Federal Ministry
of Economics
and Technology

Digital Broadcasting in Germany

LAUNCH SCENARIO 2000

A new world of television and radio

BMWi

Introduction of digital broadcasting in Germany

“Launch Scenario 2000”

Status report and recommendations by the
“Digital Broadcasting” Initiative
on the digitisation of radio and television
taking account of the cable, satellite
and terrestrial transmission paths

This report can also be obtained on the Internet at http://www.bmwi.de

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PREFACES

Broadcasting is going digital; new prospects for the marketing and use of existing services and of innovative new services are emerging for commerce and consumers. With its “Launch Scenario 2000” report, the “Digital Broadcasting” Initiative has put a further milestone in place on the way to a new world of radio and television. Following the strategy concept which was developed two years ago, the focus is now on implementation. This leads to increased interest in the question of what it will cost the consumers and what they will gain from it.

After all, merely broadcasting using digital rather than analogue technology would not justify the expense involved. Digitisation must bring a benefit, an “added value”, and thus be so attractive that the consumers decide to use it. And digital broadcasting can certainly offer this added value. The leap forward in broadcasting technology is substantially expanding the existing limitations to broadcasting and is allowing it to become a full part of modern integrated media systems. This means it will be possible to link up the television, the Internet, the computer and the mobile phone, for example, and exchange any content between them.

The consumer is the winner. He will be able to choose from a growing and increasingly interesting range of services at comparatively low costs. He will be able to continue using his existing terminal equipment to access these services. All he needs is an extra digital appliance which he can obtain at a low, one-off cost. The preconditions for this have been put in place by the good co-operation between the Federal Government, the *Länder*, and representatives of commerce, academia and consumer associations. I am grateful to all the participants that, despite some very divergent ideas, it has been possible to resolve virtually all the critical questions in a consensus.

Nevertheless, more work remains to be done. The introduction of digital broadcasting still needs to be handled with care. In 2002, we will review the success of the action taken. From an economic point of view, I hope that this process of development can be accelerated so that all television and radio broadcasting can be fully digital, if possible before 2010.

I particularly ask the decision-makers to orient themselves towards the recommendations set out in this report. We will only be able to implement our recommendations and guidelines with their help – to the benefit of the consumers.

Yours, Werner Müller

Werner Müller

Federal Minister of Economics and Technology

The digitisation of the media is advancing – with the exception of radio and television, which are still generally transmitted on an analogue basis. On the one hand, this represents a waste of scarce resources in the frequency spectrum, and on the other, it means that the opportunities offered by digital technologies are not being utilised (additional services, portable reception, etc.).

I therefore welcome this report: it documents the results of the “Digital Broadcasting” Initiative which have so far been achieved with everyone involved in the digitisation process under the leadership of the Federal Government and the *Länder.* This broad consensus on key issues forms a good basis on which to make progress on the digitisation of broadcasting.

Digital terrestrial radio (DAB) is already being broadcast as a regular service. The first steps towards an island-based introduction of digital terrestrial television (DVB-T) can now be taken. This means that, in addition to cable and satellite, the third transmission path for broadcasting will also become digital.

Traditional broadcasting services will have to act as pioneers and pace-setters. They will have to pave the way for new applications and non-broadcasting-related services together with additional services accompanying and supplementing the programmes.

The business world still needs to tackle an important task. There is a need to develop coherent and economically viable concepts for new services which take advantage of the additional technical opportunities and represent added value for the consumer. This requires innovation and commercial daring, not playing around with technical gadgetry.

I believe that the preconditions in Germany are now in place. I would like to thank everyone who has worked to this end in the “Digital Broadcasting” Initiative.

by Kurt Beck

Minister-President of Rhineland-Palatinate and

Chairman of the *Länder* Broadcasting

Summary

0 Summary

0.1 Need for the "Digital Broadcasting" Initiative

The digitisation of broadcasting creates the necessary preconditions for the further development of broadcasting and the integration of information, communications and broadcasting technologies. It thereby opens up markets for new digital applications and a diversity of innovative processes. It also reduces current scarcities of frequencies. Specifically, the digitisation of broadcasting provides the basic infrastructure for the market launch of new, digital products and services both in traditional broadcasting[1] and in the field of new multimedia services.

The faster digitisation takes place, the greater the market opportunities will be for broadcasting and new multimedia services. This means that digitisation of broadcasting transmissions will help to keep Germany competitive and to prevent German companies and service providers from falling behind their rivals. It will also help to consolidate and build on Europe's lead in this field. The opportunities this will open up for new markets for digital broadcasting and multimedia services will foster growth and employment in this very dynamic sector.

The increased amount of transmission capacities made possible by the digitisation of broadcasting should be open to multimedia services, whilst broadcasting retains its priority, and should be distributed on a non-discriminatory basis.

In order to encourage this development, the "Digital Broadcasting" Initiative was set up by a Cabinet resolution on 17 December 1997, taking account of the resolution by the Minister-Presidents of the *Länder* of 24 October 1997.

[1] The term "broadcasting" embraces radio and television broadcasting by cable, satellite and terrestrial transmitters.

0.2 Composition and mandate of the Initiative

The “Digital Broadcasting” Initiative is headed by the Economics Ministry (chair) and the *Länder* (deputy chair). Its membership consists of representatives of the Federal Government and the *Länder*, public and private broadcasting, service and content providers, network operators (satellite, cable, terrestrial), the equipment industry, trade and crafts, the consumer associations and some scientific institutions. In total, more than 70 companies and bodies are involved at present.

The Initiative’s task is to elaborate viable strategies for the introduction of digital broadcasting (radio and television) and future multimedia services. The Initiative makes recommendations in this regard which are then presented to the decision-making bodies of those involved.

As part of a first step, the Initiative presented a strategy for the process of digitisation and the phasing out of analogue broadcasting; this was set out in a report[2]. The Federal Cabinet approved this report on 24 August 1998 and called on the decision-makers of the institutions involved to base their future planning on the results so far achieved and in particular on the timetable, and to keep pushing ahead with the development.

On the basis of this report, and in order to implement it, the relevant parties are now evolving the necessary recommendations for future action. The “Launch Scenario 2000” documents the current state of play. The “launch scenario” starts in chapters 1 to 4 with fundamental statements on the digitisation of broadcasting, including the legal framework, touching not least on frequency assignment, the phase-out of analogue broadcasting and the use of capacities. Chapters 5 and 6 then cover the actual “Launch Scenario 2000” and marketing and cost aspects of DAB[3] and DVB-T[4].

The work is focusing on issues related to terrestrial broadcasting: support for the market penetration of digital radio (DAB, regular service since 1999) and the introduction of digital terrestrial television (DVB-T). Aspects of satellite and cable transmission of radio and television are also addressed; since, however, the market introduction has already occurred here (satellite 1996, cable 1997), the efforts in this area need to focus on encouraging further market penetration of digital services.

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[2] Federal Government “Digital Broadcasting” Initiative, BMWi Documentation no. 451

[3] Digital Audio Broadcasting (digital radio)

[4] Digital Video Broadcasting (digital television); T: terrestrial; C: cable; S: satellite

0.3 Key points of the launch scenario

0.3.1 Digital terrestrial radio (DAB)

When one previously analogue television channel is reassigned to DAB, between 6 and 8 digital radio channels with multimedia services can be provided in each *Land*. Mobile reception is ensured.

The Initiative recommends that a further coverage (2nd coverage) soon be introduced in each *Land* in Band III (regionalisable as far as possible) in addition to the coverage already being established in Band III and the L Band, and that in the medium term a 3rd coverage be introduced in Band III.

The Initiative also recommends that all the parties should work together to arrive at a situation where the vast majority of listeners will be using digital radio in 2010. This would enable analogue radio transmission to be phased out between 2010 and 2015.

0.3.2 Digital terrestrial television (DVB-T)

When one previously analogue television channel is reassigned for digital terrestrial broadcasting, DVB-T enables the transmission of 4 digital programme equivalents[5]. Portable reception (indoors and outdoors) and, within certain limits (speed limits), mobile reception is possible.

The intention is for it to be possible to receive 12 digital programme equivalents (the existing programmes which have so far been broadcast on an analogue basis, plus additional new programmes and multimedia services) (when the final stage is reached, the aim is to achieve the transmission of at least 20 programme equivalents).

The introduction of digital terrestrial television is confronted with a lack of frequencies. There are hardly any new frequencies available which are not assigned to and used for broadcasting. It is therefore only possible to introduce DVB-T by taking existing analogue frequencies and switching them over to digital. Such a conversion must begin on an “insular” basis in large densely-populated areas, so that as many participants as possible can be reached right from the start. The coverage would then be expanded to rural areas.

For a transition period which is yet to be defined (but has to be short for commercial reasons) there is to be – where possible – parallel digital/analogue transmissions (simulcast), before, in

[5] A programme equivalent is a flow of bits serving the transmission of television programmes and other, particularly multimedia, services. It refers to the capacity (frequency) needed to transmit **one** television channel (analogue: e.g. 8 MHz; digital: e.g. 2 MHz ? approx. 3.5-4 megabits/second).

line with the market penetration of digital services, it is possible to dispense entirely with analogue transmissions. The analogue transmissions should end as soon as possible, and at the latest in 2010.

0.3.3 International frequency agreements

In order to arrive at least 20 programme equivalents for DVB-T nation-wide, it will be necessary to reorder the existing analogue frequency distribution in the European area (regional conference of the ITU for the European broadcasting zone). The necessary steps for this have been set in motion, but the results are not likely to be available before 2005. In this context, an important role will also be played by the question of dividing up the (still scarce) frequency spectrum between the systems for television (DVB-T) and radio (DAB).

0.3.4 Cable

The process of transition from analogue to digital broadcasting on the broadband communication networks can basically be market-driven. It is therefore certainly possible for analogue transmissions to end before 2010.

For 98 % of all households linked up to broadband communications, the necessary connection for digital programmes is already in place; some 1 million households already own a digital pay-TV decoder. In the short term, it will only be possible to achieve a significant increase in digital services by expanding the cable networks up to 862 MHz, and this is therefore recommended by the Initiative.

The Initiative recommends that all the radio stations required by media legislation continue to reach households via the broadband communication networks in future. The decision on the use of the system should be taken in line with aspects of commercial viability and public acceptance, and should generally be left to the discretion of the network or platform operator.

The Initiative recommends that all participants use an open, uniform and hardware-independent application programming interface (API) and that only those systems be used which are compatible with the “Multimedia Home Platform” standard (MHP). The Initiative also recommends enabling the use of different CA systems[6].

0.3.5 Satellite

As with cable, the process of transition from analogue to digital broadcasting can basically be market-led and can certainly be concluded before 2010. Since 1996, digital television and radio programmes have been available in Germany via various satellite systems. The diversity of digital services is being further expanded. The recommendations by the Initiative for the satellite sector are similar to those for cable.

0.3.6 Terminal equipment

In order to accelerate the conversion from analogue to digital, the Initiative recommends the availability of low-cost multistandard receivers as soon as possible (VHF/DAB; PAL[7]/DVB, also offering a combination of terrestrial, cable and satellite reception modes).

[6] Conditional Access system – encryption system

[7] Phase Alternation Line – analogue television transmission system

0.4 Further action

The implementation of the Initiative's "Launch Scenario 2000" recommendations has already begun. Digital terrestrial radio (digital radio – DAB) and digital television via cable and satellite (DVB-C[4] and DVB-S[4]) are already operating a regular service. DVB-T[4] will follow on a regional basis from 2001. In the summer of 2002, the success of the action taken is to be reviewed and the future national/international approach stipulated by the Initiative.

1 Introduction

1.1 Convergence

In almost all areas of telecommunications and information technology, digitisation has proved to be the commercially viable route to a better qualitative and quantitative use of resources. In the case of broadcasting (i.e. television and radio), this developmental step has only partly been taken.

In general, the digitisation of radio and television transmissions creates the necessary conditions for integration with the (already digital) information and communications technologies. It provides the infrastructure basis for the market launch of new digital products and services, both in traditional broadcasting and in the field of new multimedia services, and it opens up the markets to new digital applications including Internet applications and many different innovative processes. The introduction of digital broadcasting is therefore a vital step on the way to the information society.

Digitisation needs to embrace the entire infrastructure of broadcasting, i.e. cable, satellite and terrestrial transmission. That is the only way to provide the necessary capacities and frequencies for radio and television stations and new multimedia services within a reasonable period.

DAB[4] and DVB[4], the technologies which can be used to digitise the previously analogue transmissions, are European systems which are increasingly being introduced outside Europe too. A rapid introduction in Germany and the resultant development of new markets will promote growth and employment in this dynamic sector.

1.2 “Digital Broadcasting” Initiative

In order to promote this development, the Federal Cabinet launched the “Digital Broadcasting” Initiative in a resolution dated 17 December 1997, taking account of the resolution by the Minister-Presidents of the *Länder* of 24 October 1997. The objective is to develop viable scenarios for the introduction of digital technologies for the transmission of radio and television channels and future multimedia services to the audience in Germany, and to facilitate the conversion process.

As part of a first step, the Initiative presented a strategy for the digitisation process and the phasing out of analogue transmissions. This is set out in a report[2]. The Federal Cabinet approved this report on 24 August 1998 and called on the decision-makers of the institutions involved to base their future planning on the results so far achieved and in particular the timetable, and to keep pushing ahead with the development.

On the basis of this report, and in order to implement it, the participants are now engaged in four working groups (capacity requirements, scenarios, market development, legal issues) and the DAB and cable sub-working groups, under the guidance of a steering committee, and are developing the necessary recommendations for future action. The “Launch Scenario 2000” documents the status now achieved.

The “Launch Scenario 2000” is being presented to the decision-making bodies of the participants in the Initiative for implementation and, where appropriate, decisions.

2 Broadcasting – changing fast

The transmission of radio and television programmes occurs today via terrestrial transmitters, cable and satellite. Most participants still receive the transmitted programmes in analogue form. But digitally transmitted programmes are beginning to conquer the market (satellite available since 1996, broadband cable since 1997, DAB since 1999). Internet services are also gaining in significance.

The market conditions vary for the respective transmission routes. Whilst, in the satellite field, virtually unlimited transmission capacities can be created, frequencies for terrestrial transmitters are scarce. In particular, there are hardly any free frequencies for digital services; the introduction of digital terrestrial radio and – to an even greater degree – digital terrestrial television therefore requires particularly closely co-ordinated action by the market participants, and most of the comments in the following sections are devoted to it.

2.1 Radio

2.1.1 Market situation

Approximately 79 % of the terminal equipment used to receive radio in German households depends on terrestrial transmissions[8], broken down into 22 % car radios and 57 % radios in the home. Correspondingly, when digitising radio, it is necessary to ensure adequate indoor provision and to ensure that the terminal equipment can be used for both portable and stationary reception. For the car radio market, the important thing is that there is full coverage nation-wide. 21 % of radio receivers are linked to cable or satellite equipment.

[8] Source: Prognos AG, 1996

2.1.2 Digital technologies

The DAB system is available for the introduction of digital terrestrial radio transmissions. DAB was developed both for terrestrial and satellite-based reception. DAB can also be fed into cable systems. The uniform DAB standard has been standardised by ETSI[9] and uses the concept of a data container. DAB permits mobile, nation-wide coverage, even at high speeds. For the transfer of data services accompanying programmes or independent of programmes, the multimedia object transfer protocol (MOT) has now been adopted.

All the digital radio channels now being broadcast via cable and satellite are currently transmitted by ADR[10] and DVB systems.

2.1.3 Available spectrum and current use for radio

At present, analogue radio uses long wave, medium wave and short wave[11], as well as its allocation of 87.5 to 108 MHz in the VHF[12] spectrum. At the DAB planning conference in Wiesbaden in 1995 an allotment plan for frequency bands 47-68 MHz, 174-230 MHz, 230-240 MHz and 1452-1467.5 MHz was adopted. The Wiesbaden agreements on Band III envisage primary rights for DAB over analogue TV transmissions in the relevant areas.

Initially, two DAB coverages are planned for Germany: the frequency band 223-230 MHz (Band III, channel 12, blocks 12A – 12D) was selected for the first coverage. Because this could not be achieved in all the *Länder*, DAB blocks are also being used in channels 5, 6, 7, 8 and 11, and in some European countries even in channels 4 – 13. Frequencies are available in the 1.5 GHz band for the second DAB coverage. This means that transmission capacity exists for 12 to 14 DAB programmes.

[9] European Telecommunications Standards Institute

[10] ASTRA Digital Radio; proprietary standard of the SES/ASTRA satellite operator

[11] Not currently covered by the Initiative's work

[12] very high frequency

2.2 Television

2.2.1 Market situation

It is difficult to ascertain the precise levels of use of the various transmission paths, and the results vary by several percentage points depending on the nature of the survey and the base used. According to a survey by Infratest Burke on behalf of Luxembourg's Société Européenne des Satellites (SES), the television reception situation in Germany is as follows:

Transmission path	**Households**[13] %
Terrestrial[14]	8.8
Broadband cable	55.3
Satellite	35.9
Total	100

Table 2.2.1: TV reception in Germany Source: Infratest Burke, status 31.12.1999

A representative survey in North-Rhine/Westphalia showed that almost one-quarter of those surveyed connected the first TV set to a terrestrial antenna either exclusively or in combination with satellite reception. This is frequently necessary since, for example, the terrestrial antenna can receive local and regional channels not broadcast by satellite. Furthermore, according to this study, 39 % of households had a second set and 10 % a third set. Whilst cable households tended to use the cable connection for second and third sets as well, such sets are often connected to a roof antenna in households using satellite.

[13] Primary reception (first set); some second and third sets use a different mode of reception, mainly terrestrial

[14] Exclusively terrestrial reception

2.2.2 Digital technologies

The DVB system is available for the introduction of digital television transmission. It consists of components for terrestrial, cable and satellite applications. The components have been standardised by ETSI with standards for terrestrial television (DVB-T), cable television (DVB-C), satellite television (DVB-S), point-to-multipoint video distribution, and distribution via a central satellite antenna. The DVB system also includes a large number of other standards for additional and supplementary purposes (e.g. teletext, service information, access authorisation, data broadcasting and interactivity).

The DVB systems use the concept of a data container (multiplex), with which data of all types can be transmitted via any distribution mechanism. The DVB standards are also suitable for a variety of additional applications such as Internet access and the electronic programme guide (EPG) and, in addition to the transmission of television and radio, also for media services and teleservices.

As part of the DVB project, a Java-based Application Programming Interface (API) has also been introduced. On the basis of API, it is possible to set up a uniform terminal equipment platform, the Multimedia Home Platform (MHP). This creates one of the preconditions for the emergence of unfragmented, horizontal market with full competition at the various stages of the supply chain.

2.2.3 Available spectrum and current use for television

The revised Stockholm Plan of 1961 regulates the international use of television frequencies.

It is based on a rhombic network with television channels on the same frequency at distances of 200 – 250 km. Further channels from the television frequency spectrum are distributed equally throughout the grid area and thus cover the entire grid area. In this way, a “multifrequency network” has emerged.

At present, the following frequency bands are allocated to terrestrial television in Germany:

Frequency band	Frequency range MHz	Number of channels
I	47 - 68	3 (K 2-4)
III	174 - 223	7 (K 5-11)
IV / V	470 - 790	40 (K 21-60)

Table 2.2.3-1: Frequency bands for terrestrial television

In various European countries, the 790-862 MHz band (channels 61-69) is also available. In Germany at present, however, only channels 64-66 can be used for broadcasting – and not nation-wide. The other channels of the 790-862 MHz band are currently used by the military. In frequency band I (K 2-4), no further planning is taking place. This band will cease to be used for broadcasting.

On channels 2-60, the following transmitters are operating at present:

	ARD	ZDF	3rd channels
Mainly basic network transmitters	94	104	119
Transposers	2821	2869	3048
Coverage	*Land*-wide	Nation-wide	*Land*-wide (regional)
Technical range (population)	99.3 %	98.9 %	98.7 %

Table 2.2.3-2: Transmitters for public television channels

	RTL	SAT.1	PRO 7	VOX	DSF	NTV	others	foreign armed forces
Mainly low power transmitters	88	104	37	44	7	4	12	156[15]
Technical range (population)	65.5	36.5	15.3	11.4	3.3	0.06	-	-

Table 2.2.3-3: Transmitters for private stations

In addition, secondary services are provided on the same channels, geographically separated from the television service.

During the transition phase from analogue to digital television broadcasting, it will largely be necessary to use frequencies from the Stockholm Plan of 1961 for digital transmissions. The technical parameters needed for this were stipulated in 1997 in the Chester Agreement[16]. This agreement contains only planning principles and co-ordination criteria, and no new frequency allocations. This ensures protection for existing analogue services.

[15] Mainly low-power transmitters

[16] But neglecting questions of indoor supply and mobile reception

3 Objectives and fundamental stipulations

In the digital world, there will be more intensive competition than there is today throughout large part of the supply chain. The traditional distribution platforms of broadcasting, i.e. terrestrial transmitters, broadband cable and satellite, will not merely intensify competition amongst themselves but will also be competing with other telecommunications networks to reach the final consumer. This competition will vary in intensity between the various services on offer. Global services like the Internet will also help to lessen the distinction between individual and mass communication. Digital broadcasting networks will only form part of the supply chain if they develop within and significantly shape these parameters.

> The Initiative takes the view that both the digital successor system to analogue radio, DAB, and the digital successor system to analogue television, DVB, will be able to establish a firm place for themselves on this market.

3.1 Digital terrestrial radio (DAB)

DAB – the digital platform of the future for radio and data services – is a European development which has since acquired global significance. A pan-European frequency plan has been adopted (cf. section 2.1.3). DAB services can already be received in many countries. A regular service commenced in Germany in 1999.

3.1.1 Coverage objectives

The Wiesbaden Plan of 1995 establishes a foundation on which frequencies for two terrestrial DAB coverages can be used nation-wide. Generally, each *Land* has at its disposal one coverage for *Land*-wide coverage in the VHF area and one coverage for regional or local coverage in the 1.5 GHz band. This corresponds to transmission capacities for 12-14 DAB radio stations.

In the VHF band (first coverage for *Land*-wide use), some of the *Länder* already have a clear capacity shortage, that that some services broadcast nation-wide and *Land*-wide cannot be included, or can only be included in the regionalised 2nd coverage). In addition to this restriction, existing coverage structures, especially for local providers and for regional peculiarities, cannot always be reflected in the allotment areas of the Wiesbaden Plan.

Due to its physical propagation conditions and the commercially favourable structures of transmitter networks, the VHF band is particularly suitable for large areas of coverage. The L Band is suitable for immediate coverage in conurbations and a targeted coverage of transport routes, e.g. of autobahns. However, it is less suitable for commercial reasons in topographically difficult areas and for full coverage across large areas.

> Against this background, the Initiative recommends that full use be made of the frequency resources so far available for DAB and furthermore that additional capacities be provided in Band III so that further radio stations and data services can be transmitted to an appropriate extent. In this way, additional capacity is created in Band III for the provision of mobile services using the DAB standard. Plans to provide further DAB coverages must be made quickly, but they cannot be implemented until analogue television transmitters in the VHF band have been switched off or other uses (e.g. military) have been discontinued.

At present, DAB is basically a service offered in addition to analogue VHF radio. However, the aim is to replace VHF radio with DAB at a time yet to be stipulated (cf. also sections 3.1.3, 3.1.4, and 5.1.1).

3.1.2 Follow-up conference to Wiesbaden 1995

The planning of individual frequencies for further expansion of DAB can initially take place via the co-ordination agreements from the conference in Wiesbaden in 1995. However, in order to implement the long-term concept of further coverages, a follow-up conference is needed (cf. section 3.2.4). Additional scenarios for a “gentle” phase-out of VHF coverage need to be developed which include a future use of Band II for DAB.

3.1.3 Transition from analogue to digital radio

The question of the timing of the replacement of VHF radio and the related question of the future use of the VHF spectrum in Band II cannot currently be answered (cf. section 3.1.4). A precondition for this is that DAB establishes itself on the market as the digital platform for radio. The relevant markets for this (terminal equipment market for DAB receivers and listeners/advertising market for the radio stations) have specific preconditions:

- In view of the way people use radio, the only mode of radio reception of journalistic and commercial relevance is - unlike television - terrestrial. A replacement of VHF by DAB will thus generally be refinanced by the programmes broadcast on VHF. Here, it is necessary to assume that there will be a lengthy period of simulcast, resulting in higher expenditure for this double transmission of programmes. The final conversion and thus a possible end to simulcast cannot come until the listeners can actually be reached by DAB programmes.
- Most of the terminal equipment is used on a portable and mobile basis. In order to develop the market, it is therefore vital rapidly to make available DAB car radios and home appliances, preferably as multistandard receivers (VHF/DAB). The market penetration for portable and mobile uses will basically occur due to low-cost products and the availability of new data services not possible on VHF.

The Initiative therefore recommends a rapid continuation of the nation-wide expansion of DAB networks and the immediate marketing of more multistandard appliances to receive DAB and VHF programmes.

A provision of mobile, portable and stationary DAB terminal equipment at marketable prices needs to be envisaged in an action plan, as does the introduction of a voluntary commitment by the automotive and terminal equipment industry to include DAB appliances in the equipment available in cars.

3.1.4 Phase-out of analogue radio transmission

The costs of transmitting a radio station via DAB are substantially lower than for transmission on VHF. However, the simulcast phase in which both DAB and VHF are transmitted is very expensive. Therefore, neither the providers nor the fee payers can be expected to put up with a long simulcast phase, and particularly with one whose length is not clearly defined.

> The Initiative recommends that joint efforts by all participants create a situation in which the vast majority of listeners are using digital radio in 2010. This would permit analogue radio transmissions to be phased out between 2010 and 2015, or a substantial reduction in the amount of spectrum still used for VHF. In line with the decision by the Initiative taken in 1998, a detailed timetable for the stages of the conversion process will be laid down in 2003. Band II, which has so far been used by broadcasting, should remain available for broadcasting in future.

3.2 Digital television (DVB)

The success of digital terrestrial television depends on the "added value" the consumers expect from this service, e.g.

- a larger number of channels than with analogue transmission in the past;
- attractive multimedia services;
- nation-wide portable reception;
- mobile reception;
- possibilities to regionalise the programmes on offer.

The digitisation of television must not be a 1:1 conversion of the existing service. The more of the extra benefits listed above that digital television can offer, the greater the public acceptance of it will be. Here, each of the three distribution platforms (cable, satellite, terrestrial) has its strengths and weaknesses:

Terrestrial television permits the nation-wide transmission and the portable and, with restrictions, mobile reception of a limited number of channels, including both nation-wide stations and regional and local ones. Cable and satellite can transmit a substantially larger range of services. In the case of satellite transmission, the emphasis is on channels broadcast nation-wide and Europe-wide; here, the transmission of local stations faces commercial constraints at present. Cable can be used to transmit nation-wide, regional and local stations, but for commercial reasons cable networks cannot be extended to cover the whole country.

3.2.1 Coverage objective for terrestrial digital television (DVB-T)

DVB-T is to replace analogue PAL television by 2010 and is to have a picture quality[17] which is at least comparable to PAL. At that time:

- there should be at least 20 programme equivalents on which nation-wide, regional and local television stations and data services (media services and teleservices) can be provided throughout Germany;
- portable indoor reception with a high degree of location and time probability, and the level of mobile reception which is possible in this context, should be achieved.

Depending on the parameters selected (cf. section 3.2.2), and assuming use of the “portable-indoor” reception mode and the possibility of regional coverage, the 40 channels available in Band IV/V (without channels 61-69) can be used to provide wide geographical coverage for up to 20 programme equivalents (5 coverages à 4 programmes), following a reordering of frequency use and the phase-out of analogue television transmitters. Further programme equivalents can be provided in conurbations if wide geographical coverage is restricted.

Digitisation will have to start – prior to a revision of the Stockholm Agreement (cf. section 3.2.4) – on the basis of the 1997 Chester Agreement, which stipulates criteria for digital use and utilises the framework of the Stockholm Agreement. In order to make the beginning of digitisation possible and easier, capacity in Band III is available for DVB-T; in each case, this must be decided locally taking account of the demand for further expansion of DAB and observing the stipulations of the Wiesbaden Agreement. In general, the future use of Band III is, like that of all the other television frequencies, subject to the results of a follow-up conference to Stockholm.

[17] Cf. Recommendation of the Initiative in the "Digital Broadcasting" Report: BMWi Documentation no. 451.

Programme providers and network operators assume that additional market potential can only be achieved with high quality indoor coverage. Because of building insulation, low antenna height and the lack of antenna gain, indoor reception requires a higher reception field strength than reception via a roof antenna. The technical implementation will ensure that thresholds already in existence are not exceeded and that there is no excessive electromagnetic exposure for the population. One way of achieving this is to use single frequency networks (several transmitter locations).

3.2.2 Systems stipulations for DVB-T

In general (assuming the same coverage objectives and appropriate design), digital systems enable substantially more efficient frequency use than analogue systems. With regard to terrestrial television, studies in Germany have shown that digital single frequency networks (SFNs) can provide almost twice as many coverages in a given spectrum as an analogue multiple frequency network (MFN).

> In order to achieve added value in the light of the more efficient use of the spectrum, the Initiative recommends that the establishment of SFNs begin as soon as possible.

When SFNs are used, the high transmitter power needed in MFNs to enable indoor reception can be reduced. The conditions for digital transmission applications will be set in the form of stipulations on modulation, the code rate, the guard interval and the operating node.

For terrestrial television, the Initiative recommends the setting of parameters which represent a commercially acceptable compromise between user data rates, portable receptability and infrastructure costs.

This compromise will permit a user data rate of roughly 13.3 MBit/s per 8 MHz channel (multiplex) and be deployable for four programme equivalents (TV programmes, media services and teleservices) at 3 MBit/s each.

The Initiative recommends the use of statistical multiplexes for a dynamic combination of various programmes and related services within a channel, because this permits a more efficient use of the maximum available bit rate.

3.2.3 Planning certainty

The establishment of the DVB distribution platform is driven by market and cost/benefit issues. It is based on a global open systems architecture in conjunction with common MPEG 2 video and MPEG 1 Layer II audio compression standards and a number of receiver interfaces, as these standards are already used for satellite and cable transmissions. Only this platform is currently available with ETSI standardisation and therefore feasible for the introduction of digital television.

The Initiative recommends that full use be made of the possibilities for further innovative developments in DVB-T (e.g. in terms of data compression, frequency consumption, mobility, energy levels and energy consumption). The Initiative recommends that these further developments be actively pursued and used as soon as they are elements of an ETSI standard (DVB or DAB).

3.2.4 Revision of the Stockholm Agreement

In order to achieve the above-mentioned coverage objective, it is necessary to revise the Stockholm Agreement of 1961. A follow-up conference needs to stipulate that the frequency bands allocated to television broadcasting for the European broadcasting zone be used for a purely digital environment and at the same time to permit large-scale single frequency networks, which however cannot be realised until a few years after the conference.

It must also include the stipulations from the DAB conference at Wiesbaden in 1995 and in the long term take account of the demands of digital radio replacing VHF radio.

3.2.5 Insular digitisation and simulcast

A move from analogue to digital television transmission would be made substantially easier by the provision of a sufficient number of additional frequencies. These are not currently available in Germany.

> However, the Initiative recommends examination of whether, during the switch-over period, additional channels can be made available on top of channels 64-66[18].

The frequencies needed for the digital transmissions must basically be obtained by releasing frequencies used for analogue transmissions.

This process is not possible on a simultaneous and nation-wide basis; it needs to be implemented in a spatially restricted and staggered fashion in “islands”. An island embraces the coverage area of the analogue transmitter to be converted or switched off.

> Since the insular strategy is the only feasible way for technical reasons related to

[18] At their meeting on 15 June 2000, the heads of government of the *Länder* stated that there is an increased need for frequencies in the context of the introduction of digital terrestrial television (DVB-T) which cannot be met merely by rededicating frequencies so far used on an analogue basis. They therefore ask the Federal Government to advocate the rapid provision of additional transmission capacities in these areas. However, the allocation of additional transmission capacities must not impede or restrict either the regular DAB service now in place nor the necessary development options for DAB.

frequencies, and since it keeps the network investment at a reasonable level, the Initiative recommends this approach.

The introduction of DVB-T necessitates uniform concepts which must be implemented in the various *Länder*, so that the islands are not impeded from growing together.

In order to supply as large a section of the population as quickly as possible and thereby to give the manufacturers of DVB-T reception equipment the opportunity to produce price-lowering volumes of units, it makes sense to begin simultaneously in several islands with a high proportion of the population and with transmitters with a high technical range. However, full geographical coverage can only be achieved on the basis of the results of the Stockholm follow-up conference.

In order to protect the consumers and to ensure planning certainty, there is in principle a need for a simulcast phase. This will have to be longer at the beginning of the conversion process than at the end and may differ from island to island for various reasons. In some islands, resources will not permit full simulcast operations. The reception of the analogue programmes being broadcast may also deteriorate. For the switch-off, switch-off criteria must be stipulated. These can include a defined digital penetration rate and minimum and maximum periods for the simulcast. The impact of the criteria may be subject to regional variation.

3.2.6 Terminal equipment for DVB

The conversion from analogue to digital television involves the use of new or additional reception equipment for the consumers (e.g. purchase, lease, rental). The main driving force behind such investment will initially be the content-related advantages of the new service. Only in the medium term will the expected fall in the price of equipment, its greater technical maturity and functionality, and the normal cycle of equipment replacement lead to hardware advantages. Then the range of terminal equipment available will also become one of the main driving forces for the penetration of digital television.

Further to this, it is necessary to offer integrated hardware concepts as soon as possible, in order to utilise synergies from the range of equipment in the terrestrial, cable and satellite sectors.

In order to facilitate the conversion from analogue to digital transmission, the Initiative recommends that multistandard appliances (PAL and DVB) be offered right from the start.

3.2.7 Pilots for DVB-T

In advance of the introduction of DVB-T, a number of pilot projects were carried out. Most of the results of these tests have underpinned the theoretical transmission models and the system and coverage parameters, and have particularly highlighted the limitations to portable indoor reception in terms of the SFN gain and to mobile reception for various frequencies and DVB-T parameters, as well as answering questions about public acceptance.

4 Legal framework of telecommunications and media legislation governing frequency administration and use

The national legal framework is set out in the Telecommunications Act, the Information and Communications Services Act, the Television Signal Transmission Act, the Interstate Agreement on Broadcasting, the Interstate Agreement Media Services, and the *Länder* laws on media and broadcasting.

The current provisions of the Telecommunications Act and the *Länder* laws are also applicable to the use of digital transmission capacities. They do not block a gradual (insular) conversion and the appropriate inclusion of new services.

The Initiative assumes that unresolved questions related to the three ordinances on frequency regulation authorised by the Telecommunications Act must be clarified by the Federal Government and the *Länder* without delay and before the beginning of the switchover. In the course of the analogue-digital conversion process, the media legislation of the respective *Länder* must be observed. In principle, the *Länder* laws do not differentiate between analogue and digital transmission technologies for broadcasting and new services.

4.1 Stipulations on the phase-out of analogue transmissions

In view of the needs of the consumers, providers and network operators for transparency and certainty, it is necessary to have a sufficiently long run-up before analogue transmissions are discontinued and for there to be intensive co-operation and co-ordination amongst the respective market partners and the relevant Federal and *Länder* agencies.

> However, for reasons of legal certainty, the Initiative recommends that fundamental conditions for discontinuation (e.g. the criteria and the procedure for the phase-out) of analogue transmissions be set out in law.

Here, advantage should be taken of the experience already made with the introduction of new technologies (e.g. the discontinuation of DSR[19]; mobile communications networks B and C; the SECAM/PAL[20] conversion in the east of Germany after reunification).

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[19] Digital satellite radio; service discontinued in early 1999

[20] Séquentielle à memoir/Phase Alternation Line: analogue television transmission processes

4.2 Safeguarding the right to information under Article 5 of the Basic Law

> The Initiative feels that, following the simulcast phase in certain regions, it is acceptable to cease full analogue terrestrial coverage where other reasonable access possibilities are available.

Under these preconditions, it also seems reasonable to restrict analogue reception both in terms of the number of stations and the quality of transmission during the simulcast phase.

In the case of terrestrial DAB coverage, the listening patterns of the consumers mean that coverage via satellite and cable cannot replace terrestrial coverage: the latter must therefore aim at the best possible geographical coverage right from the start.

4.3 Stipulations on frequency allocation

On the one hand, the Initiative believes it necessary for everyone involved, and particularly programme providers and network operators, to be given the necessary planning certainty for the move to digital. On the other hand, the digital use of a frequency previously used for analogue transmissions is a new use as defined in the Telecommunications Act (e.g. different technical preconditions, different commercial use). This means that frequencies need to be reissued for digital use under the rules of the Telecommunications Act.

The assignment of frequencies is based on the Telecommunications Act and the ordinances on frequency regulation derived from it.

> The Initiative recommends that the relevant frequency award procedures be prepared and implemented without delay, so that, depending on the respective wishes of the *Länder* for coverage, at least the transmission capacities desired for the launch scenario can be made available.

Also, the early award of frequencies is needed to ensure the necessary planning certainty for everyone involved at the earliest juncture.

The starting point for issuing any frequency is the desire of a *Land* for coverage. In order to meet the technical demands involved in implementing these desires for coverage, it will probably be necessary to be able to stipulate the various frequency uses on a changing basis during a transitional period until a planning conference. This is due to the need for temporary continuation of sufficient coverage with analogue signals, taking account of the frequencies that are locally or regionally available. After all, until there is a new planning conference, the latter can only be used digitally under the relatively restrictive conditions imposed in the 1997 Chester Agreement.

The Initiative therefore recommends:

- that the final technical implementation of a desire for coverage should only take place after the above-mentioned planning conference on the basis of a final frequency assignment and
- that the frequency be assigned for a reasonable period after the planning conference, even when the frequency is awarded before the conference.

The Initiative recommends that the replacement of analogue broadcasts by digital technology and the possibility this creates for the use of frequencies by digital broadcasts, media services and teleservices including mobile multimedia services be supported via government policy on levies in the respective introductory phases.

4.4 Stipulations on capacity use

Digitisation will create additional capacity both for broadcasts and for new multimedia services. The distribution of the available capacities will occur on the basis of the Telecommunications Act and the ordinances on frequency regulation derived from it and on the basis of *Länder* legislation.

Regulations on the allocation of digital terrestrial transmission capacities for television already exist in section 52a of the draft of the 5th agreement amending the Interstate Agreement on Broadcasting. The Minister-Presidents of the *Länder* have issued a protocol declaration in this regard[21].

4.5 Decoders for DVB-T

In order to ensure freedom from discrimination, the reception equipment for DVB-T must also have interfaces which are open to access. In view of the relevant provisions in the Television Signal Transmission Act and the Interstate Agreement on Broadcasting (section 53), no further need for legislation is seen at present.

[21] Protocol declaration by the Minister-Presidents of the *Länder* regarding section 52a of the Interstate Agreement on Broadcasting: The *Länder* will work to ensure that, in an introductory phase of 5 years, the *Länder* broadcasting institutions associated in the ARD and ZDF will receive a total of 50 % of the total capacities for their services when digital terrestrial transmission capacities are allocated. This includes the operation of the technical multiplex for ARD and ZDF. They assume that appropriate attention will also be paid to rural areas during the establishment of the digital terrestrial television networks.

5 Launch Scenario 2000

The “Launch Scenario 2000” is a milestone on the way towards the digitisation of broadcasting. For digital terrestrial television, it marks the process of introduction on to the market, and the following comments therefore focus mainly on this aspect. It also contains measures to promote market penetration for the existing digital systems, i.e. digital radio (DAB) and digital television via cable and satellite (DVB-C, DVB-S).

5.1 Digital terrestrial radio (DAB)

The frequency-related possibilities opened up by the Wiesbaden Plan for the introduction of DAB ensure that the step of building a DAB network can be taken reliably in 35 CEPT countries. Furthermore, the two coverages already stipulated there are mostly differentiated in line with *Land*-wide and regional needs.

5.1.1 Capacity requirements and coverage objectives

Even if the individual *Länder* initially find they have different capacity requirements, it is considered that there is a long-term need – also taking into account the demand for data services – to implement further coverages in addition to the coverages of the Wiesbaden Plan:

- in each of the *Länder* one further coverage for an additional *Land*-wide programme with full geographical coverage and
- further DAB coverages in geographically limited coverage areas, varying from *Land* to *Land*.

In order to meet the capacity need for radio and for data services, the Initiative recommends that three coverages be provided in Band III in the medium term alongside the L Band:

- 2 coverages, each for *Land*-wide coverage
- 1 coverage for regional/local coverage.

For the conversion from VHF to digital, and with the objective of shortening the simulcast phase, the Initiative recommends the development of additional scenarios which include the future use of Band II and possibilities to use channel 13 for DAB.

5.1.2 Expansion plan

For the short term, the Initiative recommends:

- that the first coverage of the Wiesbaden Plan in Band III be built up throughout all of the *Länder* without delay;
- that the second coverage of the Wiesbaden Plan in the L Band also be rapidly built up in line with the frequency assignments already made and in co-ordination with the *Länder*;
- that in Band III in the short term a further DAB coverage be made available in each *Land*, and that it be capable of regionalisation where possible.

5.2 Digital terrestrial television (DVB-T)

5.2.1 The coverage objective in the launch phase

As soon as it provides a regular service in each region, DVB-T will need to offer a minimum number of television stations which is higher than the number of stations currently transmitted by analogue, in order to achieve public acceptance.

> The aim is 12 programme equivalents, with programmes in a picture quality comparable to PAL[22], and new multimedia services. It must be possible to create bouquets of programmes. Gradually, the number of programmes offered at the launch is to be capable of expansion to at least 20 television programme equivalents, and a regionalisation of the programmes is to be possible.
>
> Portable indoor reception is to be made possible right from the beginning – albeit not necessarily in rural areas (depending on the levels of transmitter power permissible under Chester ’97[23]).
>
> For this reason, the Initiative recommends the establishment of single frequency networks right from the beginning.

To a limited extent, mobile reception is possible, but it is not an explicit coverage objective. The family of DVB standards (DVB-T, MHP[24]) forms the technical basis for the broadcasting of television programmes, media services and teleservices.

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[22] Phase Alternation Line: existing process for transmission of analogue television programmes

[23] 1997 Agreement by the European broadcasting area with a basis on which to plan the transmission of digital television programmes in the context of the 1961 Stockholm Agreement

[24] Multimedia Home Platform

5.2.2 Introduction of digital transmission (introduction scenario)

> The transmission of digital terrestrial television programmes and supplementary multimedia services for customers (with the provision of a regular service) can commence from 2001 in selected areas, so-called “islands” which, if possible, include a conurbation, but whose geographical coverage may extend outside it. For commercial reasons, the possible regions for the launch are Rhine/Ruhr, Düsseldorf/Cologne, Berlin/Potsdam, Hamburg, Rhine/Main, Munich, Stuttgart, Bielefeld, Hanover/Braunschweig, Rhine-Neckar area, Leipzig/Halle, Nuremberg/Erlangen/Fürth, Dresden, Bremen, Saar, Aachen, Erfurt/Weimar. The islands are identified by the *Länder*.

In the course of the coming years, successive additional network islands are to be created or the existing ones expanded so that by 2010, the final date envisaged by the Initiative, all the islands have been merged to form an infrastructure covering, if possible, the whole country.

Since at present only a few unused frequencies, most of them with a low range, are available, it will normally be necessary to use high-range analogue frequencies for digital transmissions. It may be necessary to switch existing analogue transmitters to other analogue frequencies, even if this results in worse reception of the existing analogue programmes. Here, it is necessary to strike a balance regionally between the risk that terrestrial viewers may migrate to cable/satellite and the gain in range for DVB-T.

5.2.3 Programme range

The launch service is intended to consist of 12 programme equivalents (3 multiplexes à 4 programme equivalents) for each island. In general, the programmes broadcast on analogue at the time of conversion enjoy a right to continue broadcasting and will be transferred to a digital multiplex. Further programmes will be licensed on the basis of *Länder* law. In this context, it will also be necessary to distribute capacity between public and private programme providers and to stipulate the use of the multiplexes. The *Länder* will put the necessary legislation in place in the 5th Agreement amending the Interstate Agreement on Broadcasting.

> The Initiative recommends that consideration be given to new multimedia

services in the launch phase, in order to make DVB-T more attractive.

5.2.4 Parallel provision of analogue/digital programmes (simulcast)

In order to protect the consumer, it is in principle necessary for the analogue programmes to be broadcast in parallel alongside the digital programmes for a certain period. For reasons of cost and a shortage of frequencies (further digital programmes cannot be transmitted until frequencies used by analogue have been released), however, such a transitional phase must be kept as short as possible.

The Initiative is aware that in general in the simulcast phase, it will not be possible to maintain the entire analogue range for reasons related to frequency planning.

The Initiative recommends

- that the parties to the Initiative give the participants in the various islands plenty of advance notice about the planned conversion;
- that the industry manufacture and market multistandard appliances which receive both analogue and digital programmes.

5.2.5 Frequency spectrum

The frequency resources for DVB-T can be seen in table 5.2.5:

Broadcasting bands IV and V:	Channels 21 – 60 ? 40 channels à 8 MHz Channels 64 – 66 ? 3 channels à 8 MHz
Broadcasting band III to enable simulcast and to facilitate the launch phase of DVB-T	A number of channels depending on the local situation and taking account of the objective of making available a further DAB coverage in each *Land*, regionalisable where possible.

Table 5.2.5: Frequency resources for DVB-T

All of the frequency assignments made by the Regulatory Authority for Telecommunications and Posts for the conversion process depend on confirmation in the form of a reordering to be undertaken at the planned successor conference to the Stockholm Agreement of 1961.

5.2.6 Network access – service providers

The future digital terrestrial distribution paths (transmitters) can be used to broadcast free-to-air and encrypted (pay TV) services on an insular basis, differing from island to island.

The Initiative recommends that the free TV services should not normally be encrypted where this is not required by the respective programme provider, e.g. for invoicing purposes.

Service (content) providers wishing to make broadcast services accessible to a public need to obtain an appropriate licence under the respective *Länder* law (unless statutory authorisation already exists, e.g. in the form of an Interstate Agreement on Broadcasting). Media services and teleservices do not require a licence. An operator of a transmission network must provide the desired access at normal market, transparent, non-discriminatory conditions.

5.2.7 Network access – consumers (terminal equipment)

In addition to attractive content, a key factor affecting public acceptance of DVB-T will be access conditions for the consumer which are as uniform, transparent and low-cost as possible. Terminal equipment for DVB-T is already available on the European market as so-called "Integrated Televisions" or as set-top boxes.

The Initiative recommends to the industry that right from the start:

- an increasing and sufficient supply of low-cost terminal equipment be made available for the reception of digital programmes;
- multistandard appliances be marketed in order to foster the switchover process, permitting the reception of both existing analogue and new digital programmes;
- "multistandard receivers" be marketed permitting combinations of reception by terrestrial transmitters, cable and/or satellite (the existence of multistandard appliances has proved useful in the past, e.g. during the transition from SECAM to PAL in the east of Germany following reunification).

The Initiative recommends that:

- the digital reception equipment on the market be DBV-compatible, i.e. that the APIs[25] in particular support the MHP standard;
- all unencrypted services be readable with all normal receivers on the market;
- **one** terminal appliance be able to receive all encrypted services.

5.2.8 Encryption (conditional access – CA)

A transmitter operator must be able to service all the free TV and pay TV services. The German TV Platform has described the solutions available on the market in a detailed report[26]. In

[25] Application Programming Interface: (software) interface of the operating system of a terminal appliance to guide/programme the customer services available via the box.

[26] "Grundlage für die Konvergenz der Medien - Basispapier zum Einstieg in einen freien Markt für digitales Femsehen in Deutschland"; Deutsche TV-Plattform e. V. , Stresemannallee 19, c/o ZVEI, 60596 Frankfurt, 12/99

principle, competition must be possible between systems with built-in CA modules or modules which can be retrofitted. For the providers of access authorisation services, the Television Signal Transmission Act and section 53 of the Interstate Agreement on Broadcasting apply in conjunction with the rules of the *Länder* media institutes on freedom of access to digital services.

The Initiative recommends that the market partners agree on solutions which are commercially viable for the providers, which promote the market development and which take full account of the interests of the consumers.

5.3 Digital cable television (DVB-C) and digital cable radio (DVB-C; DAB)

5.3.1 General points

Broadband cable networks are a well-developed platform for the transmission of broadcasting and data services. More than half of all households already receive television and radio programmes via these networks. Here, the transition process from analogue to digital transmission has already begun – unlike for terrestrial transmission. The cable network operators have gradually expanded their digital services. Nevertheless, analogue programmes still dominate the market.

The process of transition from analogue to digital transmission in the broadband cable networks can therefore basically be market-led. It must be designed in such a way that all of the partners on the market (content providers, network operators, platform operators) can participate. That means that it must be possible for all of those on the market to refinance the necessary investment by using flexible business models. Only if there is the necessary planning certainty will the partners on the market carry out the high investment needed for a successful shift to digital.

At the same time, the market is changing fast.

Deutsche Telekom AG has regionalised its broadband cable business and is currently selling majority shareholdings in the various regions. It is expected that the cable network operators will push ahead with the development of the broadband cable networks and offer comprehensive new services in future. As well as additional digital television programmes, this involves broadband Internet, telephony and multimedia services. These services will be based on a wide diversity of business models. In order to foster the process of digitisation, the market participants (content providers, network operators, platform operators) must be given sufficient scope when they select their business model. Overall, this will permit an intensification of competition.

5.3.2 Market situation

Germany’s broadband cable networks have generally been established using standard technology for broadband distribution networks on the basis of 450 MHz coaxial copper technology. In the frequency band up to 300 MHz, the programmes are transmitted using analogue technology. The band above that up to 450 MHz (the so-called hyperband) has already been digitised and is available to transmit digital services; temporarily, however, capacities for a total of 5 programmes are being used for analogue transmission.

Radio and television is provided by broadband cable networks to approx. 21 million households in Germany. The relationships with the final customers divide up as follows:

- 6.8 million are final customers of Deutsche Telekom AG;
- 11.0 million are final customers of network operators using upstream services from Deutsche Telekom AG;
- approx. 3 million are final customers of other network operators.

Digital provision began in October 1997 with the inclusion of digital DVB-C programmes on the hyperband. The programmes are fed into almost all the broadband cable networks. As a result, up to 98 % of all broadband cable households can receive digital programmes. Today, approx. 1 million cable households already receive digital programmes via a decoder and thus generally receive approx. 80 programmes (pay TV and public television), but without private free TV channels and free-to-air media services.

The way the 13 channels (of 8 MHz each) currently available on the hyperband are occupied has been co-ordinated with the Conference of Directors of the *Länder* Media Institutes (DLM). It is assumed that each of these channels can be occupied by 9 programme places.

The DLM’s current occupancy plan contains 6 programme places for the parallel digital transmission of existing analogue private programmes (simulcast transmission). In line with a DLM decision, Deutsche Telekom AG is called on to provide further capacities for a seventh simulcast place. Simulcast transmission of public television stations is already possible with the present channel occupancy.

5.3.3 Coverage objective

Cable television

The medium-term objective of the cable network operators is to continue to promote the digital service. Since the digital capacities of the hyperband have largely been occupied, no significant increase in the digital service will be possible until after the expansion of the cable networks to 862 MHz. The Initiative recommends that this expansion take place as quickly as possible. In the medium and long term, it will also be possible to expand cable capacity by successively converting from analogue to digital applications.

Radio

The move to digital also embraces the radio stations. The Initiative recommends that all radio stations required by media legislation continue to reach the households via the broadband cable networks.

Radio transmissions via broadband cable can occur

- via DVB-C: reception via a set-top box or an integrated TV receiver and/or
- via DAB: reception via a normal DAB receiver.

The two processes involve different transmission and reception technologies.

The Initiative recommends that the decision on the way the system is used be made in line with commercial considerations and issues of public acceptance, and be basically left to the discretion of the network or platform operator.

5.3.4 Access to the network platform

Broadband cable can be used nation-wide and regionally to transmit free TV and pay TV programmes (TV programmes and multimedia services) and radio services.

> The Initiative recommends that this network platform be available to all providers to market their content. It must be open and non-discriminatory and thus offer clearly defined functionalities to all programme providers.

An essential precondition for rapid market introduction of DVB-C is the introduction of a standardised application programming interface (API) which is open, uniform and hardware-independent for all market participants. Such a standard is available in the form of the Multimedia Home Platform (MHP). In future, MHP is to be used for multimedia applications like e-commerce, home banking or games.

> The Initiative recommends that only MHP-compatible systems be introduced and existing systems be migrated to MHP-compatible systems.
>
> The Initiative also recommends creating the possibility to use different CA processes. There are various ways to ensure their compatibility: the simulcrypt process and the multicrypt process with common interface.

ARD, the RTL group and the consumer associations take the view that the multicrypt platform needs to be used in order to achieve non-discriminatory access for all content providers. In this way, it is possible to ensure that there is no monopoly with regard to the CA system deployed.

On the other hand, in the view of current pay TV providers, technical platform providers and network operators, the integrated solution offers advantages, which mainly lie in low production costs, a higher security level and immediate pay TV receptability. Since the market launch of digital television in Germany and other countries has occurred via the rental of set-top boxes and thus via an investment by the pay TV provider, the integrated solution has come to be used almost exclusively throughout Europe. However, as a sales market develops, this will change.

> The Initiative assumes that the market participants (content providers, network

operators, platform operators) need to be given sufficient scope in which to select their business models; the possibility of encrypting the content in order to safeguard the implementation of the business models selected must not be excluded.

In the view of the consumer associations, there should be no basic encryption of the programmes which so far have been freely available via cable.

5.3.5 Terminal equipment

If the new services are to be accepted by the public, the consumer needs not only attractive content, but also access conditions which are as uniform, transparent and low-cost as possible. Terminal equipment for DVB-C is available both as so-called "Integrated Televisions" and as set-top boxes for the television sets sold on the European market.

The Initiative recommends that the industry:

- offer a growing and sufficient supply of low-cost terminal equipment to receive digital programmes;
- offer multistandard appliances which permit the reception of both the existing analogue and new digital programmes; and
- offer receivers which allow for the combination of reception by terrestrial transmitters, cable and/or satellite (the existence of multistandard appliances has proved useful in the past, e.g. during the transition from SECAM to PAL in the east of Germany following reunification).

5.3.6 Legal aspects

The necessary legal preconditions to safeguard open and non-discriminatory access to the digital platform are set out in the Television Signal Transmission Act and section 53 of the Interstate Agreement on Broadcasting. Details regarding the content and procedures pursuant to section 53 of the Interstate Agreement on Broadcasting are set out in the rules of the *Länder* media institutes on freedom of access to digital services.

The Initiative sees no need for further-reaching stipulations.

5.4 Digital satellite television (DVB-S) and digital satellite radio (DVB-S, DAB)

Since 1996, DVB-S-based digital television and radio services have been available in Germany via various satellite systems (ASTRA, EUTELSAT, etc.). The introductory phase can be deemed complete, since virtually all German-language TV programmes can now be received digitally via satellite. At present, however, analogue reception systems still dominate the market. With the standardisation and introduction of the Multimedia Home Platform as the API for digital reception equipment, the basis is currently being created for the broadcast of numerous value-added multimedia services which will make it attractive for an even larger public to obtain a digital receiver. These value-added services and the early availability of modern digital set-top boxes with built-in hard-disks to automatically record programmes will substantially speed up the exchange of analogue reception systems for digital equipment.

5.4.1 Coverage objective and market penetration phase for TV and multimedia services

The medium-term objective of the satellite operators is to continue to promote the diversity of digital services. This particularly includes the transmission of additional television stations and interactive applications for the Multimedia Home Platform (MHP) and the provision of novel multimedia services (broadband Internet content) for PCs and set-top boxes. The provision of a “return channel via satellite” in the so-called Ka Band (29.5 – 30.0 GHz) will permit the feeding of multimedia content to server platforms at the uplink location.

For existing analogue services, the decision to convert to digital transmission will rest with the respective programme providers and operators.

Radio

Digital radio stations have been transmitted via satellite since 1995 on digital sub-carriers above the video signal spectrum on analogue transponders using a proprietary standard (ASTRA Digital Radio – ADR). This transmission process currently offers the consumer a selection of 85 mainly German-language private and public stations.

Since 1996, free-to-air German-language and international radio stations have also been transmitted using the DVB-S procedure. Using an appropriate DVB-S receiver, a final consumer currently has a choice of more than 100 free-to-air German-language and international digital radio stations.

The satellite operators are expecting a further increase in DVB-S-based digital radio programmes. There will also be a large number of novel multimedia services.

5.4.2 Access to the network platform

The satellite transponders used for digital applications can transmit free-to-air and encrypted (pay TV) services throughout Europe, nation-wide and regionally. Using a geostationary satellite system, it is in principle possible to ensure full geographical coverage with television and radio programmes and multimedia services for stationary reception.

> The Initiative assumes that the satellite operators will provide the desired access at normal market, transparent and non-discriminatory conditions.

In the case of transmission via satellite (ASTRA, EUTELSAT, etc.), a platform operator or a service provider is basically free to select an encryption process in line with his own criteria and requirements, as long as the standardised DVB “common scrambling” is used. In order to permit reception of different pay TV packages using different encryption systems via a single set-top box, two different technical processes have been standardised: simulcrypt and multicrypt.

Both processes are in use across the European market; at present, all the pay TV providers prefer the simulcrypt solution with fixed built-in CA systems, both for cost and for contractual reasons. In the view of the Initiative, the market should decide which of the two access processes ultimately penetrates the market.

> The Initiative assumes that service providers and platform operators will make their CA systems available to both simulcrypt and multicrypt processes (common interface) at normal market and non-discriminatory conditions.

5.4.3 Terminal equipment

If the new services are to be accepted by the public, it is essential to have not only attractive content but also access conditions for the consumer which are as uniform, transparent and low-cost as possible. Terminal equipment for DVB-T is already available on the European market as so-called "Integrated Televisions" or as set-top boxes.

The industry is offering a growing and sufficient range of low-cost terminal equipment for the reception of digital programmes. The conversion process is also being fostered by multistandard appliances which permit the reception both of the existing analogue and of new digital programmes and by receivers which permit combinations of reception from terrestrial transmitters, cable and/or satellite.

The Initiative recommends that industry and service providers focus greater efforts on ensuring that:

- the digital receivers on the market are DVB and MHP-compatible, i.e. in particular that they contain the standardised DVB-API;
- that all unencrypted services can be read by all normal receivers on the market;
- that **one** terminal appliance can receive all encrypted (perhaps in different ways) and unencrypted services.

6 Marketing and cost aspects

6.1 Marketing of DAB and DVB-T

6.1.1 Information on/marketing of DAB

The situation of radio in Germany is characterised by horizontal, highly fragmented markets with, in some instances, intensive competition between the participants. There is a high degree of diversity from local, regional, *Länder*-based and nation-wide private and public radio providers for many different target groups. Within this structure, there is a lack of highly capitalised firms which could actively take over the marketing of a DAB system on their own with the objective of improving their own market position.

If DAB is to develop successfully, there is a need for a co-ordinated approach by all the parties engaged on the market. The Initiative finds that planning certainty does exist in major areas. This includes, for example, the allocation of frequencies in line with the Wiesbaden Agreement, the transmitter network operators' plans for expansion, and the framework of media legislation. However, the planning certainty already in place does not apply to all aspects of the market and has not encouraged all the market participants to become more proactive. Certainly, any proactive approach has not yet attracted great publicity.

The Initiative therefore recommends that all the market participants publish their intentions without delay and thereby furnish the other market participants with the missing information, and in particular provide the consumers with the information they need when selecting their purchases.

The Initiative deems it particularly important that:

- nation-wide provision of DAB is established and maintained;
- additional services like traffic information are offered;
- the terminal equipment industry actively markets its DAB products, and does more to push multistandard appliances in particular;
- the DAB programme providers advertise their DAB services on VHF stations;
- traders and the crafts are included via information, training and, if appropriate, the provision of demonstration equipment.

6.1.2 Information on/marketing of DVB-T

Whilst digitisation in the field of cable and satellite is largely market-driven, there is a need for targeted market development measures in the field of terrestrial television. These measures must embrace both the programme side and the terminal equipment side and include all those involved in the process of digitisation, and particularly traders and the crafts. Particular attention needs to be devoted to the consumers. Information on the conversion process must not only be presented at an early stage and in sufficient detail: it must be proactively passed on to the consumers. Here, special efforts need to be made to show consumers the added value of digital transmissions. The supply side needs to stimulate the demand for services accompanying programmes and for multimedia services in particular, both in terms of content definition and in terms of placing them on the market.

The preparations for the phase-out of analogue transmissions in an island will be of outstanding importance. The consumers will only accept the phase-out if all the components are properly in place. That includes an attractive range of services (TV programmes and new services), a sufficient and attractive range of terminal equipment, and plenty of advance notice about what is happening.

The implementation of a concerted market strategy therefore requires co-ordination between transmitter network operators, content providers, the terminal equipment industry, traders, the crafts, and consumer associations, e.g. on conversion timetables, programme structures, technical parameters and consumer-friendly information strategies. Only in this way will strategically co-ordinated measures have a chance of ensuring that DVB-T is introduced.

With regard to implementation, the Initiative recommends a two-stage concept:

- **Stage 1:** A “DVB-T Task Force”, consisting of representatives of the Federal Government and the *Länder*, programme providers, network operators, industry, trade and crafts, is set up as a permanent panel for the switchover phase. The necessary introductory measures for regional (islands) and supraregional projects are co-ordinated and adopted at this “round table”. The aim is to develop and market the new and uniformly understood product: “DVB-T”.
- **Stage 2:** The switchover could be managed by a marketing company, since the market forces themselves – whose interests diverge and who differ regionally – are not deemed sufficiently strong to achieve a successful introduction of DVB-T.

The task of the marketing company mainly involves the co-ordination of the actions of the market partners from industry, trade and crafts and the communication of the benefits of DVB-T to the consumers via suitable PR measures. This marketing concept needs to be developed and implemented supraregionally, whereby regional projects (islands, etc.) can be realised by the marketing company in line with the overall concept with different project partners. Similar concepts have already been successfully practised in comparable situations.

The funding needs to be ensured via a joint provision of funds by the commercial parties involved in the task force.

6.2 Likely costs of DVB-T transmissions

The total cost of analogue terrestrial transmission of TV programmes by public programme providers amounts to DM 450 million p.a. This pays for the broadcast of three channels throughout Germany. The cost of the nation-wide provision of one channel is approx. DM 150 million. The total spending by the private television providers amounts to approx. DM 55 million for the transmission of a varying number of private stations, not covering the whole country.

It is difficult to estimate the likely costs of DVB-T transmissions, mainly because the annual costs to reach a broadcasting consumer (with one channel) depend very much on the technical and coverage-related parameters selected. In particular, the costs are affected by the coverage objective of stationary, portable indoor or mobile reception in rural districts or conurbations, commercial factors like the need for depreciation and maintenance of transmitters, the topography of the coverage area and transmission-specific requirements like feeding via permanent line, radio relay or satellite.

On the other hand, the costs of DVB-T transmissions will represent a key element determining the demand from TV programme providers and multimedia providers for transmission capacity. This particularly applies to the phase of simulcast operations and for the period in which relatively few receivers are in use. Also, the costs are of key significance for those programme providers who have not so far transmitted their programmes on a terrestrial analogue basis or have done so only to a limited extent. For these private providers, digital terrestrial television transmission represents a genuine extra expense, but one which offers the chance of a real increase in range.

Studies have been carried out – and published – into the costs of DVB-T transmissions, e.g. a study by the *Land* Institute for Communications in Baden-Württemberg[27] (submitted to the Initiative as a document). According to this, the annual costs for the transmission of one television station in Baden-Württemberg amount to approx. DM 35 million for an analogue network (degree of population coverage V approx. 99%) and for a DVB-T programme with portable indoor coverage to between DM 5 million (V = 61 %) and DM 20 million (V = 95 %). This results in clear cost advantages for the operators of networks offering wide geographical coverage: far-reaching coverage of the *Land* (V = 95 %) with portable indoor reception costs only about 75 % of the amount needed for analogue transmission with stationary reception for one television station.

If, instead of the portable-indoor reception mode, the stationary reception mode is selected, the costs per station and year would be cut to a third or a quarter of that of analogue transmission, which itself only permits the stationary reception mode; i.e. based on the findings of the above-mentioned study in Baden-Württemberg the costs would be approx. DM 10 million or, extrapolated for a nation-wide station, approx. DM 40-50 million as against DM 150 million.

For private providers, however, the situation may be characterised by possible additional costs rather than savings. But where these DVB-T services are broadcast without wide geographical coverage, i.e. only in conurbations, they are substantially cheaper than programmes provided across a wide area.

All the studies make assumptions which still involve considerable uncertainties.

> At the present time, and in view of the present planning status for the switchover from analogue to digital transmissions, the Initiative is therefore unable to make any reliable detailed estimate of the expected costs. It will only be possible to estimate the costs reliably for the conversion of a specific island.
>
> The Initiative therefore recommends that such a cost estimate be included in the decision-making process for insular switchovers.

It can certainly already be stated today that portable indoor coverage across a wide area will drive up the costs of DVB-T.

In view of the available cost estimates, the Initiative has recommended:

- that the portable-indoor reception mode with limited possibilities for mobile reception be implemented nation-wide with wide geographical coverage by the end of the conversion process (2010) and that the scope for development in the use of the data container (expansion of the target groups) and in the technical field be fostered and taken into account;
- that the expansion of the DVB-T networks be managed flexibly from the launch phase onwards with this aim in mind; and
- that in the introductory phase in the islands (launch scenario), portable indoor coverage be achieved in line with the stipulations in the Chester Agreement, but that it should not be required for wide geographical areas in this first phase.

In summary, the Initiative finds that a development strategy for DVB-T with portable indoor and mobile reception which is adapted to demand and the scope for development will be cheaper per programme than the existing analogue TV coverage, which is only designed for stationary reception.

In the view of the Initiative, the anticipated costs are justified by the added value offered by DVB-T, i.e.

- portable indoor reception, and the level of
- mobile reception which is possible in this context, and related to this
- a greater diversity of programmes and new multimedia applications.

[27] Netzplanung und Kosten von DVB-T; VISTAS, 1999, publications of the LfK, vol. 8, ISBN 3-89158-244-7

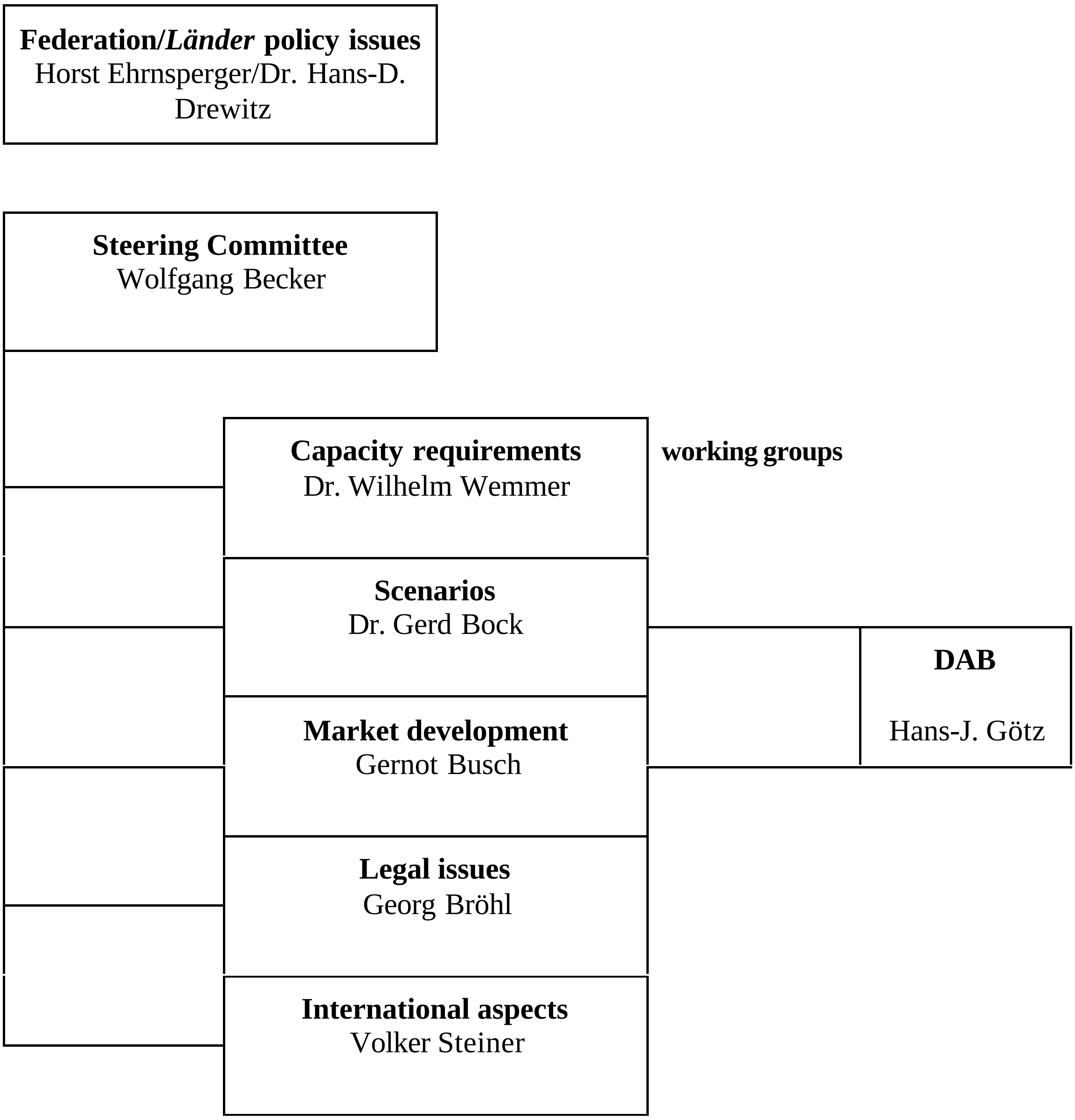
6.3 Promotion of the introduction of digital broadcasting

The rapid continued introduction of digital broadcasting creates competitive advantages and enhances Germany's competitiveness.

The Initiative therefore recommends that models for the financing and support of digitisation of transmission paths be developed as soon as possible. This work will be done by the DVB-T Task Force, which should include not only those involved in the market launch, but also representatives of the Federal Government and the *Länder*. In view of the massive introductory costs, the Initiative recommends that the various companies and institutions take advantage of all the available support measures.

7 Annexes

7.1 Organisational chart of the "Digital Broadcasting" Initiative



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