Norwegian Communications Authority

Summary

The 2012 World Radio Conference (WRC-12) decided that after WRC-15 the 700 MHz band will also be allocated to mobile broadband on co-primary basis with broadcasting. The Norwegian authorities have yet to make a decision on the future use of this band in Norway.

The 700 MHz band constitutes approximately 30 per cent of the frequency band used by today's digital terrestrial television network. Any change in the use of the 700 MHz band will pose challenges for terrestrial television.

In view of this, the Norwegian Communications Authority (Nkom)[1] initiated a project to examine this issue more closely. The project consists of two parts: a technical part and a financial part, resulting in two separate reports. The technical report summarises an impact assessment conducted by Nkom with assistance from Norkring, NRK, NTV and RiksTV. The report includes the assessment of the technical consequences of five different scenarios for the digital terrestrial television network after 2021. On commission from Nkom, Nexia AS has prepared a report[2] estimating the costs of the five different scenarios. The scenarios in the two reports are not based on exactly the same assumptions, partly because this work has been done in parallel, meaning the consequences described in the technical report were not available when Nexia was performing its analyses.

Description of the terrestrial network

The terrestrial network is a platform for the distribution of television. NTV is the platform operator and licence holder of the terrestrial network in Norway. The licence is valid until 2 June 2021. NTV has two customers: NRK and RiksTV. NRK is required to provide its radio and television channels free of charge to all households in Norway, without them having to establish a customer relationship with a third party. The terrestrial network is the only television distribution platform that meets this requirement. RiksTV offers pay television services. The terrestrial network provides coverage for approximately 98 per cent of all permanent households in Norway. The terrestrial network is used by around 30 per cent of the population. The digital terrestrial network was completed in 2010 and cost approximately NOK 1.5 billion to develop. The network was funded privately.

The terrestrial network consists of two networks: a basic network that has 430 transmitters and a satellite shadow network with 552 small transmitters. Norway's topography means that approximately 2.5 per cent of the households in the country are located in a satellite shadow where television reception via satellite is not possible. The basic network covers some parts of the areas in a satellite shadow, while the satellite shadow network covers those households that are not covered by the basic network and cannot receive television signals

[1] From 1 January 2015 the Norwegian Post and Telecommunications Authority changed its name to the Norwegian Communications Authority (Nkom)

[2] Terrestrial television without 700-MHz band. Costs and financial consequences

from other distribution platforms. This means that if the terrestrial network is discontinued, many households will no longer have access to television. Discontinuation of the terrestrial network will also reduce competition in the television distribution market.

Release of the 700 MHz band

If the 700 MHz band is released from the terrestrial network and everything else remains the same, there would no longer be any nationwide television channels. A reshuffle of frequencies between different MUX would only yield two nationwide MUX. In order to achieve more than two nationwide MUX, frequency use must be replanned, requiring negotiations on frequency use with our neighbouring countries and an extensive and costly implementation process, estimated to take around five years together.

Alternative technologies

The project has considered whether alternative technologies can compensate for the consequences of the loss of the 700 MHz band after 2021. The terrestrial network currently uses the radio and network technology DVB-T and the compression technology MPEG-4. These were the latest technologies when the digital terrestrial network was established in Norway. The technologies that have been assessed are: DVB-T, DVB-T2 and LTE, and the compression technologies MPEG-4 and HEVC.

DVB-T2 is a further development of the current DVB-T technology. DVB-T2 enables better frequency utilisation and increases the capacity of the terrestrial network compared with current technology. DVB-T2 is a robust and well-established technology that is currently in use in several countries. One of the consequences of introducing DVB-T2 in the terrestrial network is that large parts of the transmitter infrastructure in all the 430 transmitter stations in the basic network would have to be replaced.

HEVC is a further development of today's compression technology and is expected to reduce the bitrate by around 50 per cent for the same type of video content and quality compared with MPEG-4.

LTE eMBMS is a technology that allows content to be broadcast to a large number of concurrent users of LTE networks. This technology has several limitations that must be addressed and resolved before it can be considered for use for broadcasting television signals to large screens on a national scale in Norway.

Five scenarios

Using the technologies mentioned above as a starting point, the project has identified and assessed five scenarios for post-2021. Key information, including the technical implications and consequences for the end user, is presented in the table below.

Each of the factors described in the "consequence" column could lead to loss of customers from the terrestrial network platform. The scenarios that result in increased capacity compared with today will appear more attractive to the users of the platform, assuming the increase in capacity manifests itself in a richer range of services.

Scenario and technology	Total capacity	Consequence
Scenario 1: DVB-T and MPEG-4 Same technology as today; the 700 MHz band is not released	110 Mbit/s As today	None
Scenario 2: DVB-T and MPEG-4 Same technology as today; the 700 MHz band is released. This solution requires coordination with neighbouring countries, replanning of frequency use and an extensive implementation process	82 Mbit/s Reduction of 25 % compared with the current terrestrial network	- Reduction of current coverage. Some users in these areas will be able to regain coverage by changing the direction of the antenna. Alternatively 10–15 per cent more transmitters can be established to maintain the current degree of coverage - Coverage may move - The satellite shadow network is extended. Some households risk losing 4 MUX and will be left with 1 MUX - Reduction in capacity entails a reduction in the range of services
Scenario 3: DVB-T2 and HEVC New technology and compression standard; the 700 MHz band is released	150 Mbit/s Increase of 36 % compared with the current terrestrial network The new compression standard HEVC will provide additional improvements in capacity	- The receivers that the users have today will have to be replaced - Reduction and/or change of existing coverage. Some users in these areas will be able to regain coverage by changing the direction of the antenna
Scenario 4: DVB-T2 and HEVC As for scenario 3. But in this scenario the terrestrial network is allocated frequencies from the DVB-T block in the VHF band	175 Mbit/s Increase of 59 % compared with the current terrestrial network The new compression standard HEVC will provide additional improvements in capacity	In addition to the consequences described for scenario 3 above: - Due to the additional work of changing antennas on all the transmitters, this scenario will entail significant downtime for services - The users must either purchase new additional antenna and thus have two antennas, or replace their current antenna with a combined VHF and UHF antenna
Scenario 5: LTE Broadcast and HEVC New technology and compression standard; the 700 MHz band is released	Uncertain. Capacity depends on the technological characteristics of a future technology that is not currently standardised Depends on the structure of the mobile network that will offer LTE Broadcast	- The receivers and antennas that the users currently have will have to be replaced - Reduction and/or change of existing coverage - Uncertain how many base stations will be required to maintain the current degree of coverage - If the terrestrial network depends on the existing mobile networks, there is the risk of fewer available information channels in the event of a disaster, etc. compared with the current situation

General schedule

The changes in the network as described in the various scenarios are costly and time-consuming, and the licence holder of the terrestrial network needs a decision from the authorities regarding the future licence in order to be able to initiate such major changes. Scenarios 2, 3 and 4 will take approximately 4.5 years to implement. The timing of a possible release of the 700 MHz band from the terrestrial network depends on when the authorities make a decision. If the 700 MHz band is to be released within the expiry of the licence, the authorities will have to make a decision by the end of 2016 at the latest. The licence holder cannot make a choice regarding technology until the authorities have made their decision. Only technologies that are fully developed and suitable at this time can be considered for use.

The schedule for scenario 5 is uncertain, because it is unknown both when technology will be available for broadcasting on a national scale and how long it will take to establish this kind of network.

Increased vulnerability

If in the future the terrestrial network is based on mobile technology, it will be important to assess vulnerability and reduced independence. If linear television services are transmitted via the same commercial mobile network as mobile voice and data services, the public risks losing three important services at the same time in the event of disruption of operations, sabotage, a major emergency or disaster. This will also affect the authorities' and others' ability to get necessary information out to the public in an emergency situation. The question of an independent terrestrial network is therefore also related to issues of national security and emergency preparedness.

Coexistence between broadcasting and mobile services

The introduction of mobile services in the 700 MHz band may cause interference for the digital terrestrial television receivers. However, the severity of the problems and the solutions may be different with interference in the 700 MHz band than we have experienced in the 800 MHz band. This is because in the 700 MHz band the mobile terminals are going to use the frequencies closest to the television band.

Coordination with neighbouring countries

Norway's neighbouring countries Finland and Sweden have decided that in 2017 the 700 MHz band will be allocated to mobile services and have begun their replanning processes. Norway cannot start replanning with its neighbouring countries until a national decision has been made regarding this band. It is important that Norway clarifies the future use of the 700 MHz band at an early enough stage to ensure we have the opportunity to secure a good position in the negotiations with our neighbouring countries.

Wireless microphones

Wireless microphones use frequencies allocated to the digital terrestrial network on a secondary basis. This means that the users of this equipment are not entitled to protection and must therefore adapt their use to the frequency use in the digital terrestrial network. If the 700 MHz band is used for mobile services in the future, the available frequency spectrum in the UHF band for wireless microphones will be reduced. This will lead to increased probability of interference for users of wireless microphones in the UHF band, entailing that wireless microphones that use the 700 MHz band must change frequency or buy new equipment that uses other frequencies.

Report on the financial consequences provided by Nexia

On commission from Nkom Nexia has prepared a report on the financial consequences. All the assessments in the report are Nexia's own. The profitability of the five scenarios has not been assessed, nor whether the scenarios are technically feasible and commercially realizable or not. The scenarios are based on different assumptions and risks, making a direct comparison of the various scenarios difficult.