

THE TRANSITION FROM SECAM TO DIGITAL BROADCASTING

The DVB-T experience in the Netherlands

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1. Television market

The penetration of cable and satellite television in the European market has been very different from country to country. Figure 1 gives an overview of cable and satellite penetration in a number of European countries. Please note that the penetration percentage can vary from source to source and therefore the values given in Figure 1 must be taken as indicative values only.

As can be seen from Figure 1 the Netherlands is one of the countries with the highest cable penetration.

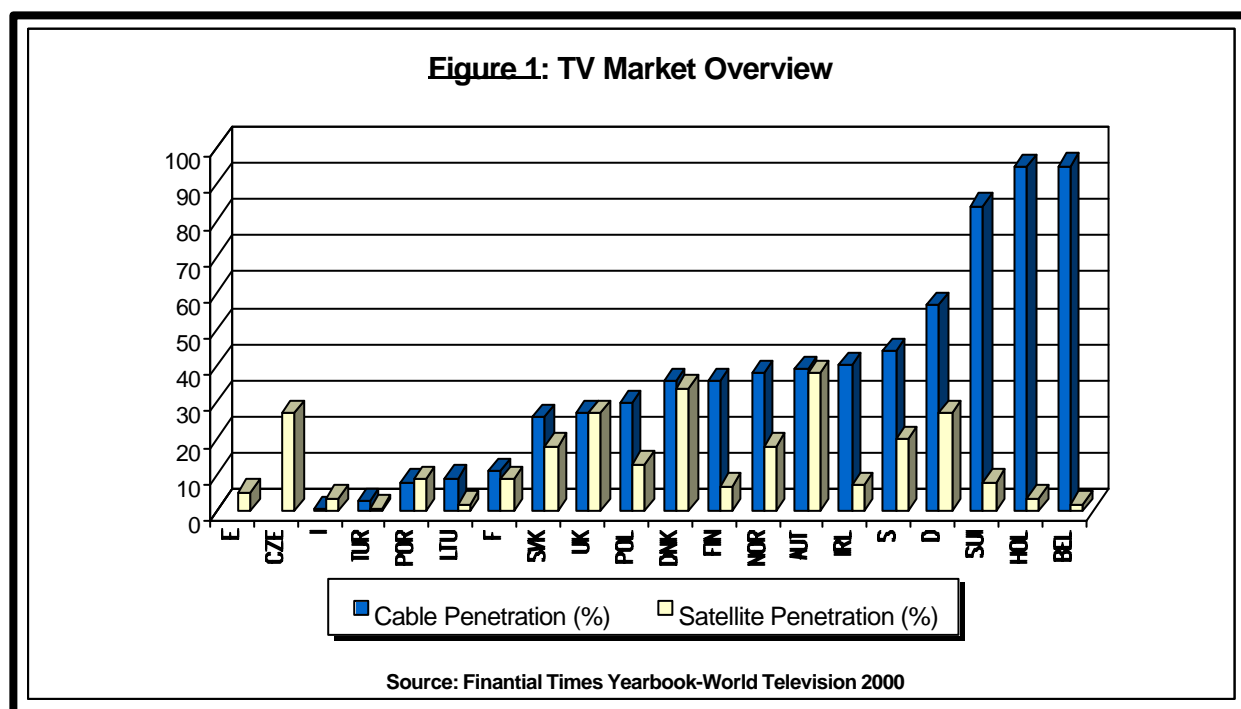


Figure 1 Cable and satellite penetration in a number of countries

The vast majority (94% of the households of the 6.4 million households) uses cable. In a number of cases (2% of the households) also a satellite dish has been installed to receive foreign services that are not distributed in the cable network.

Terrestrial reception is mainly restricted to the rural areas where no cable network is available (4% of the households). In these cases the service offer is often supplemented by means of (digital) satellite reception.

There are even a considerable number of households (2%, that is 230,000 households) that have no television set.

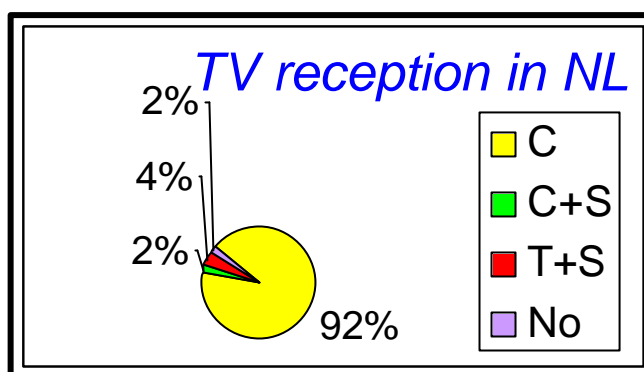


Figure 2. Statistics of television reception in the Netherlands

Table 1 gives an overview of the services delivered by cable, satellite and terrestrial transmissions. Cable companies have started the introduction of digital cable distribution (DVB-C) mainly focused on pay television and new services. The Dutch commercial television programmes and the national public programmes are digitally transmitted (DVB-S) via ASTRA in the package from Canal+. Satellite transmissions are mainly used for feeding cable systems. Some years ago the satellite operator switched from analogue to digital for cost reasons. A simulcasting period of only one month took place.

Delivery medium	Potential coverage	Number of NL public services	NL commercial services	Total number of programmes	Main reception	Digital services
Cable	95%	3 national, 1 regional	Yes	< 30	Domestic	Starting
Digital satellite	80%	3 national, 1 world service	Yes	>100	Cable feed	Since 1996
Terrestrial	99%	3 national, 1 regional	No	4	Domestic	Test transmissions

Table 1. Overview current television offer in the Netherlands

One of the consequences of the high cable penetration is that roof top antennas have almost disappeared. It is evident that introduction of digital television can only be successful if:

- DVB-T can be received at indoor locations by means of simple antennas
- a package of at least twenty programmes is offered.

2. DVB-T introduction

2.1 DVB-T services

Consumers, government and market parties welcome the introduction of DVB-T in the Netherlands because it provides competition for the de-facto monopoly of the cable companies. There is a broad consensus that DVB-T should provide portable and as far as possible also mobile reception possibilities. DVB-T will therefore also be an attractive delivery medium for second television sets in the home and for television reception in holiday homes, boats etc.

One multiplex will be allocated to public broadcasters (national and regional). Four multiplexes will be licensed for commercial services. After considerable political debate it has now been decided to licence the package of four multiplexes on the basis of a "beauty contest" in stead of an auction.

Public and commercial broadcasters, Canal+, KPN, NOB and Nozema have set up a consortium called "Digitenne". Digitenne is preparing for the market introduction of DVB-T. The Digitenne DVB-T package using the five multiplexes will consist of:

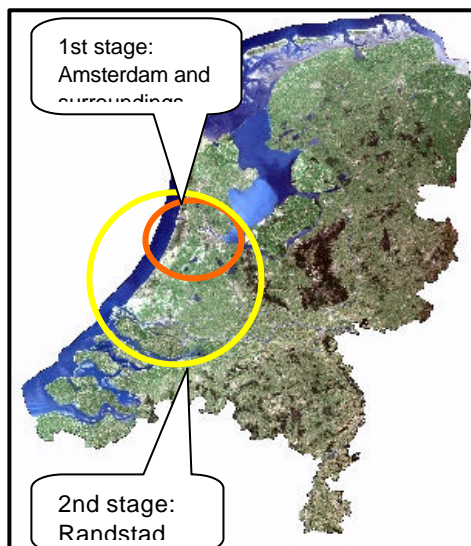
- 20 most popular tv services
- 15 radio channels
- 3 pay-tv channels
- Electronic Programme Guide (EPG), Enhanced teletext and games
- Weather and traffic information

A return path will be provided via PSTN and later (2002) also via ASDL. In a second phase additional innovative services (shopping and info channels, games, internet tv) will be offered.

The business model of Digitenne is based on a monthly subscription for the above mentioned services. Initially a rented set-top box is included in the offer. The price will be competitive to the cable subscription.

2.2 Roll-out

Implementation of DVB-T will take place in three stages:.



1. Amsterdam and surrounding area with five multiplexes and about 20% of the population. The commercial start is now planned in May 2001 but will depend on the licensing procedure.
2. "Randstad" (central and western part of the Netherlands) with five multiplexes and about 50% of the population. This stage will start in the fourth quarter of 2001 but it will take a year or more before this area is fully covered.
3. The whole of the Netherlands with six multiplexes after analogue television has been switched off. No decisions have been made yet about the analogue switch-off date, however it is expected between 2003 and 2010.

Figure 3. Roll out

3. Frequencies

Frequency assignments are based on the requirement to achieve portable indoor reception for at least 70% of the locations. As far as possible Single Frequency Networks (SFN) are applied. The size of the SFNs is limited to a maximum distance between transmitters of about 70 km in order to avoid self-interference. In a few cases a somewhat larger distance between transmitters could be achieved by applying a delay at one of the transmitter and restricting the power of another. Smaller SFNs are more common because of restrictions due to avoid interference to other transmitters (digital or analogue). One network has a regional structure, therefore the coverage of SFNs in this network are restricted to the provincial boundaries.

The frequency plan uses channels of Band IV and V. Some channels will continue to be used for other services, these are channel 38 (radio astronomy) and the channels 61,62, 68 and 69 (military tactical links). A number of channels in Band IV and V have national constraints because of the use of services ancillary to broadcasting (SAB).

DVB-T channels are chosen on the following basis:

- unused analogue television assignments of the Stockholm Plan
- one or more the channels above 60
- “gaps” in the spectrum
- operational analogue channels after analogue has been switched off (stage 3 only)

Due to the geographical situation and the fortunate circumstance that some unused analogue assignments are available it is possible to plan five multiplexes for portable indoor reception in the “Randstad” (western and central part of the Netherlands) using a modulation and code-rate of 64QAM2/3 and a guard interval of 224 us. This leaves a net bit rate of 19.9 Mbit/s.

One multiplex with limited coverage is available for most of the country. Only after analogue television has been switched off, six multiplexes will be available in the whole country. However some of these multiplexes have limited coverage. Full coverage for portable and possibly mobile reception is expected to be possible after a revision of the Stockholm Agreement.

4. Network

The network should fulfil the following requirements:

- Transmitter sites in or near urban areas in order to achieve a high location probability for portable indoor reception in the urban areas.
- More or less equal coverage of the five (later six) multiplexes
- As far as possible use of existing sites (television, FM, or telecom sites)
- A regional structure of the multiplex for the public services

The requirement for portable indoor reception leads to high a minimum required field strength. Taking into account the power restrictions needed to protect foreign transmitters the above mentioned requirements can only be achieved by means of a dense network and the use of SFNs. More than 60 DVB-T sites are foreseen with a radiated power ranging from 1 to 10 kW. For comparison, the current analogue television network consists of 10 stations with a radiated power of more 1 kW.

Network	SFN	Tx/SFN
1	2	3; 11
2	3	5; 3; 6
3	2	1; 13
4	2	1; 13
5	2	1; 13

Table 2. Network topology in stage 2 Coverage of “Randstad”

Table 2 shows schematically the topology of the network in the second stage of implementation: coverage of the “Randstad”. Fourteen sites are planned for this area. The number of SFNs per network ranges from 2 to 3 and the number of transmitters per SFN ranges from 1 to 13. The “SFNs” consisting of one transmitter will be extended to more transmitters in the third stage of implementation.

5. EMC

Cable systems in the Netherlands use frequencies up to 862 MHz. The cable system itself (that is from the head-end to the wall outlet in the home is well screened. However the domestic installations are often of poor quality. Television transmitters had always the potential to interfere with cable reception but this was avoided by not using the channels that are transmitted off air.

With the implementation of digital terrestrial television more channels will be used off air, but also in the cable systems the number of used channels have reached almost the maximum. Cable companies are not willing to avoid the channels used by digital television transmitters and the government has no legal means to enforce that. The result is that a considerable emc problem is expected. Investigations have shown that potentially about 30% of the households may have interference in cable reception on one or more channels provided that their receiver is tuned to the interfered channels. It has also been investigated that the percentage of interfered households reduces to 0.02% if connectors of good quality are used. The Ministry of Transport in co-operation with all interested parties will start a campaign to inform the public to install connectors of good quality and to urge dealers to make these available.

