EUTC

EUTC comments on the European Commission White Paper "How to master Europe's digital infrastructure needs?"

1. Motivation for energy systems critical communication needs

Everyday life and commercial processes in modern societies are heavily dependent on public communications services. This dependency is even more increased by the usage of 5G mobile services and the approaching 6G mobile services. The usage of secure and reliable voice, data and video communications for personal use are omnipresent in the fields of transport, manufacturing, health, agriculture and more. On the other hand all the above mentioned services need electrical power to function properly. Typically commercial network operators do not have end-to-end power backup for their networking equipment. This has the consequence, that outages in the power supply will stop the digital public infrastructure and no more services are available. This in turn means a severe degradation of everyday life if not more serious consequences like disturbances. In order to prevent this from happening every country needs reliable electrical energy systems. The power systems of the past have been very reliable. To fight climate change there is the need to drastically reduce the carbon footprint of the energy systems in Europe in order to meet the agreed climate goals. In the energy system this goal is achieved by replacing traditional thermal power plants with renewables like wind turbines or photovoltaic installations. Unfortunately, most renewables have a fluctuating generation characteristic which means fluctuations in wind speed result in fluctuations in the generated power and for photovoltaics similarly have a time and weather based varying output . In the energy system there has to be a balance between generation and supply at any given time. If this requirement is not met for a certain interval, the system will eventually crash and the result is a blackout in the country. In order to prevent this from happening renewable sources are controlled via communication links to keep the system balanced. This process makes very clear, that communication services used to control renewables are system critical. If they fail, the whole energy system may fail and as a consequence the proper functioning of public life would be in danger. Since the majority of the renewable energy sources are connected to medium and low voltage levels of the power grid (for example in Germany over 50 GW today) a cost effective solution spanning wide areas is required. Radio-based solutions are the appropriate choice to keep cost down. These solutions need frequency spectrum to be operated. Because of the critical application the services need to be black-out resilient and thus need end-to-end power resilience. This is not the case in public commercial mobile networks. Consequently a dedicated mobile network for critical communication services for utilities is required. In addition to the control of renewables there are more services like status monitoring of the power grid in medium voltage and low voltage, digital substation control, smart metering, electric vehicle charging control and more.

In summary the availability of power supply is dependent on the availability of critical communication services to control the power grid. In other words utility communication services are critical to modern energy systems and consequently to everyday life and commercial processes.

2. Comments on the white paper from the utility perspective

Chapter 2.1

Utilities typically have a good *fibre coverage* alongside the extra high voltage and high voltage power grid lines. This is used as the digital communication backbone. On the other hand in medium voltage and low voltage there is typically some dedicated utility communication infrastructure. This represents a big hurdle for the implementation of energy transition to reduce the carbon footprint of the energy system. *Satellite broadband* services are interesting for utilities in cases where high bandwidth is required and no fibre available. Specifically low earth orbit satellite (LEO) and medium earth orbit satellite (MEO) services are useful for video, voice and bulk data transfer because of the relatively low delay. However due to the risk of missing end-to-end power resiliency and political influences these services should only be used for non-critical services like augmented reality support for technicians in the substation or digital twin applications just to name a few. *Edge computing* is an interesting approach for utilities as well. An example is the state estimation of the low voltage power grid in a secondary substation. This makes sure that requirements for the integration of photovoltaic, electric vehicles and heat pumps may be met without overwhelming a central control function.

Chapter 2.2

Currently 4G-technology is functionally sufficient for utilities. However this may change in future and *5G-networks* advanced functions like direct device to device communication may be useful.

The *quantum communication infrastructure (EuroQCI)* may be useful for utilities for example to protect their critical digital infrastructure by authentication of devices with digital signatures. This makes sure that new devices can only be attached if there is the correct signature.

Chapter 2.3.2

A very interesting topic for utilities in Europe would be the development of cyber security devices made in Europe. Probably this could be addressed by the *European Digital Innovation Hubs.*

Chapter 2.3.3

No single market for electronic communication networks: In the European utility space a harmonisation of the frequency bands in the 400 MHz range would be very helpful and would create a single European wide market for equipment and services.

Radio spectrum: “It is imperative that spectrum is managed in a more coordinated way among all member states”. EUTC fully supports this view.

Chapter 2.3.5

Sustainability challenges: The sustainability of energy systems can be accelerated by making frequency spectrum available for the use in critical mobile communication networks in order to integrate a large portion of renewable energy sources as described in paragraph 1.

Chapter 2.4.

Need for security in the supply and in the operation of networks. This holds definitively true for critical communication in energy systems. Since the energy system is likely the most critical component in the supply of a country, strict rules must apply to the selection of trusted suppliers. In addition *security standards for end-to-end connectivity* are of utmost importance to utility communication systems. By digitising our energy systems in preparation for energy transition and to accommodate modern services the whole critical infrastructure is prone to cyber-attacks. Also *security by design*, proper monitoring and threat intelligence are measures to harden utility communication systems.

Chapter 3.1.

Community of European innovators: An important task should be added. This is the creation of powerful European cyber security solutions in order to achieve autonomy from overseas vendors and protect the European power systems against possible cyber-attacks. This can be achieved by partnerships between European vendors and businesses and would increase *EU’s digital sovereignty*.

Chapter 3.2.5.

Radio spectrum: As described in paragraph 1. Dedicated radio spectrum is the means for utilities to digitise their power grids and foster energy transition thus reducing the carbon footprint of the energy system. In contrast to mobile network operators utility communication does not require large spectrum bandwidth. For example the 450 MHz LTE critical mobile network in Germany uses a bandwidth of two times 4.74 MHz for up- and downlink respectively. The achievable data rates are sufficient for the critical communication required for grid control in the medium and low voltage layer of the power grids. Commercial mobile network operators need much more frequency spectrum to meet the requirements of 5G and in the future 6G technologies.

For both types of networks – utility specific mission critical and commercial mobile network operators as well - it is mandatory to build upon 3GPP standardized platforms to facilitate a solid market of products and services.

Chapter 3.2.6.

Copper switch-off: The migration from legacy copper to fibre networks is desirable in the utility space as well. On the other hand there is still a lot of utility owned copper communication lines in use and their replacement is in many cases too costly. An alternative solution is the use of the copper infrastructure for critical grid control and utilize broadband satellite services for non-critical bandwidth intensive applications like augmented reality or digital twins.

Chapter 3.3.

EUTC fully supports the statements made in chapter 3.3.

In addition, a distinction needs to be made between 'security' and 'resilience', especially in relation to critical utility telecommunications control networks. Although the intention is to ensure telecoms networks are 100% secure and reliable, in reality networks are penetrated and occasional fail, often due to weather related events – especially with the more severe weather incidents caused by climate change. In this context, resilience means not only the ability of a network to withstand severe weather events and cyber attacks, but to continue to function when under stress; and if it does fail, to be able to be rapidly restored. The architecture of a critical network may therefore be different to that of general commercial networks in order to meet these and other challenging operational requirements.

Chapter 3.3.1.

Quantum and post-quantum technologies: The quantum security challenge holds true for utility communication systems as well. Given the criticality to EU's energy systems specific European solutions and services – based on international standards- should be envisaged. The *community of European innovators* mentioned in chapter 3.1. could play an important role to provide solutions.

3. Conclusion

The white paper addresses the very important domain of resilient digital infrastructures for Europe for the commercial areas and public life. In addition to that EUTC would very much welcome the inclusion of utility specific aspects where ever possible to the white paper since the future of European energy systems if of huge importance to all EU member states.

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