United Kingdom has already achieved a 57% market share for digital broadcasting, and we can expect that by the beginning of 2010, Europe will predominantly use digital broadcasting transmission, and that by then analogue transmission will play a smaller and shrinking role.

Public consultations carried out by the RSPG indicated the following main obstacles to rapid switchover:

- in the political arena in the form of the absence of policy decisions, such as national withdrawal of analogue broadcasting, failure to set

deadlines for the withdrawal of analogue broadcasting and a lack of European debate and policy;

- in the economic market arena, the need to set up many basic transmitters; low demand from consumers, based on a lack of incentives to change; resistance based on financial risk on the part of investing operators.

Apart from the advantages at the national level, acceleration of the switchover procedure could also increase the learning effect and encourage positive examples among member states. Numerous new technologies and services depend on achieving a critical mass of users at the European level and becoming more attractive through a larger installed technology base in Europe.

Market actors are concerned that the development of new services could be hindered by divergent implementation in individual European countries. In particular, they are demanding legal protection regarding the terrestrial spectrum that could be available, and a reduction of barriers caused by state borders.

Acceleration of the switchover at the level of member states as well as cooperation in the transitional period and on the date of withdrawal would enable a rapid switchover in Europe. The RSPG group proposed the introduction of a limited number of time schedules that member states could consider, and research of joint completion of the switchover procedure.

The spectrum of pan-European services and numerous cross-border services, such as traffic information and shipping management, mobile communications and various data services will, after the withdrawal in all member states, be available only at the European level. Those member states that have already completed the switch-off will also be able to introduce cross-border services earlier. There are thus reasons for accelerating national procedures for the switchover and to strive to set a date by which analogue broadcasting will be withdrawn in all member states.

Such an acceleration and deadline for the European Union regarding the switchover procedure would help overcome the current fragmentation of European digital television markets. This will enable European players to compete with other global interest groups in all parts of the digital television value-chain, which, in turn, will have positive economic consequences: increased exports and revenues, greater competition on content etc.

The pace at which Europe, as a whole, can move will depend on the paces of national switchover procedures on the one hand, and the pace of the slowest member states on the other hand.

The high power levels of signals transmitted by analogue TV transmitters and the sensitivity of domestic analogue receivers to interference imply that the introduction of new services will also be hindered by the aforementioned continued use of analogue services in certain member states.

Consequently, each share of the spectrum at the national level will depend heavily on the number of neighbouring countries that have already achieved the switch-off, while at the European level, it will only be fully achievable on the basis of full withdrawal of analogue broadcasting throughout the European Union and neighbouring countries.

On the basis of data available to the services of the European Commission, a table of classes for the withdrawal of analogue terrestrial TV in member states was prepared.

| Group | Member states |
|---|--|
| A (withdrawal date: end of 2010 or earlier) | AU, DE, DK, ES, FI, FR, IT, LU, MT, NL, SE |
| B (withdrawal date: end of 2012 or earlier) | BE, CZ, EL, LI, LT, PT, SI , SK, UK, HU |

Member states not listed in this table must announce their plans subsequently or they have not announced the withdrawal date yet.

The official withdrawal date of analogue broadcasting announced by the Republic of Slovenia is 2012, although the actual withdrawal of analogue broadcasting will, according to the Digital Broadcasting Act, take place at the end of 2010 at the latest.

Due to different treatment and progress levels of member states, and due to the advantages of a coordinated European view on the withdrawal of analogue broadcasting, the European Commission proposed that a joint timeframe be set for the switchover to digital terrestrial TV.

The majority of those member states which have already decided on the withdrawal will perform it by 2010 or earlier. Other countries will do so by 2012 at the latest. On this basis, the European Commission expects that by

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the beginning of 2010 the switchover procedure will be well advanced throughout the European Union, and it therefore proposed that the beginning of 2012 be set as the final deadline for completion of the withdrawal of analogue terrestrial TV in all European Union member states.

Situation in neighbouring countries (March 2008):

4.1.1 AUSTRIA

Analysis of the situation in Austria before the switchover to digital broadcasting regarding the reception of television signals, showed that 47% of households received television signals through satellites; however, the latter did not enable the reception of national and regional programmes. Consequently, a combination with the terrestrial reception of television signals was common, while only 15% of household relied on terrestrial reception only.

The Austrian government set up the DF (Digitalisation Fund) with annual funding of 6.75 million euros received from broadcasting fees, supported by loans and financial incentives for pilot projects, new services for digital broadcasting base, testing of mobile services and coverage, and financing of a public awareness campaign for digital television.

The Austrian digital switchover strategy envisaged that the transition will last approximately four years from the first start-up, and will be completed in 2010. The switchover was planned to be performed regionally with 6-12 month transition periods. The analogue withdrawal will be performed once 90% of the population receive DDT services.

The switchover in Austria was completed at the end of 2007. It was implemented gradually, at first in the main regional centres and the capital, providing for 80% coverage of all households in Austria with digital signals. Final coverage of multiplex with national programmes is projected to exceed 90%. At present, three multiplexes on a DDT platform are in operation; a multiplex on a mobile DVB-H platform has also been launched, which is expected to attain 55% coverage of population by the end of 2008.

More than 400,000 digital signal receivers have been sold by now (hereinafter: STBs), from which almost 30% have MHP open-code access, which is a great success for a market containing 3.3 million households.

Relations between operators have not been fully regulated yet, which points to a certain complication between the only national private provider of the ATV programmes and ORS multiplex operator regarding the payment of expenses to the multiplex operator or the amount of these expenses.

4.1.2 ITALY

The Italian Communications Agency in 1999 established the DDT National Committee, which brought together broadcast content providers, network operators, industry, universities and R&D institutes. The result of their work organized in four study groups, each discussing specific areas, was the so-called white paper published in September 2000, which the Agency submitted to the Italian parliament. The paper included financial incentives for major broadcasting providers to release frequencies and incentives for small broadcasting providers.

In 2007, the Italian parliament adopted an act which postponed the complete switchover from analogue to digital terrestrial television until the end of 2011, although providers are exercising pressure for the switchover to take place earlier.

In the framework of RAI (public radiotelevision), more than 200 DVB-T transmitters are in operation in all Italian major cities, while two multiplexes are providing digital signal to 70% of the population. Many innovations have been introduced to the services: EPG, superteletext, interactive advertising programme based on DVB-MHP open API-basis and T-government programme for public administration (for payment of fees and pension funds).

MEDIASET (Italia 1, Rete 4, Canale 5, etc.), the largest Italian private communications and broadcasting group, part of the FININVEST GROUP, also has a very active role in promoting DVB-T systems. The group already has more than 120 DVB-T-active transmitters covering a significant portion of the population with one multiplex. A large part of its income is due to the pay-per-view principle of broadcasting, since in 2007 it sold more than 2 Mio of cards (€ 10 for 6 programmes per month).

In addition to the two largest Italian TV networks, there are also many other private national, regional and local operators of DVB-T networks, offering their services to various providers of programmes and other content. Thus individual areas have four or even five multiplexes available.

In 2007, Italy introduced the DVB-H broadcasting system, offering nine television programmes for €29 per month. This is one of the first serious commercial attempts in the EU to offer television content on mobile telephones using DVB-H technology. At present, Italy is testing combined

broadcasting of both, the DVB-H and DVB-T, systems on the same multiplex by using hierarchical modulation. First tests are giving very promising results.

In 2006 and 2007, the Italian government generously subsidized STB purchases, provided that the STB followed the principle of open-code access to the MHP. Since the beginning of the switchover in 2004, more than 6.5 Mio STBs have been sold, of which 18% of iDTVs (Integrated Digital Tuners) and 82% of exterior STBs. The majority, as much as 95%, are interactive – MHP. The government also adopted two measures, namely that from 2009 onwards, all appliances must have built-in iDTV and that all citizens who purchased a TV receiver with iDTV in 2007 are entitled to a 20% tax relief from the value of the purchased appliance (maximum €200). The only condition is that the RTV fee has been paid. The European Commission assessed the system of subsidies in Italy as problematic, since the principle of technological neutrality was not observed.

4.1.3 HUNGARY

Hungary prepared a switchover plan already in 2000, although coordination is still underway. Under the plan, three multiplexes should use 17 existing and 3 new transmitters. They will use channels in the 478-862 MHz frequency band. It has been foreseen that call for tenders will be completed in the beginning of 2008. The remaining two DTT multiplexes will be available no sooner than in 2012, after switching off the analogue transmitters, while 1 multiplex is reserved for DVB-H and is currently test broadcasting.

Decision on the conclusion of switchover to digital broadcasting has been adopted for 2010.

4.1.4 CROATIA

Croatia began test transmissions of the DVB-T system in May 2002 and at the moment it is already preparing for withdrawal in the Istrian region, Zagreb and the County of Osijek. The switchover should be completed in 2010.

In the area of Zagreb, HRT (public radiotelevision) began to test broadcast the high-definition television signal.

The Croatian government has provided substantial financial support for the switchover, since it granted a voucher to Istrian inhabitants in the value of 200 kuna (€27), which may be realised upon purchase of STB in certain shops.

In Croatia, information campaign is being conducted, which includes posting of "Digital Croatia" pamphlets and promotion of digitalisation through advertisements at the HRT.

4.2 Summary of situation around the world

In the USA, the Congress has set the end of validity date for analogue television permits to 17 February 2009. The initial date, 17 February 2009, was revoked as soon as it became clear that television stations and users will not be able to meet all the requirements and observe this date.

In Korea, digital services have been available since 1 January 2005. In the first years of commercial broadcasting of digital services, a minimum of 10 hours a week of broadcasting HD content has been prescribed.

In Japan, analogue broadcasting will be switched off on 24 July 2011.

4.3 Summary of situation in the Republic of Slovenia

In the Republic of Slovenia there is a clear need for local television and radio content. The main reason for this is the existence of the Italian and Hungarian national minorities and cultural and social diversity of the environments, which requires diversity in media treatment to be maintained in the future.

It is important to ensure the right of citizens to freedom of expression and the right to be informed also at the local level, via programmes, whose broadcasters are based outside the capital of the Republic of Slovenia. Such programmes (programmes of particular relevance) are an important addition to national RTV programmes: they ensure media pluralism, more equal development of all regions in the country and the identity of the community for which the programme is intended.

Digital broadcasting may offer a wide range of high-quality programmes and services; the Republic of Slovenia shall strive to take the best advantage of

the transition to new broadcasting technology in order to maximise media pluralism and the diversity of programme contents.

An important milestone was the adoption of the Act which entered into force on 24 November 2007 and which specifically regulates digital broadcasting, conditions for implementing digital broadcasting, rights and obligations of providers, changes in the radio frequency spectrum management, the gradual transition from analogue to digital broadcasting, inclusion and introduction of complementary and innovative services, and the gradual phasing out of analogue broadcasting and incentive measures for facilitating the transition to digital broadcasting.

At present, in the Republic of Slovenia there are 70 television and 113 radio media registered, of which 22 television and 83 radio stations are broadcast using analogue technology, while 19 television stations and two radio stations use cable distribution networks or the Internet to transmit their programme content.

National coverage by analogue broadcasting covers five television stations. There are 31 programmes having the status of particular relevance, among them there are 18 radio and 13 television programmes.

The public radio and television broadcaster RTV Slovenia uses satellite broadcasting to transmit three national television and six national radio programmes on the Eutelsat Hot Bird satellite at position 13°E using the DVB-S system with conditional access using the Viaccess system. Besides the public RTV, commercial television stations also broadcast their programme through satellite Eutelsat W.

Cable distribution network operators in major towns offer digital packages via their cable networks using the DVB-C system; in addition, Ljubljanski Kabel uses the Point to Multipoint digital wireless system named Lastovka.

The radio and television programmes of RTV Slovenia, as well as those of some other broadcasters, can be received via the Internet. SIOL and T2 offer IP television services, which include more than one hundred television programmes.

Statistics show that there are 640,000 households in the Republic of Slovenia. Of those, approx. 60% can receive television and radio programmes through cable access. In turn, more than 70% of these can receive digital television via cable (DVB-C).

At present, RTV Slovenia public institute is the sole operator in Slovenia which holds decisions on allocation of radio frequencies for terrestrial digital network, DVB-T broadcasting, on the basis of which it is allowed to cover the whole area of Slovenia with digital signal by means of one multiplex (multiplex A). First decisions were issued to RTV Slovenia by APEK at the end of 2006. At the end of August 2008, approximately 80% of Slovenia's population is covered with digital signal.

APEK has already published an invitation to tender for allocation of radio frequencies for DVB-T digital video broadcast - terrestrial network for the whole territory of the Republic of Slovenia (multiplex B).

Slovenian multiplexes use the MPEG-4 standard for coding the broadcasted signal.

RTV Slovenia broadcasts T-DAB radio signal (digital radio) from the transmitter located on Krvavec, which covers the central part of Slovenia and the Gorenjska region.

Moreover, first test broadcasts of HDTV are being transmitted from Šance broadcast point, covering the wider area of Ljubljana, on channel 26 and 47.

4.4 Evaluation of the media market in the Republic of Slovenia

In accordance with the European criteria, a television market shall be deemed to have reached the most essential level of diversity and pluralism if at the national level there are at least three broadcasters whose signals reach the majority of the population.

In adopting the list of most important events that must be available to the majority of population, it was established that in the Republic of Slovenia, two programmes of RTV Slovenia, POP TV, Kanal A and TV3 comply with these conditions. It needs to be mentioned that, in line with recommendations for small countries where the advertising market is limited, it is acceptable if there is only one private supplier, since foreign available channels also contribute to pluralism. With regard to these criteria, the television market in the Republic of Slovenia is sufficiently developed.

The current offer of the television programmes market is illustrated in the following tables.

REVIEW OF TV CHANNELS – source APEK, November 2007:

| Order No | Channel name | Status | Holder | No. of decisions |
|----------|---|---|---|------------------|
| 1 | ATV SIGNAL LITIJA | status of local television programme of particular relevance | <u>ATV BABNIK & CO d.n.o.</u> | 4 |
| 2 | EPTV | / | <u>EURO 3 TV, d.o.o. Ljubljana</u> | 1 |
| 3 | KANAL 10 | status of local television programme of particular relevance | <u>TV IDEA - KANAL 10 d.o.o.</u> | 1 |
| 4 | KANAL A | / | <u>Kanal A d.o.o.</u> | 12 |
| 5 | MEDIA TV | status of local television programme of particular relevance | <u>MEDIA PARTNER, TV programi in multimedijška dejavnost d.o.o.</u> | 1 |
| 6 | MOJ TV | / | <u>MOJ TV d.o.o.</u> | 1 |
| 7 | POP TV | / | <u>POP TV d.o.o. Ljubljana</u> | 33 |
| 8 | RTS | status of regional television programme of particular relevance | <u>Tele 59 d.o.o.</u> | 2 |
| 9 | Sponka.tv | / | <u>DOMATES d.o.o. Portorož</u> | 1 |
| 10 | STUDIO AS - lokalni TV program | status of non-profit television programme of particular relevance | <u>HI-FI VIDEOSTUDIO d.o.o.</u> | 1 |
| 11 | TELEVIZIJA CELJE | status of local television programme of particular relevance | <u>TV CELJE d.o.o.</u> | 2 |
| 12 | TELEVIZIJA KOPER CAPODISTRIA /TV KC/: regionalni televizijski program | RTVS programme | <u>RTV Slovenija</u> | 24 |
| 13 | TELEVIZIJA KOPER CAPODISTRIA /TV | RTVS programme | <u>RTV Slovenija</u> | 24 |

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| | | | | |
|----|---|---|-------------------------------------|-----|
| | KC/: televizijski program za italijansko narodno skupnost | | | |
| 14 | TELEVIZIJA MARIBOR - TELE M | RTVS programme | <u>RTV Slovenija</u> | 2 |
| 15 | TELEVIZIJA SLOVENIJA 1 /SLO1/ | RTVS programme | <u>RTV Slovenija</u> | 206 |
| 16 | TELEVIZIJA SLOVENIJA 2 /SLO 2/ | RTVS programme | <u>RTV Slovenija</u> | 198 |
| 17 | TV 3 | / | <u>Prva TV d.o.o. Ljubljana</u> | 12 |
| 18 | TV PIKA | status of regional television programme of particular relevance | <u>TELEVIDEO d.o.o. Ljubljana</u> | 1 |
| 19 | TV PRIMORKA | status of local television programme of particular relevance | <u>VA VIDEO AUDIO FILM D.O.O.</u> | 2 |
| 20 | VAŠA TELEVIZIJA | status of regional television programme of particular relevance | <u>VTV Studio, d.o.o.</u> | 3 |
| 21 | Vaš kanal | status of regional television programme of particular relevance | <u>TELEVIZIJA NOVO MESTO d.o.o.</u> | 2 |
| 22 | VITEL | / | <u>VI-TEL d.o.o.</u> | 1 |

The criteria for protection of pluralism in the radio market vary considerably in different European countries, but the general principle applies that more broadcasters are necessary than in the television market.

This involves different combinations of rules due to different ownership, the populations covered by individual programmes and respect for regional and local diversity.

Slovenian legislation has ensured the conditions for the creation of an exceptionally wide range of national, commercial, regional and local programmes and programmes of special importance. We still do not have a final, sufficiently accurate picture of the position and the programme diversity of radio media in Slovenia, but one is being prepared and will be completed shortly.

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From the available data based on a media survey, we can conclude that the radio market in the Republic of Slovenia is sufficiently developed and that the level of programme diversity is adequate.

Offer of radio programmes:

REVIEW OF RADIO CHANNELS – source APEK, November 2007:

| Order No | Channel name | Status | Holder | No. of decisions |
|----------|--|--|--|------------------|
| 1 | 1TR (EN-TE-ER) | / | <u>NOTRANJSKI RADIO d.o.o., Logatec</u> | 2 |
| 2 | ALPSKI VAL | status of local radio programme of particular relevance | <u>RADIO KOBARID d.o.o.</u> | 3 |
| 3 | Europa 05 | / | <u>BRUS MEDIJI, d.o.o.</u> | 1 |
| 4 | INFORMATIVNI VAL | / | <u>QUADRUM d.o.o.</u> | 1 |
| 5 | KOROŠKI RADIO | status of regional radio programme of particular relevance | <u>KOROŠKI RADIO d.o.o. Slovenj Gradec</u> | 1 |
| 6 | Mariborski radio Študent – Marš | / | <u>Zavod Mariborski radio Študent - Marš</u> | 1 |
| 7 | MOJ RADIO | / | <u>MOJ RADIO BORIS SUŠIN s.p.</u> | 1 |
| 8 | POMURSKI MADŽARSKI RADIO - MURAVIDEK MAGYAR RADIO | RTVS programme | <u>RTV Slovenija</u> | 1 |
| 9 | Radio 1 107.9; ENA LJ | / | <u>RADIO ŠPORT d.o.o.</u> | 1 |
| 10 | Radio 1 Dolenjska; ENA NM | / | <u>RADIO PRO 1 d.o.o.</u> | 3 |
| 11 | Radio 1 Krvavec; ENA KR | / | <u>RADIO 1 d.o.o.</u> | 2 |
| 12 | Radio 1 Obala; ENA KP | / | <u>RADIO 1 d.o.o.</u> | 1 |
| 13 | Radio 1 Portorož; ENA | / | <u>RADIO 1 d.o.o.</u> | 1 |

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| | | | | |
|----|--------------------------|--|--|---|
| | PO | | | |
| 14 | Radio 1 Primorska; ENANG | / | <u>QUADRUM d.o.o.</u> | 3 |
| 15 | Radio 1 Štajerska; ENAMB | / | <u>RADIO 1 d.o.o.</u> | 2 |
| 16 | RADIO 94 | / | <u>Radio 94 d.o.o. Postojna</u> | 3 |
| 17 | RADIO ALFA | / | <u>ALFA KOMERCIALNI RADIO d.o.o.</u> | 2 |
| 18 | RADIO ANTENA | / | <u>RADIO ANTENA d.o.o., Ljubljana</u> | 2 |
| 19 | RADIO BAKLA | / | <u>NOBLESSE, d.o.o.</u> | 1 |
| 20 | RADIO BELVI GORENJSKA | / | <u>RADIO BELVI, d.o.o.</u> | 2 |
| 21 | RADIO BREZJE | / | <u>Radio Brezje d.o.o.</u> | 1 |
| 22 | RADIO BREŽICE | / | <u>RADIO BREŽICE d.o.o.</u> | 2 |
| 23 | RADIO CAPODISTRIA | RTVS programme | <u>RTV Slovenija</u> | 3 |
| 24 | RADIO CAPRIS | / | <u>RADIO CAPRIS d.o.o.</u> | 3 |
| 25 | RADIO CELJE | status of regional radio programme of particular relevance | <u>NT&RC d.o.o.</u> | 4 |
| 26 | RADIO CELJSKI VAL | / | <u>MOŠKOTEVC MARKETING d.o.o. STOPČE</u> | 1 |
| 27 | RADIO CENTER | / | <u>RADIO CENTER d.o.o.</u> | 3 |
| 28 | RADIO CITY | / | <u>RADIO CITY d.o.o.</u> | 3 |
| 29 | RadioDur | / | <u>RADIODUR d.o.o.</u> | 3 |
| 30 | Radio Ekspres | / | <u>R GAMA - MM d.o.o.</u> | 1 |
| 31 | RADIO ENERGY | / | <u>PUNTAR d.o.o.</u> | 1 |
| 32 | RADIO FANTASY | / | <u>ŠPRAH d.o.o., Škofja vas</u> | 1 |
| 33 | Radio FANTASY MARIBOR | / | <u>ŠPRAH d.o.o., Škofja vas</u> | 1 |
| 34 | RADIO FANTASY VELENJE | / | <u>ŠPRAH d.o.o., Škofja vas</u> | 1 |

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| | | | | |
|----|-----------------------------------|--|---|---|
| 35 | RADIO GEOSS | / | <u>Mahkovec Š&D d.n.o.</u> | 1 |
| 36 | Radio GLAS Ljubljane | / | <u>RADIO GLAS LJUBLJANE d.d., Ljubljana</u> | 3 |
| 37 | RADIO GOLDI - SAVINJSKI VAL | / | <u>RADIO GOLDI SAVINJSKI VAL, d.o.o.</u> | 3 |
| 38 | RADIO GORENC | status of local radio programme of particular relevance | <u>RADIO GORENC d.o.o.</u> | 3 |
| 39 | RADIO HIT | / | <u>R Domžale d.o.o.</u> | 4 |
| 40 | RADIO KOPER /RADIO KP/ | RTVS programme | <u>RTV Slovenija</u> | 8 |
| 41 | RADIO KRANJ - GORENJSKI MEGASRČEK | status of regional radio programme of particular relevance | <u>RADIO KRANJ d.o.o.</u> | 1 |
| 42 | RADIO KRKA | / | <u>RADIO KRKA Novo mesto, d.o.o.</u> | 1 |
| 43 | RADIO KUM | status of regional radio programme of particular relevance | <u>Radio Kum Trbovlje d.o.o.</u> | 1 |
| 44 | Radio Laser Slovenj Gradec | / | <u>LASERR d.o.o.</u> | 1 |
| 45 | RADIO LJUBLJANA | / | <u>SODA d.o.o.</u> | 1 |
| 46 | RADIO MARIBOR | RTVS programme | <u>RTV Slovenija</u> | 4 |
| 47 | RADIO MAXI - PRLEŠKI VAL | / | <u>RECAL d.o.o.</u> | 2 |
| 48 | RADIO MURSKI VAL | status of regional radio programme of particular relevance | <u>RADIO MURSKI VAL, d.o.o.</u> | 2 |
| 49 | RADIO NET FM | / | <u>RADIO NET d.o.o.</u> | 1 |
| 50 | RADIO NOVA | / | <u>NOVA NOVA d.o.o. Ajdovščina</u> | 1 |
| 51 | Radio Odeon | / | <u>ARTIST d.o.o.</u> | 1 |
| 52 | RADIO ODMEV | status of local radio programme of particular relevance | <u>RADIO CERKNO d.o.o.</u> | 4 |

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| | | | | |
|----|--|--|---|----|
| 53 | RADIO OGNJIŠČE | status of non-profit radio programme of particular relevance | <u>Radio Ognjišče d.o.o.</u> | 18 |
| 54 | RADIO ORION | / | <u>INTERTEH d.o.o.</u> | 1 |
| 55 | RADIO PLUS MARIBOR | / | <u>B.&B.BELNA d.o.o.</u> | 1 |
| 56 | RADIO PRLEK | / | <u>ZAVOD ZA INFORMIRANJE</u> | 1 |
| 57 | RADIO PTUJ | status of regional radio programme of particular relevance | <u>RADIO TEDNIK Ptuj d.o.o.</u> | 3 |
| 58 | Radio RADIO | / | <u>MEDIA TON d.o.o.</u> | 1 |
| 59 | RADIO RADLJE | / | <u>RADIO RADLJE d.o.o.</u> | 3 |
| 60 | RADIO ROBIN | status of local radio programme of particular relevance | <u>RADIO ROBIN d.o.o.</u> | 1 |
| 61 | Radio Rogla | / | <u>NOVICE, d.o.o.</u> | 2 |
| 62 | RADIO SALOMON | / | <u>RADIO GLAS LJUBLJANE d.d., Ljubljana</u> | 2 |
| 63 | RADIO SEVNICA | / | <u>RADIO SEVNICA d.o.o.</u> | 1 |
| 64 | RADIO SLOVENIA INTERNATIONAL /Radio Si/ | RTVS programme | <u>RTV Slovenija</u> | 13 |
| 65 | RADIO SLOVENIJA, drugi program - PROGRAM VAL 202 /VAL 202/ | RTVS programme | <u>RTV Slovenija</u> | 46 |
| 66 | RADIO SLOVENIJA, prvi program - PROGRAM A1 /A1/ | RTVS programme | <u>RTV Slovenija</u> | 39 |
| 67 | RADIO SLOVENIJA, tretji program - PROGRAM ARS /ARS/ | RTVS programme | <u>RTV Slovenija</u> | 21 |
| 68 | RADIO SLOVENSKE GORICE | status of regional radio programme of particular relevance | <u>RADIO SLOVENSKE GORICE d.o.o.</u> | 1 |
| 69 | RADIO SNOOPY | / | <u>SNOOPY-HOLC IN DRUŽBENIKI d.n.o.</u> | 1 |

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| | | | | |
|----|---------------------|--|--|---|
| 70 | RADIO SORA | status of regional radio programme of particular relevance | <u>Radio Sora, podjetje za informiranje d.o.o.</u> | 3 |
| 71 | RADIO SRAKA | / | <u>SRAKA International d.o.o.</u> | 1 |
| 72 | RADIO ŠTAJERSKI VAL | status of regional radio programme of particular relevance | <u>RADIO ŠTAJERSKI VAL d.o.o.</u> | 2 |
| 73 | RADIO ŠTUDENT | / | <u>ZAVOD RADIO ŠTUDENT</u> | 1 |
| 74 | Radio Tartini | / | <u>ŠU & CO, d.o.o. Piran</u> | 2 |
| 75 | RADIO TEMPO | / | <u>RADIO TEMPO MATJAŽ JERŠIČ s.p.</u> | 1 |
| 76 | RADIO TRIGLAV | status of regional radio programme of particular relevance | <u>RADIO TRIGLAV JESENICE, d.o.o.</u> | 4 |
| 77 | RADIO UNIVOX | status of local radio programme of particular relevance | <u>UNIVOX d.o.o.</u> | 2 |
| 78 | RADIO URBAN | / | <u>RADIO URBAN d.o.o.</u> | 1 |
| 79 | RADIO VELENJE | status of local radio programme of particular relevance | <u>Naš čas, d.o.o.</u> | 2 |
| 80 | RADIO VESELJAK | / | <u>RADIO GLAS LJUBLJANE d.d., Ljubljana</u> | 3 |
| 81 | RADIO VIVA | / | <u>MEDIA INFO d.o.o.</u> | 2 |
| 82 | RADIO ZELENi VAL | / | <u>Alpe Adria 'Zeleni val' d.o.o.</u> | 2 |
| 83 | STUDIO D NOVO MESTO | / | <u>Studio D d.d.</u> | 1 |
| 84 | RADIO GROM | / | <u>Glasnik d.o.o.</u> | |

4.5 Economic aspects

The switchover procedure must be market-oriented while at the same time requiring joint coordination to achieve equal and market-based implementation (e.g. compatibility of schedules, joint presentations).

Member states that relied not only on market-based methods but also on clear measures of public policy to coordinate television broadcasters are quicker in adoption and switchover.

One important feature of coordination is the agreement on time coordination of different levels. This provides greater security for market players who supply digital products and services, and supports them in fostering demand. National switchover procedures therefore have benefits from the advantages of well-focused coordination of all relevant players. At the member-state level, rapid switchover brings immediate benefits.

Time coordination and the duration of the transition are decisive factors. The sooner the switchover procedure begins, and the shorter the transition period, the sooner the benefits will be realised. Public acceptance and understanding of the digital television advantages, as well as general understanding of the additional benefits to be obtained after the withdrawal of analogue terrestrial television and the replacement of cable networks will be important in accelerating the transition process.

Retail prices of digital receivers have fallen considerably since the first European Commission report on the switchover. The price of integrated television receivers has also been reduced. For most citizens, the purchase of equipment for digital television no longer presents a problem.

No accurate studies have been carried out on the costs arising in the transition period and the extent of this increase compared to the current analogue broadcasting system. We can, however, conclude from examples of foreign practice, that the rise in costs due to dual transmission is somewhere between 40% and 70%. Energy savings after the transition will be proportionately higher, since essentially one new transmitter will replace three or four old ones.

Following on from this, we must consider whether the option with rapid transition, with the financing/subsidising of the purchase of set top boxes (STBs) for the users, is more acceptable for providers from the economic point of view. Such measures have been proven effective in Germany (Berlin), and they also show good effects in Italy. The problem that arose is that at the EU level there is no established practice and the legal options are not defined in sufficient details.

European Union documents relating to policy on the switchover from analogue to digital broadcasting at present mainly focus on the terrestrial platforms.

The principle of technological neutrality emphasised in the regulatory framework of the European Union means that arrangements may not impose or disregard the use of individual technologies.

However, it does not prevent member states from adopting proportionate measures to promote individual technologies for digital television transmission as a means for increasing spectrum efficiency.

The European Commission nevertheless warns that the transition to digital TV is a procedure covering various networks, business models and services,

where each different treatment of market actors or technologies must be justified.

In proceedings before the European Commission, the Association of Cable Operators in Berlin launched a dispute, accusing MAAB (Berlin/Brandenburg Broadcasting Regulation Agency) of unjustified financing (compensation) of commercial broadcasting providers amounting to 4 million euros to cover the costs of digital terrestrial broadcasting in the city of Berlin. The decision in this case will strongly influence the ongoing switchover and the development of terrestrial digital television. The denouement, in which the commissioner for industry, Günther Verheugen and the commissioner for information society, Viviane Reding, participated, showed that the intervention was unlawful, and so the European institutions established guidance on acceptable forms of public support. These are:

- Investment in transmission networks in areas of poor coverage and of less commercial interest to investors (rural regions, less populated areas)
- Financial compensation to public RTV for the cost of broadcasting using all broadcast technologies, thereby ensuring coverage of the whole population through public service provision;
- Subsidies for users to buy digital decoders, provided they are technology-neutral, and particularly if they encourage the use of open standards for interactivity;
- Financial compensation to broadcasters that would have to cancel analogue broadcasting for specific interests before the expiry of their licences, if this was ensured by the capacities for digital broadcasting.

On the other hand, the USGAO (United States General Accounting Office) carried out a study on the success of the switchover to digital broadcasting in the Berlin case, which showed the most positive effects in the shortest time. The Americans conducted the study due to the difficulties that emerged in their switchover procedure, as they found that they would not achieve the planned completion of the switchover in December 2006.

They investigated the structure and arrangement of the German market as a whole, the progress of the Berlin switchover project and its critical components and negative side effects. They found out that the organisation of the German television market is based on two levels.

The upper level is regulated throughout the country by state institutions responsible for legislative frameworks and allocation of frequency licences, while the lower level comprises regional governments with 15 media institutions responsible for implementation and regulation within the framework of their regions and competences. All are financed from mandatory RTV subscription (16 euros per month per household). According to the latest data, less than 7% of Germans receive TV signals terrestrially, while most of them receive signals by cable (cost approximately 15 euros per month per connection) or satellite (cost of purchase and installation).

Following on from these data and facts, at the level responsible for media policy, industry and the economy, a detailed plan was prepared for a rapid switchover to digital broadcasting. Here the primary objective was to increase the importance, power and existence of terrestrial transmission of broadcast signals by introducing digital broadcasting. Gaining a frequency dividend was not the basic purpose (as for example in the USA).

Another very important finding was that a switchover in the framework of so-called islands or regions is more logical and reasonable than a one-off general and comprehensive switchover. This also concentrates the transmission of broadcast signals in terrestrial method.

The data that characterize the successful transition to digital broadcasting in Berlin are a short transitional phase of parallel broadcasting (10 months), financial and other support to private programme providers, subsidies for low-income households, providing equipment to households with STBs dependent solely on terrestrial reception, and a very intensive public information campaign about the meaning and benefits of digital terrestrial broadcasting.

Given that in America, a supply of digital signals (programmes) by content providers has already been ensured, it is already in the transitional phase of parallel broadcasting. The transition dynamics has lagged behind slightly, particularly among users, and so it is the task of Congress and the Federal Communications Commission to attempt to promote and further encourage households to purchase STBs or digital television receivers, since until the majority have digital reception technology, analogue transmitters cannot be switched off and the frequency dividend cannot be exploited.

Based on the German and American examples, we can conclude that planning of the analogue to digital switchover strategy and its implementation must absolutely include and consider the advantages and disadvantages for all players or participants involved, and set out and emphasise the added values and new services (digital added value) brought about by digital broadcasting.

Economic impact on individual players – participants after the switchover:

| IMPACT: ACTOR: | INVESTMENT: | GAIN: |
|------------------------------|---|---|
| CONTENT PROVIDERS | <ul style="list-style-type: none"> - new studio equipment - new communications for signal transmission - new production method | <ul style="list-style-type: none"> - lower transmission costs, - possible higher advertising revenues - new revenues |
| NETWORK OPERATORS | <ul style="list-style-type: none"> - new transmission equipment - new aerial systems - partly new connections | <ul style="list-style-type: none"> - lower energy consumption - rationalisation of equipment and premises - cheaper monitoring |
| USERS - VIEWERS | <ul style="list-style-type: none"> - new equipment for reception - partly new aerial systems | <ul style="list-style-type: none"> - less equipment needed (all in one) - lower energy consumption |
| EQUIPMENT MANUFACTURERS | <ul style="list-style-type: none"> - adoption of new technologies - new machines | <ul style="list-style-type: none"> - new jobs - sales opportunities - rationalisation of production and material |
| STATE, PUBLIC ADMINISTRATION | <ul style="list-style-type: none"> - financing information campaigns - envisaged subsidised equipment and certain services | <ul style="list-style-type: none"> - increased competition and media pluralism, - frequency dividends |

During preparation of the switchover strategy, a rough estimate was made of the cost for setting up transmission infrastructure for one network for one DVB-T multiplex.

The case led to the following conclusions:

1. multiplex (coders, MP, additional signals) EUR 400,000
 2. transmitters and converters
 - transmitters (10 stations, P = 2 kW) ... EUR 250,000
 - converters (200 locations, P = 200 W) .. EUR 170,000
 3. Communications for transmission of modulation signals ... EUR 210,000
 4. Other costs – 20 % EUR 140,000
- TOTAL: EUR 1,170,000

It must be emphasised that in this case the necessary construction works and investments in antenna systems, tower construction and power systems, which in individual cases in existing configurations will not be suitable for digital broadcasting, are not taken into account. At present, these costs cannot be projected, since it is necessary to carefully and precisely prepare a plan of coverage and transmitter network as well as calculations of mutual interference of individual transmitters.

In the case of operating for several multiplexes or in the event of collocation for multiple multiplexes with a single antenna system, this cost would be much lower.

If redundancy were taken into account in the transmission system, item 2 for transmitters and converters from the calculation would be elevated by approx. 40%, that is EUR 588,000 for transmitters and converters, however, such system would provide for an enhanced stability of the network.

Given the rough estimate, we can conclude that the cost of one multiplex is estimated between EUR 1.2M and 1.4M, while additional ones would represent lower costs assuming that they are included in the same network and use collocation.

The complete switchover investment is estimated to be between EUR 8.5 and 10.5M, depending on the utilized technical solutions. The costs of promotion and call centre incurred in the state in 2009 and 2010 will amount to EUR 0.5M annually, while subsidies for the purchase of decoders in 2010 will cost the state EUR 1M.

4.6 Social-policy aspects

A decisive factor for the success of the national switchover procedure is an effective strategy of consumer information regarding the availability of digital programmes and the necessary equipment to receive such programmes.

The switchover can also contribute to better fulfilment of special needs of people with disabilities, and attention should be paid to inclusion of accessibility requirements in the user interface, e.g. EPG (electronic programme guide) and receiver.

Example of EPG:



The introduction of digital broadcasting in the transitional period will result in additional costs for all parties involved. However, the improved economics of digital broadcasting and reception will reduce the costs in the long-term. Consequently, a coordinated and rapid transition is required.

The switchover strategy to digital broadcasting envisages eight-fold coverage (eight equal networks) for the Republic of Slovenia, and three regions. It is based on mutual coordination with neighbouring countries.

The switchover strategy encourages the entry of new competitors in all areas and at different levels of the value chain, and contributes to increased

competition in the market and promotes innovation, new television and radio broadcasters, developers of interactive programmes and competition among operators of electronic communications networks.

It ensures the right of citizens to freedom of expression and the right to information at the local level, by means of programmes produced by broadcasters established outside the capital city of the Republic of Slovenia. It enables greater media pluralism and diversity of programme contents.

Once analogue broadcasting is switched off, part of the possibly released frequency spectrum will be given over to new services.

The policy for the switchover to digital broadcasting further envisages that users will have a choice to choose the equipment required for reception of digitally broadcast programmes, from the simplest and low-priced solutions for the easiest transition possible, to equipment of better quality enabling a combination of multiple digital television services. Of essential importance are compatibility of devices that users already own with the new ones and mutual compatibility among different providers.

The objective of the Republic of Slovenia is to provide affordable prices for the switchover to digital broadcasting for the majority of population. It must be ensured that those interested only in reception of non-payable programmes can receive these programmes in digital broadcasting without disproportionate costs.

5 STRATEGY IMPLEMENTATION

5.1 Basic steps of the strategy

The strategy for the switchover to digital broadcasting must be coordinated in terms of place and time, and must be adopted by all players. The Ministry of the Economy – Directorate for Electronic Communications – and the Post and Electronic Communications Agency of the Republic of Slovenia will be responsible for implementation, coordination, and overseeing.

The strategy includes the following key steps:

1. Allocation of the right to mark the products with labels on the basis of performed testing, not later than January 2009.
2. Simultaneous transmission of all public RTV programmes and programmes with national coverage, not later than January 2009.
3. Official start of digital broadcasting promotion in January 2009.
4. Launch of digital broadcasting on the spare part of the spectrum for all existing programmes with national coverage, on at least two multiplexes not later than September 2009.
5. Start of programme introduction in high definition technique on the available spectrum part by the end of 2009.
6. Start of digital broadcasting implementation for radio programmes on the part of the spectrum envisaged for this, by the end of 2009.
7. Withdrawal of analogue broadcasting of TV programmes at the latest until the end of 2010, unless agreement on a shorter period of withdrawal is reached.
8. Introduction of new multiplexes for digital broadcasting on the spare part of the spectrum with the aim of establishing 4 or 5 multiplexes for TV in standard and high definition, in 2011.
9. Introduction of multiplexes for the digital broadcasting of mobile television on the spare part of the spectrum, in 2011.
10. Use of part of the released spectrum for broadband networks and services, in particular with a goal to achieve additional capacities on rural areas, in 2011.

5.2 Technological aspect of the switchover

The switchover strategy is based on technological requirements that, as far as possible, will enable and encourage the switchover and also later, the development of digital broadcasting.

It takes account of compatibility with neighbouring countries and the ability of domestic industry to sell existing and planned technologies.

It enables the best use and management of the available frequency spectrum and later trading in the frequency spectrum dividends, and the introduction of new services.

Given general trends around the world, the merging of network operators (GSM, UMTS, WiFi, WiMAX, ADSL ...) and content providers (TV, radio, data) in so-called hybrid networks, is envisaged.

At the regional radio conference RRC-06, which was held in Geneva, Switzerland in May and June 2006, the Republic of Slovenia managed to provide 8 television networks with national coverage within the UHF and VHF range, more local networks on different geographical areas and, in addition, to already coordinated networks, 2 additional radio networks with national coverage on the VHF range.

Network planning is based on coordination of geographical regions, referred to as ALLOTMENTS, inside of which the transmitters operate on the same frequency (Single Frequency Network – SFN). This represents a substantial saving of the frequency spectrum. It is a condition of geographical planning regions that interference caused by such a network in the neighbouring regions does not exceed a limited value.

Preparation of the digital plan required a definition of geographical areas. APEK divided Slovenia into three regions for this purpose: Western, Central and Eastern. Such a division is comparable in terms of the regions' size with those in neighbouring countries, which is a precondition for a balanced digital plan based on equal access to the frequency spectrum.

Digital transmitters will, in addition to standard parameters (frequency or channel, location, radiation diagram, antenna orientation ...), also have the following additional parameters:

- modulation type COFDM (QPSK, 16-QAM, 64-QAM),

- code ratio ($\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{6}$, $\frac{7}{8}$),
- guard interval ($\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$),
- Picture coding method (MPEG-4)
- and other parameters linked to digital technology.

Digital networks can be planned for different reception methods:

- fixed reception (aerials on roofs),
- mobile reception (aerials built-into devices),
- portable reception (external aerial or aerial built into device),
- portable reception in closed premises (external aerial, built into a device or into building fittings).

Due to the possible different coding methods of a digital signal, it is necessary to provide technical requirements for the Slovenian market, which would unambiguously ensure that the equipment of different manufacturers will operate independently of the multiplex operator. Certain technical requirements can be regulated by the APEK in its decisions or can be given in general guidelines or they can also be agreed upon by the manufacturers of the equipment and multiplex operators.

However, the basic principle is to respect existing international standards and recommendations.

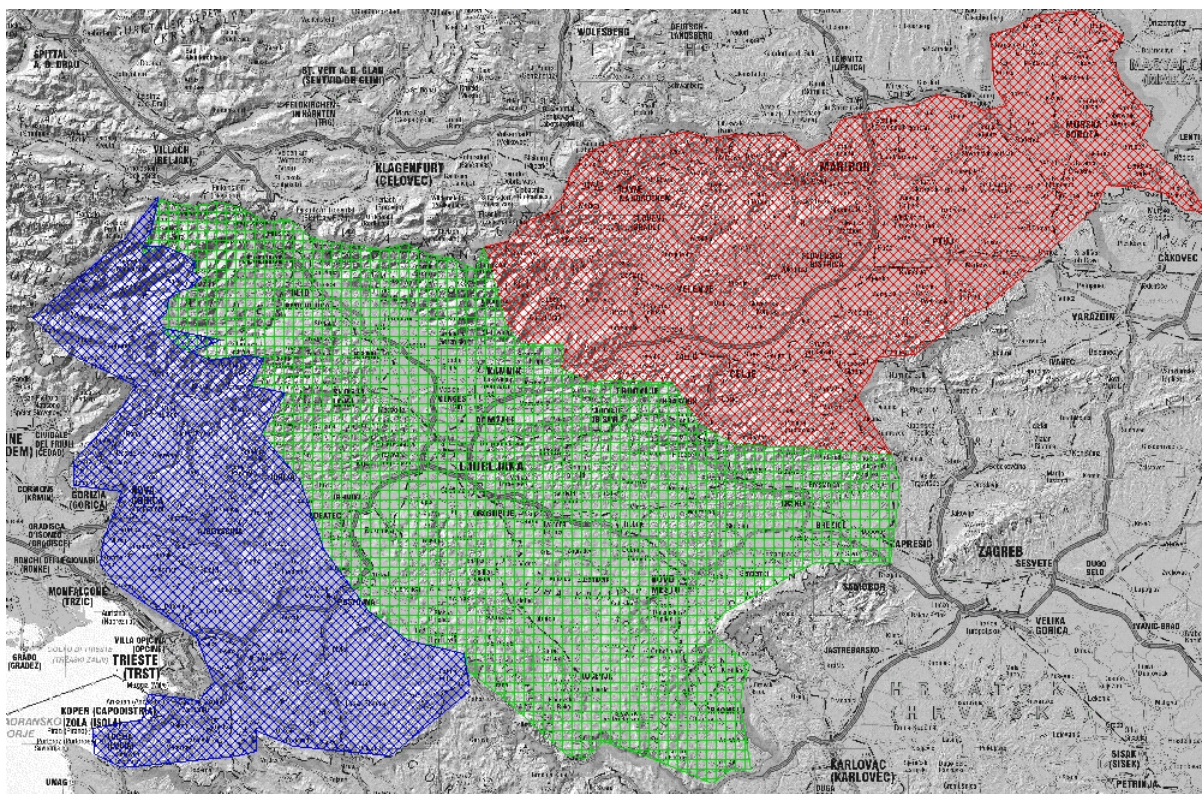
For picture coding a more advanced system ITU-T H.264 (also known as MPEG-4 Part 10) is used.

5.3 Geographical and frequency aspects of the switchover

The Republic of Slovenia is divided into three geographical areas: EASTERN, CENTRAL and WESTERN, and into two regions (EASTERN, WESTERN) for digital broadcasting on the 12th channel.

Division of the Republic of Slovenia into geographical areas:

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Division into three geographical (allotments) is necessary because of the specific characteristic of digital broadcasting – single frequency network (SFN) which can be implemented only over a certain distance.

In addition to these geographical areas, an additional geographical area for Ljubljana is provided for. This follows from the fact that all the capitals of European countries have their own special regions, and thus the possibility of additional coverage.

For each geographical region, a strategy for switchover to digital broadcasting will be separately administrated. To reach faster switchover in individual geographical regions, APEK can also establish these areas in a narrower way, but it has to ensure in the final phase that whole geographical regions are consolidated with regard to frequencies into single frequency networks (SFN).

Table of channels intended for single frequency networks DVB-T during the switchover period – source APEK (December 2007):

| GEOGRAPHICAL REGION | CHANNE L | STATUS |
|----------------------------|---------------------|---------------|
| WESTERN | 51 | MUX1 |
| CENTRAL | 45 | MUX1 |
| EASTERN | 66 | MUX1 |

| GEOGRAPHICAL REGION | CHANNE L | STATUS |
|----------------------------|---------------------|---------------|
| WESTERN | 66 | MUX2 |
| CENTRAL | 64 | MUX2 |
| EASTERN | 67 | MUX2 |

The above mentioned channels can be immediately used for the switchover to DVB-T digital transmission. Thus, networks MUX1 and MUX2 are comparable regarding coverage of Slovenia's territory. Both networks are designed so as not to interfere with the operation of existing domestic and foreign analogue and digital transmitters.

The networks MUX1 and MUX2 can ensure coverage of the total population within the area of the Republic of Slovenia.

For other smaller networks regarding local and regional programmes, and for the needs of DVB-H and high definition television, the channels from GE06A (digital transmission) or GE06D which are free and do not interfere with the reception of other existing transmitters, can be used.

In the case where a binding intercountry agreement on release of radio frequency band over 790 MHz is to be signed, it is necessary to envisage harmonisation of channels for individual geographical regions, in such a way that channels under this frequency limit are not used. For this purpose it is necessary to envisage the use of channels that are, at this moment, occupied by analogue television.

5.4 Aspects of competition and participants

Many partners appear in digital broadcasting who link up with each other, namely multiplex operators, content providers, and owners of the infrastructures for electronic communications.

Multiplex operators apply by tenders to ODRF (decision on allocation of radio frequencies) under conditions laid down by law, and the criteria prescribed by APEK. **Multiplex operators conclude contractual relationships with content providers/publishers for the preparation and production of programming, and data content.**

It is possible for the multiplex operator and the content provider/publisher to be part of a single legal entity (ownership links), but separate and transparent costing accounts must be provided, and the most efficient use of the frequency spectrum or multiplex assured. This means that the multiplex operators must also include other programmes if they do not provide enough of their own to fully occupy the multiplex, and must respect the legislation in force. **Multiplex operators must, within a specific geographical region, make themselves available to all content providers entitled to the distribution of programme content using digital broadcasting within the same geographical region, the same non-discriminatory conditions for access to any multiplex they operate with. This also applies if multiplex operators are content provider themselves.**

One of important objectives is to exploit the existing infrastructure regarding electronic communication to the greatest possible extent, and to avoid unnecessary activities affecting the environment. The basic principle is to encourage the sharing of infrastructure. In those case where multiplex operators are deprived of access to applicable alternatives for reasons specified in the Digital Broadcasting Act, APEK can decide on sharing.

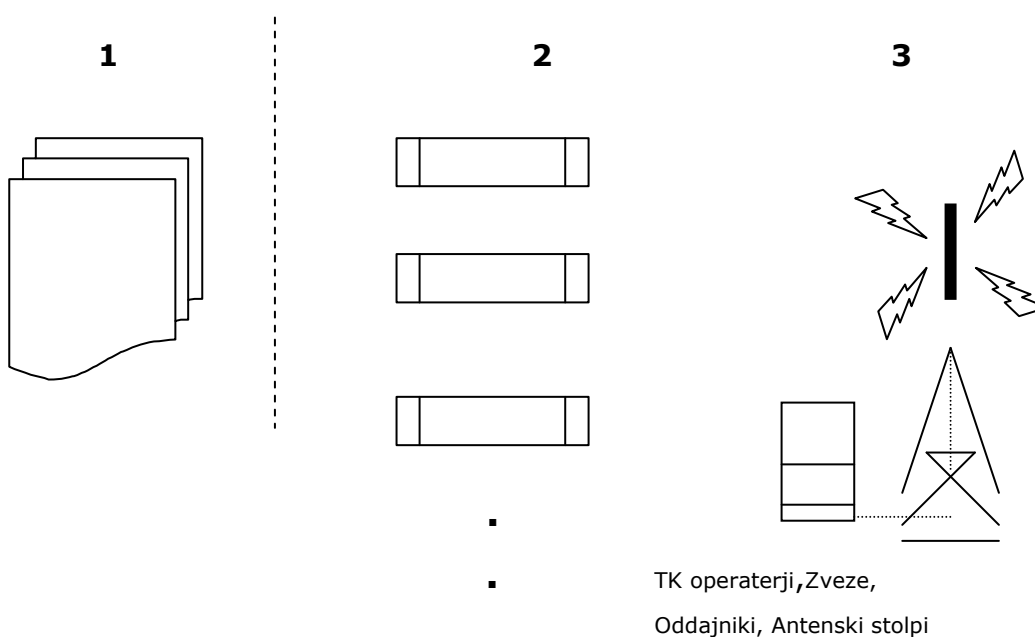
The other important objective is to ensure competition to a sufficient extent so as not to create a monopoly.

Definition of entities in digital broadcasting:

- CONTENT PROVIDER/PUBLISHER – MEDIA - 1
 - o *(preparation and production of programme content, including data content)*

- MULTIPLEX OPERATOR – 2
 - o *Administration of multiplex, awarded decision on allocation of radio frequencies for a multiplex – ODRF)*
 - o *(distribution and transmission of digital signal)*

- Owner of the infrastructure or its administrator - 3
 - o *(Administration of multiplex, awarded decision on allocation of radio frequencies for a multiplex – ODRF)*
 - o *(distribution and transmission of digital signal)*



The legal basis for issuing ODRF, the operation of digital broadcasting networks for MULTIPLEX OPERATORS, and competition between CONTENT PUBLISHERS – MEDIA for occupying programme space on MULTIPLEXES is

regulated by the law governing electronic communications, by the law, regulating digital broadcasting, and by the law regulating media.

With regard to the programmes of the public RTV, its rights and obligations are regulated by the Radiotelevizija Slovenija Act.

Implementation of the switchover strategy must primarily ensure that the switchover to digital broadcasting does not cause additional and unnecessary environmental impact, and so – as envisaged in Article 8 of the Electronic Communications Act – we will encourage shared use of existing facilities and capacities.

It is expected that all the programmes of the public RTV are placed on the first multiplex with national coverage. RTV Slovenia can receive the frequencies for one multiplex for the need to provide public service, without a public tender.

For the second multiplex with national coverage, it will be necessary to publish a public tender to award an operator and to ensure conditions so that the interest for allocation of frequencies and investments into the network construction will be provided for.

For local and regional programmes, several smaller multiplexes with local or regional coverage are foreseen.

The public RTV has the legal basis for digital transmission within the whole territory of the Republic of Slovenia as laid down by the Digital Broadcasting and Radiotelevizija Slovenija Acts. As a public service for radio and television activities, it must actively and creatively contribute to public information and the introduction of digitalisation throughout the Republic of Slovenia. Digital Broadcasting Act additionally imposes on the public institute RTV Slovenia the provision for the coverage in individual areas, which must include at least 95 % of the population.

Multiplex operators can include within digital transmission those programme providers receiving a valid decision from an authorised body for such services. In addition, multiplex operators must also ensure the principle of “must carry” for programmes and services prescribed by law or APEK.

Multiplex operators are liable to pay an annual payment to APEK for the use of allocated radio frequencies.

Multiplex operators will charge subscribers/users and content providers/media for operating, and management costs for multiplex at a level proportionate to actual costs.

5.5 Action plan

The action plan is based on the content and timeframe of European Union documents and the prepared switchover strategy. Its purpose is to achieve the objectives of this strategy and the maximum and quickest positive effects for participants and the environment.

The period until the end of 2008:

| Orientation | | |
|---|--|-----------------|
| Preparation of required legislation and strategy, implementation of public tenders and allocation of frequencies to two multiplex operators, promotion for the launch of digital broadcasting | | |
| Objectives | | |
| To ensure transparent, clear, incentive-based, competitive, pluralist, user- and environmentally-friendly circumstances for the transition to and development of digital broadcasting; and competition developing among multiplex operators | | |
| Measures | Operators | Deadline |
| Adoption of new Digital Broadcasting Act (already adopted and published in Official Gazette of the RS, No. 192/07). | MG DEK, APEK | until 2007 |
| Allocation of a frequency to the public radio television operator (procedure has been implemented) | APEK | 2007 |
| Implementation of public tender and allocation of a frequency to the second multiplex operator (procedure has been implemented). | APEK | 2008 |
| Reconciliation of technical requirements for Slovenia (procedure has been implemented). | APEK, RTVSLO, multiplex operators, equipment manufacturers | autumn 2008 |

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Period 2009-2010:

| Orientation | | |
|--|---|--------------------------|
| Implementation of efficient switchover from analogue to digital broadcasting | | |
| Objectives | | |
| Coordinated switchover under the agreed plan, active and good public information | | |
| Measures | Operators | Deadline |
| Active transmission of all public radio television programmes and all existing commercial programmes with national coverage in both multiplexes. | RTV SLO, commercial content providers | February 2009 |
| Official start of digital transmission and its promotion. | RTVSLO, MG DEK, commercial content providers, multiplex operators | February 2009 |
| Implementation of public tender for awarding a multiplex operator intended for high definition TV. | APEK | March 2009 |
| To reach a 90% coverage of the population using at least one multiplex, and at least 80% using the other | RTV SLO, second awarded multiplex operator | at latest September 2009 |
| Migration of commercial programmes to the second multiplex and introduction of new TV programmes | second awarded multiplex operator, commercial content providers | at latest September 2009 |
| Start of multiplex transmission with programmes using the high definition technique | awarded multiplex operator, commercial content providers | December 2009 |
| Implementation of tender for allocation of frequencies for digital broadcasting of radio programmes | APEK | September 2009 |
| Start of the parallel transmission of the first multiplex | APEK, multiplex operators | at latest June 2009 |

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| | | |
|---|---|--------------------------|
| Start of digital broadcasting of radio programmes. | awarded operator | December 2009 |
| Active promotion of digital transmission | commercial content providers, multiplex operators, MG DEK | February 2009 |
| Active promotion of analogue transmission withdrawal | MG DEK, APEK, commercial content providers | June 2010 |
| Assistance in purchase of equipment for materially deprived users. | MG DEK | Actions in 2009 and 2010 |
| Withdrawal of the analogue broadcasting of TV programmes | APEK, content providers | at latest December 2010 |

This is the key period in which the dynamics of the process will unfold, and problems are to be expected arising from unforeseen circumstances.

Despite the well-defined plan and schedule for transitional periods, delays can arise due to difficulties in establishing the network of transmitters, complications in the supply of equipment (problems are expected in the global market), inadequate response from consumers to acquire reception equipment etc.

Regardless of external influences that, in one way or another, will block and hinder the switchover, the agreed strategy must be implemented, the switchover plan respected, and all strengths invested into implementing the switchover, as soon as possible.

It is anticipated that initial difficulties will reduce over time and with the development of events and/or will eliminate themselves. The development of technologies and the already completed switchover in other European Union countries will also contribute to this.

Period 2011-2012:

| |
|--|
| Orientation |
| Further digital broadcasting development and use of a digital dividend from a radio frequency spectrum |

| Objectives | | |
|--|------------------|-----------------|
| To enable the digital broadcasting of new programmes, transmit using a better quality technique, using the spectrum for other services | | |
| Measures | Operators | Deadline |
| To decide on the allocation of frequency bands for the use of mobile television and two-way networks | MG DEK, APEK | the end of 2010 |
| Implementation of tenders and allocation of frequencies for third and fourth multiplexes | APEK | start of 2011 |
| allocation of rights to frequencies for the coverage of smaller geographical regions, to local TV programme providers | APEK | start of 2011 |
| Implementation of tenders and allocation of frequencies for the two multiplexes of mobile television | APEK | 2011 |
| Implementation of tenders and allocation of frequencies for two-way networks (broadband networks). | APEK | 2011 |
| Co-financing network setting on the areas lacking commercial interest – implementation of tender | MG DEK | 2011-2012 |

During this period, the withdrawal of analogue transmitters will release the frequency spectrum, and it will be possible to establish complete third, fourth and all other digital networks, depending on supply and demand.

During this period, it will be possible to ensure several options for the needs of additional TV programmes, programmes in high definition technique, and mobile television.

This period will require final coordination of the national spectrum plan and – within the framework of European frequency-spectrum policy and on the basis of such new coordination – determination of the spectrum dividend. Joint coordination and agreement will be

required with regard to use, since otherwise it will be impossible to develop new pan-European services and to market such spectrum dividends.

6 ACTIVITIES LINKED TO THE STRATEGY

6.1 Policy on obligations and incentives

Policy on the switchover to digital broadcasting, all activities undertaken, and all documents produced in relation to the switchover are harmonised with European regulations and legislation.

According to the provisions of the Digital Broadcasting Act, the Republic of Slovenia will implement the following measures and activities via the ministry competent for electronic communications, in order to strengthen the expansion of digital broadcasting:

- Organise workshops and forums where the problems of switchover to digital broadcasting and withdrawal of analogue TV transmission will be dealt with,
- Inform the public about key decisions,
- Organise consumer incentives for materially deprived parts of the population regarding the purchase of equipment for digital broadcasting reception
- Co-finance network settings in those areas with insufficient commercial interest,
- Organise promotion for the switchover to digital broadcasting and inform the public about the switchover.

The source for financing the mentioned measures will be, amongst others, a one-off amount paid for efficient use of the mentioned natural goods by the multiplex operators for innovative services or mobile television, and other means envisaged in the budget.

In the form of consumer incentives, the ministry will, within the framework of available means, co-finance the purchase of digital television receivers for materially-deprived consumers. Those dependent on terrestrial television signals could be included; these are mainly in less populated regions and the countryside, and are part of the materially deprived population. Forecasts suggest there could be around 20,000 such households. The sets/receivers co-financed by the ministry, must be technologically neutral.

The ministry will also have the capacity to co-finance the planning and building of networks for digital broadcasting in those areas where, despite the achieved 92 % coverage of the population in the Republic of Slovenia with at

least one multiplex, the reception of digital broadcasting programmes is still impossible.

Within the framework of European legislation, the Republic of Slovenia will encourage the participation of domestic industry and technology in the switchover and, subsequently, in digital broadcasting, since there are quite a number of companies in Slovenia that can technologically provide equipment for DTT transmission and reception.

The purpose of promoting the switchover is to improve the reception of programmes, additional services, to improve services, and enhance the provision of information to the public. Measures will be undertaken across the whole country, with emphasis on the accelerated building of networks in less developed regions. These measures will lead to a more equal territorial development of electronic communication services.

The measures for promoting digital broadcasting can include, if necessary, monetary incentives in order to strengthen penetration.

6.2 Areas of cooperation with the EU

In addition to the advantages at national level, the acceleration of the switchover procedure could also increase the learning effect, and promote positive examples among member states. Numerous new technologies and services depend on achieving a critical mass of users at the European level, and become more attractive as the basic technology increases in Europe.

Market actors are concerned that the development of new services could be hindered by different implementations in individual European countries. In particular, they are seeking legal protection regarding any terrestrial spectrum that could be available, and a reduction of the barriers caused by state borders.

Acceleration of the switchover procedure at the level of member states, and cooperation in the transition period and on the date of withdrawal, could enable a rapid switchover in Europe. RSPG proposes the introduction of a limited number of timeframes that member states could follow, and investigation of a joint declaration on the switchover procedure.

The spectrum for pan-European services and numerous cross-border services, such as traffic information and shipping management, mobile communications and new forms of data communication, will – after the cessation of analogue

broadcasting in all member states – only be available at the European level. In those member states in which analogue transmissions have already stopped, cross-border use could also be introduced earlier. Thus, there exist reasons for accelerating switchover procedures in individual countries, and to strive to set a date by which analogue broadcasting should be ceased in all member states.

Such acceleration and a European Union deadline for the switchover would help overcome the current fragmentation of European digital television markets. This will enable European players to compete with other global interest groups in all parts of the digital television value chain, and will have positive economic consequences in terms of exporting the technology, knowledge and products, increased revenues, and greater competition regarding content.

The speed at which Europe as a whole can move will depend on the speed of national switchover procedures on the one hand and on the speed of the slowest member states on the other. The high capacity of analogue TV transmitters, and the sensitivity of analogue receivers to interference means that the introduction of new services will also be hindered by limited continued use of analogue services in some member states.

Therefore, each share of the spectrum at the national level will greatly depend on the number of neighbouring countries that have already withdrawn analogue transmissions, and on the European level as a whole, will only be achievable on the basis of complete withdrawal of analogue broadcasting throughout the European Union, and neighbouring countries.

One of the main driving forces regarding the switchover to digital broadcasting is the interest of the European Union reflected over several areas. The emphasis is on new and pan-European services, marketing the spectrum dividends, development of new technologies, economic effects and increased competitive advantages compared to Asia and America.

A clear example suggests that 60-70% of the benefits accruing to individual states will come from their own transition, with the remaining 30-40% derived from the switchover in all European examples. Otherwise, each hindrance of the switchover at home could impose costs, and do harm to others.

6.3 Criteria for realisation of the objectives and observation indicators

With a well-defined strategy and the correct switchover dynamic, the effects of the transition could be both positive and immediate. They will be reflected directly and indirectly.

Due to the complexity of the procedure and the involvement of various players in the switchover from analogue to digital broadcasting, and the impact of digital broadcasting on the daily life of each individual, a broad political, economic, public and private consensus is required.

All players are actively included in the switchover under equal conditions, since the principle of technological neutrality – emphasised within the regulatory framework of the European Union – must apply, meaning that the use of individual types of technology can neither be required nor neglected; this does not, however prevent member states from adopting proportionate measures for promoting individual technologies for digital television transmission as a means of improving spectrum efficiency.

Another very important criterion for the switchover from analogue to digital broadcasting is environmental impact, since the introduction of digital methods must not cause additional and unnecessary impact on nature and the living environment. The final impact of the switchover will be positive, since digital broadcasting will use less energy, and the EMS burden on the living environment will also be lower.

The main criteria and indicators for monitoring the switchover strategy from analogue to digital broadcasting will be:

- speed of the switchover (meeting deadlines),
- New values and contents (new TV programmes, higher number of programmes in high definition technique, auxiliary services as MHP),
- lower transmission costs,
- disposition and release of frequency spectrum for new services,
- Introduction of new services on the released part of the spectrum.

7 Digital dividends

When analogue terrestrial broadcasting ceases to operate, the part of the spectrum which will not be used for the transmission of television programmes, will be released. We estimate that four multiplexes will be enough for the transmission requirements of Slovenian television programmes. One would be enough for the transmission of public television programmes and regional programmes or other programmes of special significance. Two multiplexes would mainly transmit programmes in high definition technique which would suffice for six to eight such programmes. One would be sufficient for the transmission of additional seven national programmes. In the case that the need for additional national programmes and regional programmes would be greater, the fifth multiplex would be used which could enable transmission of seven national programmes, 21 regional programmes or any combination of these. The subject of the strategy is not to define the numbers and types of programmes but to define sufficient capabilities for their dissemination; therefore, the specified possibilities are only informative.

The rest of the frequency space which will not be used for digital broadcasting can be used in the manner specified in the table:

| Frequency range | Purpose of use |
|---------------------------|--|
| 860 MHz ... 790 MHz | Single and two-way networks (mobile Television - DVB-H and wireless broadband networks). |
| | DVB-T |
| | DVB-T |
| 500 MHz ... 470 MHz | two-way networks (wireless broadband network for rural areas) |

The table displays only those possibilities that may occur if the prices of potential investors in such networks are favourable. Since some frequencies – after the switchover to digital broadcasting – in the regions planned for single or two way networks, will be used for the digital broadcasting of TV

programmes, it will be necessary to form a plan for the migration to frequency channels between 500 and 790 MHz.

8 SUMMARY

The withdrawal of analogue terrestrial broadcasting across the whole European Union is – taking account of the plans of member states for the switchover published as part of the e-Europe action plan and the final document, i.e. European Commission Communication COM (2005) 204 final – set for the start of 2012. In some countries, analogue broadcasting has already been stopped; for example in Austria as one of the neighbouring countries, but most countries expect to stop analogue broadcasting by the end of 2010. The Republic of Slovenia has also decided to cease analogue broadcasting by the end of 2010, and put this into law.

The switchover will foster innovation and growth in the market for equipment, and will contribute to a renewed Lisbon strategy. The benefits of digital broadcasting for consumers include better reception, improved picture quality, better sound, better portable and mobile reception, more television and radio programmes, and more information services.

These benefits derive primarily from the possibility of processing and compressing digital data, which enables much more efficient use of network capacities than with analogue signals.

One of the basic objectives is to create new and added values (digital added-value) for all players compared to the existing method of analogue broadcasting.

All the objectives of the switchover strategy must, as far as possible, enable the development and competitiveness of the broadcasting sector, reflected in technical, systemic, legislative, financial, economic, public, and environmental coordination.

The Republic of Slovenia will strive to exploit, as far as possible, the switchover to new transmission technology, in order to achieve maximum media pluralism and diversity of programme content.

By the end of analogue transmissions at the latest, part of the possibly released frequency spectrum will be allocated to new services and mobile television.

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BROADCASTING

9 DIGITAL TECHNOLOGIES

9.1 DVB-T

In order to receive digital terrestrial television, users need technology similar to that used until now: aerial, receiver and television. The only change is that the new technology must enable the reception and reproduction of a digital signal. Therefore, all devices that enable this are marked with the DVB-T logo (for more information see <http://www.dvb.org/>).



Initially, all users of classic analogue televisions will need a set top box (STB) – an external digital receiver connected to an aerial (external, indoor), and a television.

Anyone choosing to buy in the future a new television receiver, will be able to buy such with an integrated digital receiver - an integrated digital TV (IDTV) and will not need an STB.

Anyone wanting to take full advantage of all the benefits of digital television, including HDTV-format (high definition format) can already buy on the open market television sets with integrated digital receivers ready for HDTV-format (marked "HD ready").

Equipment needed to receive and transmit digital terrestrial television DTT (devices must be marked DVB-T):

- **STB – Set Top Box** (receiver for digital broadcast signal, possibility of videotext reception, VPS, dual channel sound, EPG, MHP, Dolby Digital):
 - **external independent unit** (connection for one television and/or video recorder – Twin Receiver, may have additional integrated decoders for various payable services)
 - **Integrated unit** (Integrated Digital TV is already built into the television, no external unit required, portable versions also)
 - **computer unit** (PC DVB-T, intended for personal and portable computers, built-in, PCMCIA or USB connections)

- **DTT aerials:**

- **fixed aerial** (installed on a roof, possibility of joint reception, orientation and polarisation of the aerial is important; basically the same as analogue aerials; it is important that they receive signals in VHF and UHF bands or the channel of a digital multiplex, required field strength 30 dB μ V)
 - **indoor aerial** (passive or active, used in regions with good reception, required field strength 38 dB μ V)
 - **external aerial** (suitable for portable and mobile reception, required field strength between 30 and 38 dB μ V)
- **Transmitters for digital terrestrial television – DTT**
- **transmitter** (transmission power 1-5 kW, used for DVB-T and DVB-H systems):
 - **modulator** (modulation COFDM, QPSK 16-QAM or 64-QAM):
 - **coder** (coders for MPEG-2 compression format enable capacity up to 50 Mbit/s, Interlace or Progressive system):
 - **multiplex** (active merger, possibility of dynamic setting of channel capacity, GPS-synchronisation):
 - **aerial** (similar to analogue, for VHF – Band III and UHF – Band IV and V):

9.2 DVB-H

In parallel with the DVB-T system, a DVB-H system will also be introduced, intended for mobile reception of terrestrial digital television on mobile devices. Mobile devices that can receive DVB-H are currently relatively expensive (due to limited supplies), but we can expect prices to fall and this market to bloom very soon; this will enable many new methods for providing content and interactively involving users.

DVB-T and DVB-H systems can operate in parallel in a single multiplex using the division principle, or in a hierarchical operating method. The use of hierarchical modulation, which would allow DVB-T and DVB-H signals to be transmitted in a single network, is not very likely, since there are too many restrictions. The system is not the most suitable for any technology. To date this principle has only been used in Australia.

Equipment needed for the reception of mobile digital terrestrial television (devices must bear the DVB-H symbol):



Models of DVB-H-capable mobile devices (October 2005):

9.3 T-DAB in DRM

The switchover strategy also takes account of the needs of digital radio T-DAB and DRM, but with the difference that the existing analogue frequency bands for radio programmes are not being withdrawn, which means that the switchover to digital broadcasting of radio programmes represents only an additional option to the analogue method. There is still no final deadline for radio programme providers and users by which they must replace and withdraw the existing analogue transmission and reception methods.



One of the key factors affecting the growth of T-DAB is a bit rate. High bit rates mean fewer radio programmes, and lower bit rates mean more radio programmes. A large supply of content is of key importance to establishing the T-DAB system. Instead of four programmes, one multiplex can carry 10, if we decide not to transmit the programmes at the highest bit rate. However a compromise must be reached, since the quality must not fall below a certain threshold (compared to FM). We must therefore ensure bit rates that will allow sufficient quality of audio transmission while, at the same time, fully exploiting the capacity of the whole multiplex.

T-DAB enables the creation of new themed stations, which hitherto in Slovenia, despite the wishes of some broadcasters, have been impossible due to a lack of spare frequency spectrum. We will be able to receive stations dedicated to specific musical genres (jazz, classical, folk, children's ...) or other contents, such as radio stations that broadcast parliamentary sessions, 24-hour information stations etc.

Comparing the data on bit rates with data on the spread of T-DAB and the number of radio stations, we can establish the following:

bit rate (e.g. 128 kb/s) => more stations => faster growth of T-DAB

By the end of 2004, 1.3 million T-DAB receivers had been sold in the United Kingdom. Since the UK also has the largest number of stations, we

can assert with near certainty that this is a key factor in the growth of T-DAB.

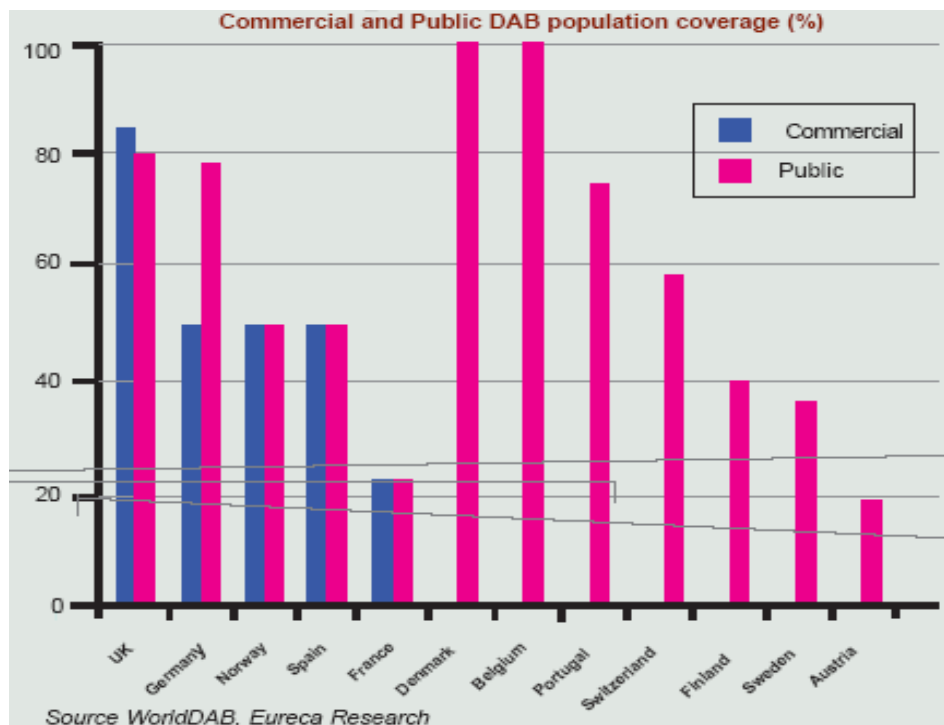
In various countries, a maximum percentage of multiplex is set for the T-DAB system – channel capacity – that may be contributed to data transmission and data services, for which special concessions are awarded.

Following on from this, the DMB system is increasingly used; it is hoped in the near future to link it with the DVB-H system.

Limits on data transmission in various countries:

- Belgium: maximum 10 %
- Denmark: maximum 10 %
- Germany: maximum 20 %
- Italy: not specified
- Singapore: up to 35 %
- Spain: maximum 20 %
- Thailand: minimum 50 % for audio transmission
- United Kingdom: maximum 20 %

T-DAB presence in EU (share of public and commercial providers):



With regard to frequency spectra dedicated to T-DAB transmission, the Republic of Slovenia has reserved enough spare channels so that terrestrial

digital radio could be introduced today, but the lack of consumer interest and the inadequate supply of T-DAB receivers are a major obstacle.

We can expect interest on the part of Slovenian users to increase with the start of commercial broadcasts of T-DAB signals and the increasing number of new stations and services.

In addition to the T-DAB network on channel 12, which was agreed in Wiesbaden in 1995, two networks are additionally proposed in the VHF range. There would thus be three networks in the VHF range with national coverage and local networks available for radio in the L-range, as agreed in Maastricht in 2002.

Licences would be awarded under uniform criteria and procedures such as those applying to digital broadcasting as a whole. The licensing and coverage procedures would operate on the basis of units – allotments, and would then be combined into larger regional and national coverage networks.

Wiesbaden '95:

- 12 B – eastern RS
- 12 C – western RS

Maastricht '02:

- LG – eastern RS
- LA – western RS
- LH - eastern RS
- LF- western RS
- LD – eastern RS excluding Prekmurje and the City of Maribor
- LC- western RS
- LI – eastern part of RS (only Dolenjska, Zasavje and Ljubljana)
- LE – western part of RS (only Gorenjska and Goriška)
- LM – Prekmurje
- LE – City of Maribor
- LO – Celje and Obsotelje
- LK – Koroška

- LJ – Zasavje
- LP – Dolenjska and Bela Krajina
- LM – Ljubljana
- LL – Goriška
- LN – Gorenjska

RRC-06:

- 2 networks with national coverage in the VHF range.

The position of DRM is still unclear, since there is very little user interest in this type of audio reception, since the range of stations and reception techniques is limited, and other methods (FM, T-DAB, Internet, DVB-T, DVB-H) already offer a much wider choice.

DRM could be used for special purposes, since its range is exceptional and it enables simultaneous dual transmission of analogue and digital channels, but it requires a great deal of transmitter power, which raises a question of this broadcasting method's economic feasibility.

In Slovenia, the public RTV in Domžale has a modern medium-wave transmitter with digital start-up, which could be converted relatively quickly and simply to the new modulation method. As such, it could be used to provide Slovenian and foreign public information at home, and in particular abroad, as well as during emergencies.

Stopping transmissions would mean that this frequency would be lost forever, since it would be occupied by other stations, or existing ones would increase their transmission power.

As a result, almost all countries in Europe and around the world have at least one powerful medium-wave transmitter operating using digital broadcasting techniques.

10 GLOSSARY

1080p/50 (HDTV broadcasting standard means 1080 lines progressive and 50 halfpictures per second, total 2,000,000 pixels on the screen)

720p/50 (HDTV broadcasting standard means 720 lines progressive and 50 pictures per second, total 921,000 pixels on the screen)

allocation (term used in planning digital broadcasting networks)

allotment (region, uniform region, term used in planning digital broadcast networks)

analogue terrestrial television (operates in frequency bands VHF 174–230 MHz and UHF 470–860 MHz, video and audio are transmitted in analogue form in the same frequency band, each station requires a separate frequency band – channel; to cover a large area we need several different frequency channels, the efficiency of use of the frequency spectrum is low, interference in transmission and reception is high, standard formats used are SD and PAL system)

APEK – Post and Electronic Communications Agency of the Republic of Slovenia (independent body regulating and monitoring the electronic communications market, operates and monitors the radiofrequency spectrum in the Republic of Slovenia, undertakes tasks in radio and television activities and regulates and monitors the postal services market)

API – Application Programming Interface (programme interface providing different software systems access to the operating system)

assignment (term used in planning digital broadcasting networks)

COFDM – Coded Orthogonal Frequency Division Multiplexing (method of modulation, processing signals for digital transmission, which protects data packets against errors and creates a protection ratio; such a method prevents multidirectional digital signal reception, packet errors and interference errors, it uses 16-QAM or 64-QAM modulation method, depending on conditions)

DAB – Digital Audio Broadcasting (also called T-DAB, Terrestrial-DAB, upgrade of the existing FM system, standard digital transmission of audio signals, intended for radio stations, developed in the European Union between 1997 and 2000, operates in the 30 MHz-3 GHz range, intended for all platforms, terrestrial, satellite and cable, uses MUSICAM – MP2 coding method, 32–256 kbit/s transmission, COFDM-modulation, for broadcasting it uses channel 12 on VHF and L- spectrum, 1452–1492 MHz)

digital added-value (new services enabled by digital broadcasting of content)

Digital Terrestrial Television (DTT, system DVB-T or DVB-H, digital broadcasting method where the basic audio and video signals are converted, modulated and coded in a digital format and propagated as such; compression enables one frequency channel of width 8 MHz – VHF and 7 MHz – UHF – to carry three to five different programmes, the digital method has a transmission gain of 10 dB over analogue due to greater sensitivity of digital receivers and signal processing procedures (modulation, coding ratio, guard interval, coding), enables

mobile reception; reception requires a roof, indoor or external aerial, coverage of a larger area requires a network that can operate as a Single Frequency Network SFN or Multi Frequency Network MFN; the former is much more efficient but harder to plan and implement).

DRM – Digital Radio Mondial (also called T-DRM, Terrestrial-DRM, upgrade of the existing AM system, digital method for transmitting long-, medium and short-wave audio signals, intended for radio stations to cover large areas, operates in the 0.15 MHz-30 MHz range, intended exclusively for terrestrial broadcasts, uses OFDM transmission method and QAM modulation in four ways, A, B, C and D, uses Advanced Audio Coding AAC, transmission capacity is 16-30 kbit/s, operates on existing analogue frequencies, can also enable simultaneous audio, data and video transmission)

DVB-C – Digital Video Broadcasting – Cable (cable-based digital video and audio broadcasting system uses MPEG-2 coding system and QAM, 128, 256 modulation, also enables a feedback – interactivity – therefore is used for Internet services, VOD – Video on Demand, PPV – Pay Per View, operates on MHP basis)

DVB-H – Digital Video Broadcasting – Handhelds (digital terrestrial video and audio broadcasting method to small, handheld mobile devices, also called mobile reception, data transmission can operate over the same network as DVB-T, simultaneously on the same channel, but such use is less likely, since the processing systems and the transmission methods are different, uses the MPEG-4 coding system, time-slicing mechanism based on IP data transmission, meaning that data transmission takes place in time bundles and not continually, it is necessary due to limited use of mobile devices in terms of energy, battery capacity; uses IFFT transformation of carriers 2K, 4K or 8K, COFDM modulation and additional coding protection MPE-FEC, transmission capacity on an individual channel depends on the parameters selected, ranging between 5 and 25 Mbit/s)

DVB-S – Digital Video Broadcasting – Satellite (most commonly used digital transmission method via various satellites: Astra, Eutelsat, Helasat, uses the MPEG-2 coding system and QPSK modulation, enables very high transmission capacity, since due to the active and control receivers on the aerial – Low Noise Block Converter, LNB – we can receive signals on four different levels, two frequency and two polarisation levels)

DVB-S2 – Digital Video Broadcasting – Satellite (upgrade of the basic satellite transmission of digital signals, with 30% greater transmission efficiency due to improved modulation and coding systems)

DVB-T – Digital Video Broadcasting – Terrestrial (also called DTT, defined standard in Europe and elsewhere for digital television and audio transmissions that can be received with aerials, data transmission for each station operates in the MPEG-2 coding system, uses the same channel width as analogue VHF and UHF transmission, 7 MHz, however, the same width of channel can carry more different programmes due to modulation procedures COFDM, 16-QAM or 64-QAM, transmission capacity on an individual channel depends on selected

parameters and is in the 12-20 Mbit/s range, individual programmes in the channel require capacity of 3-5 Mbit/s, managed by a dynamic multiplex)

DVI – Digital Visual Interface (digital interface for transmitting only pure digital video signals without conversion)

eEurope 2005 (Action plan for development of the information society in Europe – eEurope 2005 – was adopted in June 2002 in Seville, aimed at the development of e-business, e-learning, e-health and e-administration on the basis of secure broadband connections; in Point 3.1.4 of the Action Plan regarding the measure for greater use of broadband connections, measures are listed for the radiofrequency spectrum, use of broadband connections in less populated regions, elimination of barriers for wider use of broadband, contents on different platforms and the switchover to digital broadcasting; envisages an assessment of the situation in important markets in member states and the adoption of national implementation plans for the switchover to digital broadcasting, the eEurope 2005 action plan ended at the end of 2005 and was replaced by strategic framework i2010)

EPG – Electronic Programme Guide (digital form of full data on programmes, titles, broadcast time, duration of broadcast, description of content and other data on individual programmes, can also contain images, is an upgrade of the existing form of teletext and videotext, the next level will be MHP – Multimedia Home Platform)

FEC – Forward Error Correction (a technique used in digital signal transmission to reduce the error rate in the transmission of digital data, the transmitter transmits redundant additional data used for correction if individual parts of the basic transmission drop out)

Frequency dividend (also called spectrum dividend, frequencies or spectrum that will be released after the switchover from analogue to digital broadcasting due to 3-6 fold increase in spectrum use efficiency, and compression of digital data. A term introduced by the European Commission during introduction of the market approach to discussion of the frequency spectrum. The term digital dividend is also sometimes used.)

Frequency spectrum (frequency range of electromagnetic waves from 0- 3000 GHz, roughly divided into several ranges, ultra-low, very low and radio 30 KHz– 300 GHz)

HDMI – High Definition Multimedia Interface (interface, the latest standardized equipment for transmission of HDTV audio and video signals up to 5 Gbit/s, from 1 July 2005 also enables HDCP – High-bandwidth Digital Content Protection)

HDTV – High Definition Television (enabled by a digital broadcasting system because it ensures sufficient data transmission capacity; digital television is not the same as HDTV, it is more the domain of cinema and video production, but it is increasingly also used for television purposes; at present there is no uniform standard for HDTV, since there are 720p/50, 1080i/25, 1080p/25 and 1080p/50 models; the latter will likely become established in the future; all receiving equipment currently supports MPEG-2 standards, but in future they will likely

also be compatible with the MPEG-4 AVC standard; the basis is agreed marking of equipment to show users that they can receive high definition television "HD ready", regardless of the format and standard; the change is evident in the size and aspect ratio of the image, which is 16:9, which is not the exclusive domain of HDTV; and 16: 9 format is still not HDTV – the broadband required for HDTV means that the audio is also improved – Dolby Digital 5.1, which requires special peripheral equipment, including cables and connectors, HDMI, DVI, HDCP; in most European countries there has to date been very limited interest in HDTV; with the right incentives and the transmission of appropriate content of wider social interest, such as the football World Cup in Germany in 2006, the Olympic Games in China in 2008, we can expect increased interest in HDTV)

i2010 (Initiative 2010, a document issued by the EU on 1 June 2005 discussing the information society, promoting growth and employment; its purpose is a single European information area with accessible and secure broadband communications, rich and diverse contents and digital services)

ITU – International Telecommunications Union (international telecommunications organisation, member of the United Nations, national governments and private individuals coordinate global telecommunications networks and services; responsible for standardisation, harmonisation and development, including regulating the use of the broadcast spectrum and coordination of national policies)

MHP – Multimedia Home Platform (internationally defined as the standard for transmission and reproduction of interactive contents in digital television based on the JAVA programming language)

MPEG-2 (generic coding standard for audio and video by means of compression; in fact, it is not compression but data restriction; it was introduced in 1994 as a successor to MPEG-1, it is defined as the basic standard for DVB, enables data transmission of up to 50 Mbit/s)

MPEG-4 (generic coding standard for audio and video, the successor to the MPEG-2 standard from 1998, intended for systems with low capacity and bandwidth, such as mobile telephones and video telephones, but with the development of more complex compression algorithms and restrictions on data, they want also to use it in the future for DVB to increase transmission capacity – actually it is about the coding standard ITU-T H.264)

MULTIPLEX – is a part of the telecommunications digital broadcasting system that combines multiple different digital input channels and transmits them together.

ODRF – Decision on radio frequency **allocation**, that multiplex operators receive from APEK based on public tender and under conditions provided in Digital Broadcasting Act.

QAM – Quadrature Amplitude Modulation (method of amplitude modulation, processing a signal for digital transmission; at 16-QAM each carrier for 2 bits – 4th level can be multiplied by factors -3, -1, 1 and 3, which gives us a constellation of 4 bits and 16 points; at 64-QAM each carrier for 3 bits – 8 levels – can be multiplied by factors -7, -5, -3, -1, 1, 3, 5 and 7, giving a constellation of 6 bits and 64 points)

RRC-06 – Regional Radiocommunications Conference (regional radio conference for Region 1, Europe and Africa, held in Geneva, Switzerland, in April and May 2006, organised by the ITU, involving preparation of and agreement on a technical basis for planning digital radio and television for terrestrial broadcasting for frequency ranges VHF, 174 – 230 MHz and UHF, 470 – 862 MHz)

RSPG – Radio Spectrum Policy Group (working group of the European Commission which gives expert opinions on proposed documents and policies of the European Commission covering the radio spectrum)

SDTV – Standard Definition Television (used by analogue broadcast systems, standardised formats are PAL, 720 pixels x 576 lines, 50 pictures in a second, and NTSC, 720 pixels x 480 lines, 60 pictures in a second, and two methods, 'progressive', transmission of whole pictures, and 'interlaced', transmission of partial pictures)

Parallel transmission (parallel transmission of terrestrial television signal in digital and analogue technique, period is defined in Digital Broadcasting Act)

Spectrum dividend (see frequency dividend)

superteletext (upgrade of existing teletext, greater scope, faster transmission, includes pictures)

The Lisbon Strategy – (document issued by the European Commission in 2000 at the ministerial summit in Lisbon in Portugal; defines the strategy of making Europe the most competitive and dynamic knowledge-based economy with increased employment and social cohesion policy by 2010)

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