

Spectrum needs for Utilities
EUTC position paper

Summary

Communication is becoming increasingly important as Smart Grids develop. Communication services are already necessary for mission-critical utility grid management. But as Smart Grids develop further, demand-side management and decentralized energy production mean that communication with the end-points of the grid will also become mission-critical. The smart metering obligation complements the increasing demand for communication that utilities face. This development is recognised by European mandates M/441 and M/490.

The existing and future communication requirements of European utilities can be met in various ways. Differences in grid lay-out, grid density, geographic grid coverage, amounts and types of renewable energy to be integrated as well as varying demands in terms of resilience, security, latency, longevity, security, data rates, availability and criticality of communication determine which communication solution is optimal in technical terms. Although some utility requirements can be met by commercial communication networks, there are demands which cannot be met by these networks. Where the optimal solution is a self-provided wireless communication solution, dedicated radio spectrum is necessary.

To meet these specialist requirements, utilities need access to radio spectrum in a range of frequency bands. Attention is currently focusing on the 450-470 MHz band as a priority to meet current and future needs. In addition spectrum above 1 GHz (i.e. 1500 MHz range) is needed to support data intensive applications.

Frequencies in the 450-470 MHz spectrum band are already used by some utilities as they are very suitable for utilities operations. These bands offer an ideal compromise between coverage and the limited bandwidth requirements of the critically important utility applications. A harmonised European spectrum allocation for utilities will facilitate synergies between utilities, bring industrial benefits, facilitate cross-border coordination, increase security of supply and lower energy costs to consumers. Simultaneously harmonised spectrum will help achieving the overarching goal to have a trusted mission-critical communication infrastructure supporting the smart meter roll-out and smart grid developments.

A band above 1 GHz will support point to point, point-to-multipoint and wideband applications which require more data bandwidth so that the full range of smart grid requirements can be met.

Introduction

Utilities have used radio communications for over 60 years to monitor and control their networks, as well as for voice communications with their workforce. Besides wireless networks utilities also deploy various wired networks for monitoring and controlling their infrastructure.

Electricity and gas transmission and distribution companies, together with water companies, use both wired and wireless communication for Supervisory Control and Data Acquisition (SCADA) systems, distributed automation (remote monitoring and control), mobile voice communications and closed-circuit TV (CCTV) for security. Communication is also needed to support smart metering to monitor supply and consumption and to introduce dynamic tariffs. Smart meters will assist monitoring supply and quality as well as facilitate demand management. Electricity distribution companies also have a particularly demanding requirement for network protection (teleprotection).

The ambitious European goals ("20-20-20 goals") to reduce carbon emissions by means of extensive deployment of renewable energy technologies, demand management and increased energy efficiency requires more extensive and trusted communications than previously needed. Additionally the smart meter roll-out obligation (by 2018 – 2022) also adds to the increasing communication demands faced by utilities.

This is recognized in the European Radio Spectrum Policy Programme (RSPP)¹ which states that *"The Commission shall, in cooperation with the Member States, conduct studies on saving energy in the use of spectrum in order to contribute to a low-carbon policy, and shall consider making spectrum available for wireless technologies with a potential for improving energy saving and efficiency of other distribution networks such as water supply, including smart energy grids and smart metering systems."*

The increasing amount of communication and the mission-critical character of communication in the intelligent grid means that communication is of strategic importance to utilities. Trust and control over these important mission-critical communications is of the utmost importance for utilities: the stability of the grid is dependent on these communications.

¹ Article 8.2 of Decision 243/2012/EU of the European Parliament and of the Council of 14 March 2012 establishing a multiannual radio spectrum policy programme

The communication systems needed by utilities can be characterised as follows:

- low to medium data rates;
- enhanced resilience
- longevity of products and support
- extensive geographic coverage (including less populated areas);
- stringent latency requirements;
- low jitter and synchronous requirements; and
- high levels of security.

The optimal combination of these different characteristics depends on the type of utility, the type of application or system, the environment in which the utility operates and the legacy systems already in place.

Need for spectrum

As explained above, different applications in the smart grid as well as smart meters have their own communication requirements. In principle these requirements can be fulfilled by various communication solutions. Examples are (wired) copper and fibre networks, Power line communication (PLC) and various wireless solutions (RF-mesh, GPRS, UMTS/3G, WiMAX, CDMA-450, LTE, Tetra, DMR, dPMR, MPT1411, etc.).

Given the growing importance and mission critical character of communications, utilities consider that control over the communication medium is the most important criterion. The other decisive criterion when assessing communication options relates to technical telecom and application requirements (longevity of products and support, latency, availability, capacity/bandwidth).

It is in particular in the medium to lower voltage parts of the distribution grid that the future grid developments and the meter obligations require additional intensive and more trusted communication. This communication at the edges of the grid, has the following characteristics:

- a large number of assets (including millions of smart meters);
- assets are spread geographically throughout the service area of the utility;
- communication demands for bandwidth and availability are relatively low.

Based on the criterion “control” and the data requirements, most utilities consider that a private wireless network which uses a mass market technology is the optimal solution to connect the smart meters as well as the medium to lower voltage assets in the grid of the future.

Licensed spectrum is a prerequisite for a private wireless network. In order to prevent a lock-in situation with an external licence holder the utility company needs to own the spectrum license, even if they outsource maintenance and management to a third party or even share the network with other critical national infrastructure operators. It is for this reason that utilities wish to have spectrum bands allocated for utility purposes.

Spectrum proposal

Dedicated spectrum for utilities in the UHF frequency range (450-470 MHz) will satisfy strategic and the technical conditions for the roll-out of smart meters as well as for grid management:

- The geographical coverage offered in this frequency range is optimal;
- The amount of spectrum needed is a contiguous block of 3 MHz of paired spectrum, i.e. 2 x 3 MHz.

This band supports many standardised and proven mass-market technologies which will bring cost benefits to consumers and lower the risk associated with new or customised technologies.

In addition to the above band, 10 MHz of spectrum in L-band (1500 MHz range) for more data intensive applications, including security and point-to-multipoint applications is required.

Other complementary allocations (outside the spectrum range being investigated), including deregulated shared spectrum in 870-876 MHz band.

European Harmonisation

In conclusion, the **EUTC** is of the opinion that the above request for a **limited amount of harmonised spectrum** contributes to keeping costs for energy consumers as low as possible, increases service reliability and helps achieve the overarching goal of a **trusted mission-critical communication** infrastructure to facilitate smart meter roll-out and smart grid developments for **low carbon economy** of the future.

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