Commentary on RSPG24- 030: Draft RSPG Report on 6G Strategic Vision

The European Utilities Telecom Council (EUTC) represents the telecommunication interests of European electricity and gas generation, transmission and distribution companies. EUTC welcomes the opportunity to contribute to the RSPG's Draft Report on a Strategic Vision for 6G. We believe that together with other vertical sectors we can make a positive contribution to the development of this Strategic Vision, especially where it relates to private networks.

EUTC is proud that its members are an integral component of the battle to decarbonize European Society in a cost-effective, secure and sustainable manner. Electricity networks play a central role in delivering these goals. This is of course not just a European goal, but a global ambition coordinated through the Conference of the Parties to the United Nations (UN) Framework Convention on Climate Change (COP). In following these global targets, it is essential to ensure that European manufacturers are placed in a position to compete effectively on the world market with innovative products and services founded on a competitive and mature European Single Market.

RSPG's 6G Strategic Vision

Private Networks

The RSPG Report makes a number of references to 'Private Networks'. 4G/LTE has seen the growth of private networks using 3GPP technologies. This trend is already increasing with 5G and is forecast to continue growing with 6G. Although this may be considered to include virtualization and slicing in MNOs networks, it will also include vertical users building their own private networks as identified in section 2.4 of the Report.

The majority of these private networks will be on site or 'campus' style networks, but there will also be some wide-area networks in sub-1 GHz spectrum. Some will be new networks whilst others will be formed by the migration of existing private 4G/LTE networks into 5G and then 6G, or even directly to 6G.

The Vision for these networks may involve privately licensed spectrum, licence-exempt spectrum and Non-Terrestrial Networks (NTN) integrated into one seamless 6G network.

Vertical Markets

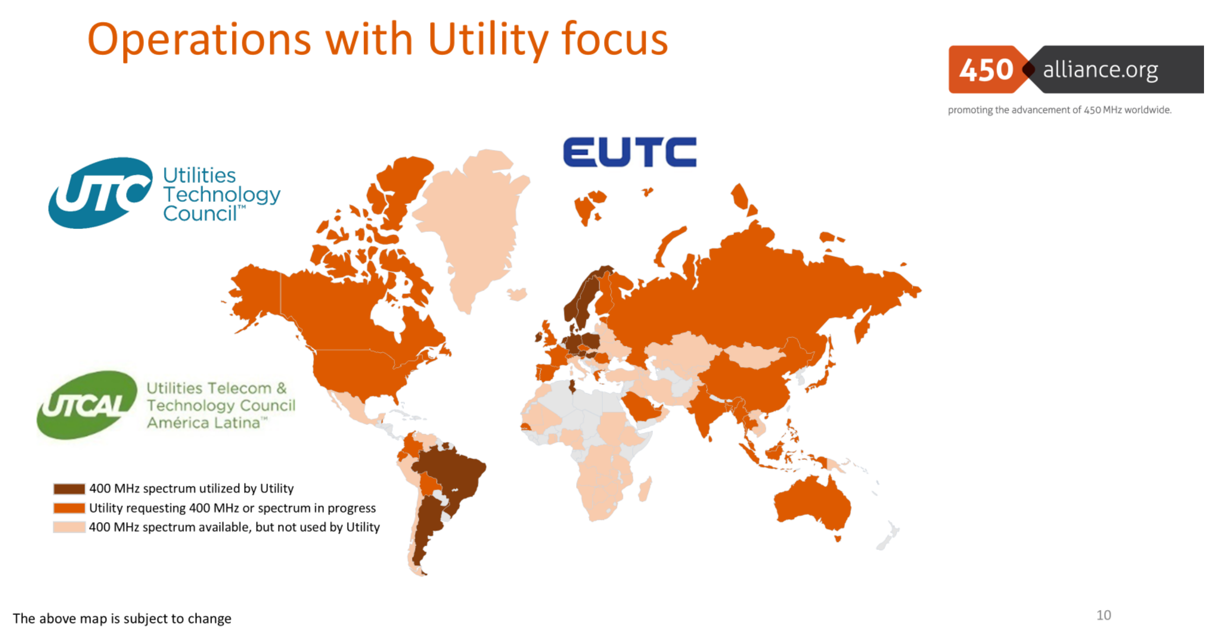
The RSPG Report makes passing reference to vertical markets, but we believe it is important to expand Section 9 of the Report to include a section on 'Views from Vertical Markets'. 'Operators' generate their revenue from the sale of telecommunications services, whereas 'Verticals' derive their revenue from the sale of non-telecommunications products and services – such as energy, water, transportation, industrial products etc. Non-commercial vertical sectors, such as Public Safety, use telecommunications to deliver essential services to the public.

These ‘vertical’ markets have different motivations for their telecoms investments compared to mobile operators. Vertical players can therefore bring much needed capital investment to the 6G market to supplement investment by network operators. This will help to plug the investment gap which has been a significant challenge for the rollout of 5G.

Spectrum for 6G

Section 2.4 ‘Locals and verticals’ addresses potential spectrum options for 6G local networks in the midband range, mainly 3.8-4.2 GHz. This is welcome for on site and campus style networks over a limited area, but frequencies below 1 GHz are essential for wide-area networks requiring geographic coverage, and penetration into harder-to-reach areas, for example, below ground. For these private network applications, we foresee continuing exploitation of spectrum in the 400 MHz band. Spectrum bands in the 400 MHz region are of little interest to Operators as they are usually only between 2 x 3 MHz and 2 x 5MHz bandwidth. This bandwidth does not enable sufficient traffic to be carried by an operator to make it a commercial proposition, but it is adequate for mission critical applications where coverage, resilience and availability are the essential parameters.

Growth in 400 MHz private networks is particularly pronounced outside of Europe (as shown on the 450 Alliance map below), and we hope that European Regulators will act swiftly to ensure that European consumers, industry and manufacturers will not be disadvantaged through a slow release of spectrum in the 400 MHz region for early deployment of private 6G networks.



EUTC’s Strategic Vision for 6G

EUTC’s detailed response below focuses mainly on the lower frequency bands being addressed by 5G, and subsequently 6G, and future wireless broadband networks. That is not to say that there will not be critical utility applications in the higher frequency bands (specifically the sub-THz bands), simply that utility applications in these frequency ranges are not yet apparent. This response also focuses on licensed spectrum applications.

Critical utility communications often avoid licence-exempt spectrum as there is no guarantee of performance or interference-free operation. However, we see emerging requirements in terms of peer-to-peer and mesh communications in both licensed and licence-exempt spectrum. This may well be one of 6G's defining characteristics in addition to gateway and repeater modes already on the roadmap for 5G.

Harmonisation of spectrum in 410-430 MHz and 450-470 MHz for mission critical services

EUTC's contribution to the Strategic Vision for 6G can bring a focus for one of the critical vertical sectors, and the Ultra Reliable Low Latency Communications (URLLC) applications which have arguably made the least progress in 5G.

EUTC has historically made a case for harmonisation of spectrum access for utilities in the 400 MHz bands as this is the 'sweet spot' blending coverage and capacity for mission critical applications. 6G may provide the impetus for rationalization of services in the 400 MHz bands to facilitate the harmonisation of spectrum access for mission critical services, especially in extending 6G into bands below 400 MHz and refarming of the UHF Television Broadcasting Bands.

Extending the lower frequency band to include 380-400 MHz

Following on from the above paragraph on 410-430 MHz and 450-470 MHz bands, it should be noted that the forecast timeline for the introduction of 6G technology is likely to coincide with the decommissioning of current narrowband Public Safety Tetra and Tetrapol networks in 380-400 MHz spectrum across Europe. This may create an opportunity for the introduction of 6G broadband services in this band for mission critical applications.

2 x 10 MHz of spectrum in 470-694 MHz identified for Mission Critical Services

Taking into account the complexity of spectrum access below 1 GHz for mission critical services, and the likelihood that the needs for these applications will continue to grow for the benefit of all of society, if spectrum in the band 470-694 MHz is to become available for IMT type services from 2035, it would be wise to reserve 2 x 10 MHz of this spectrum for mission critical applications, including utilities.

Resilience of future wireless broadband networks

Mobile broadband connectivity has presented society with vastly more options and facilities than could ever have been imagined by previous generations, but one element of the former copper-wired networks has been lost almost imperceptibly. This is the regulation of the legacy Public Switched Telephone Networks (PSTN) to deliver 99.999% availability not only with the provision of independent power supplies, but also rudimentary low voltage Direct Current (DC) provision to enable simple powering of terminal equipment connected to the line. This delivered an exceptionally reliable means for connecting the Public Safety and utility services for all members of society. We are at risk of losing this beneficial universal service without an adequate replacement being available.

Resilience forms one of the central pillars of the Programme by the President of the European Commission, Ursula von der Leyen, for the next Five Years[1]. Her goal of increasing

[1] https://ec.europa.eu/commission/presscorner/detail/en/speech_24_6084

preparedness places an obligation on the electricity networks for enhanced resilience as the European economy and population become more dependent on secure, sustainable, affordable and reliable electricity supplies. However, operational telecommunications are an essential element of modern digital energy networks, requiring highly resilient fixed and mobile telecommunications networks. Resilience must become an integral element of 6G technology as society becomes more interconnected and dependent on communications.

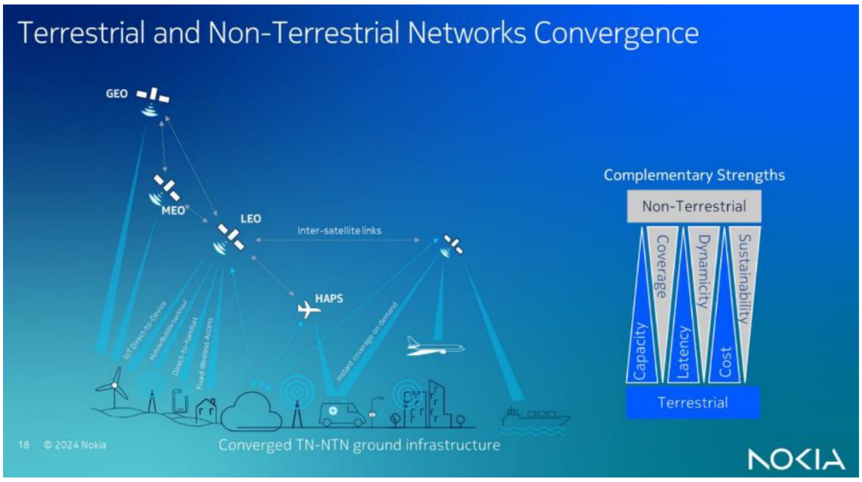
Integration of non-terrestrial networks

Utilities are interested in developments in integrating non-terrestrial elements into networks. This has the potential to enhance resilience and facilitate coverage in geographic areas which are difficult and/or expensive to provide coverage from terrestrial base stations. Utilities see particular challenges in the use of hybrid networks when seeking to provide deterministic connectivity with low latency, minimal jitter and guaranteed asymmetry. This may provide opportunities for valuable research projects within the 6G program.

A secondary issue for satellite connectivity is the perceived security risk as the attack surface is potentially greatly increased for airborne elements, and utilities require security and resilience against attack up to and including hostile nation-state capabilities.

One final element where EUTC believes further research is needed for non-terrestrial networks (especially large LEO constellations) is the potential additional vulnerability due to space weather events. This is of great importance to utilities as these space weather incidents also cause major disruption to electricity networks. It could be catastrophic if the monitoring and switching operations required by utilities to minimize the potential impacts of space weather events could not be implemented due to loss of telecommunications connectivity.

In this context, utilities welcome the Commission initiative IRIS². This new multi-orbital constellation of 290 satellites aims to combine the benefits offered by Medium Earth Orbit (MEO) and Low Earth (LEO) satellites, thereby providing comprehensive secure connectivity. The aim should be to include this initiative in the 6G Vision.



Addressing security challenges

Telecoms faces an unprecedented level of security challenges from an ever increasingly diverse range of sources. The design of 6G networks must have security elements designed-in from the outset, including massive denial-of-service attacks and quantum computing.

Symmetry and latency requirements for specialist services

Specialist industry applications sometimes require demanding symmetry and latency requirements of no particular value to the majority of users. These requirements can make demands on the architecture of the network, increasing its cost or limiting its flexibility for other users. It may be that the optimum solution for delivering these highly specialized services is separate dedicated networks for which suitable and sufficient spectrum needs to be made available, especially for utilities and industrial applications.

Implications of carbon reduction targets

The overriding requirement to reduce carbon emissions associated with future wireless broadband networks may conflict with the development of 6G, introduction of artificial intelligence (AI) and associated spectrum allocations. Ever higher frequency networks implies densification of infrastructure, potentially leading to increased energy consumption. Innovative strategies may be beneficial to address this need, ranging from closer collaboration between utility energy networks and telecommunications networks, to offloading data from 6G mobile networks to local WiFi networks.

Effect of climate change

The physical effects of climate change will need to be taken into account in the construction of future wireless networks, such as the increasing potential flooding risk and higher wind loading on antenna structures.

As well as the above, there may also be effects on radio propagation modeling and radio channels particularly due to more intense rainfall events which are especially relevant at the higher frequencies being contemplated for 6G. Propagation modeling for 6G must incorporate parameters adapted to climate change which may differ from historic scenarios.

Environmental impact of 6G infrastructure

Although most European citizens consider the environmental impact of base station infrastructure is justified on the basis of improved connectivity and services, there remains significant public hostility to the potential adverse visual intrusion of antenna structures on the environment. The move to higher frequencies may mitigate the impact to some degree because of smaller elements required at the higher frequencies, but the increase in MIMO (Multiple Input Multiple Output) densities may counterbalance this reduction in individual element size. Reducing any detrimental impact of visual intrusion from future wireless networks should be a priority.

Research into any potential adverse health effects from the use of higher radio frequencies in close proximity to humans must be included in 6G research to reassure the public that this element is being adequately addressed.

Backwards compatibility

As we move forward to 6G, backwards compatibility for legacy equipment ensures long life cycles of equipment which enhances sustainability and avoidance of stranded assets. Utility systems are often 5-10 years in planning and rollout, and are then expected to operate for at least 15 years, ideally 25 years before replacement. This not only enhances sustainability through minimizing waste and consumption of new raw materials, but also ensures that energy consumers do not have to pay for costly upgrades of technology solely to ensure continuity of operations and provision of utility services.

Strategic Spectrum Matters

EUTC's concerns in terms of strategic spectrum matters include three major policy areas where spectrum policy must support other EU objectives, specifically:

- Energy Transition and Climate Change: as outlined in previous consultations, the energy transition envisages major changes in the sources of energy supply, especially in the volume of intermittent and unpredictable generation and the whole architecture of the energy network. At the same time, electrification of heat and transport require massive growth in the amount of energy which must be supplied. Climate change also places greater strains on the energy networks due to severe weather events both affecting energy supply and demand, together with a greater potential for physical damage to energy network infrastructure.
- Resilience: as society becomes more interconnected and reliant on a secure supply of electricity, energy network resilience becomes increasingly vital, but energy network operations are themselves critically dependent on reliable operational telecommunications.
- Cyber Security: although physical security is an important element in securing energy networks, the increasingly connected nature of these network by means of advanced telecommunications creates opportunity for hostile forces to disrupt energy supplies on a potentially a massive scale, and also undermine stable and fair energy markets.

The European Utilities Telecom Council (EUTC)

The European Utilities Telecom Council (EUTC) is the leading European Utilities trade association dedicated to informing its members and influencing policies on how telecommunication solutions and associated challenges can support the future smart infrastructures and the related policy objectives through the use of innovative technologies, processes, business insights and professional people.


Typical utility distribution control room

This is combined with sharing best practices and learning from across the EUTC and the UTC global organization of telecommunication professionals within the field of utilities and other critical infrastructure environments and associated stakeholders.

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