Call for inputs on views on the impact of 5G on regulation, and to the role of regulation in enabling the 5G ecosystem

Utilities are embarked in a digitalization process where telecommunication services will play a fundamental role to ensure access - with enough capability and reliability - to a massive amount of network devices. Only with this digitalization the grids will become as smart as needed to allow the customers the active role they are claiming for its energy involvement (use and production) and ensure grid stability.

From a public mobile telecommunications perspective, all regions of the world are competing to become world leaders in 5G technology. Indeed, one could summarize the world's current perspective on 5G as, "we don't know what it is, but we must have it."

One 5G vision sets an ambition to enable a world where everything is provided wirelessly to the end device by a converged fixed and mobile infrastructure that works everywhere. 5G infrastructure should be far more demand/user/device centric with the agility to marshal network/spectrum resources to deliver "always sufficient" data rate and low latency to give the users the perception of infinite capacity. This offers a route to much higher-performing networks and a far more predictable quality of experience that is essential for an infrastructure that is to support an expanding digital economy and connected society.

5G is the next generation of mobile broadband that will eventually encompass all mobile connectivity. If we are to believe the hype, with 5G, we will see exponentially faster download and upload speeds; latency - the time it takes devices to communicate with each other – will also dramatically decrease and the density of connections will be massive.

EUTC acknowledges that there are some really important aspects gathered in BEREC's draft list of items that should be addressed to assist the enablement of 5G, network and delivered services. Quality of service, coverage, vendor lock-in avoidance, planning, access to spectrum and backhaul are key aspects that we cover in this document.

Utilities are not just another customer use case. Utilities present, from a service perspective, a number of challenges that have not yet been solved by commercial public telecommunication services. Moreover, utilities are a needed telecommunications infrastructure provider that is today present in most of the non-incumbent (competitive) telecommunication networks. Utility provided optical fiber cables over grid infrastructure connect commercial telecommunication networks. This capability, together with the pervasive need of new assets closer to the customer (base stations), and their room and energy needs, make utilities be the key enabler of 5G networks timely expansion.

The key question for utilities is how their unique requirements will be accommodated in a 5G world, especially the need for service coverage in rural and suburban areas plus underground assets, power resilience and guaranteed availability especially in adverse weather conditions. The solutions may include the use of the grid infrastructure in a framework that would make this attractive to utilities and carriers to enable a proactive and agile approach, the integration of private networks with commercially provided 5G services (to derive resilience and remote coverage from a utility self-provided network associated with the capacity and lower cost of commercial mobile networks, and the deployment of 5G with network implementations that allow the availability, reliability and quality of service needed for utility services. Security concerns might be the greatest impediment to such a mode of operation, but it would be valuable if this concept of composite networks could be progressed through the 5G development process.

There are apparent opportunities with 5G for utilities to assist commercial rollout, especially with power supplies, backhaul and base station hosting for the much denser networks required for 5G if both telecoms and energy regulatory environments encourage this approach in a co-ordinated way.

The role of regulation in enabling the 5G ecosystem

- The 5G world will be very different to the 2G/GSM world where the mobile network operators were the key players. The 5G ecosystem will embrace many more market players than even 4G/LTE. Mobile network operators will be major players in 5G, but participation in the market by other participants must be facilitated through access to private spectrum. Licence-exempt spectrum for short range devices and those applications which can survive with a lower grade of service will continue to be major complementary opportunities, but there remains a gap in the market between telecoms network operators and licence-exempt spectrum which needs licensed spectrum to be able to develop. Some administrations are already intent on releasing spectrum for industrial applications, and the rail sector is interested in developing their own mission critical operational telecoms networks. However, utilities must also have access to licensed spectrum for operational purposes in furtherance of the BEREC strategic priority of promoting competition and investment.
- 5G is being driven by 3GPP Partnership which has been very successful in delivering the required global standards to a rigid and tight deadline. The downside is that only well-resourced organisations with a global vision have been able to participate freely. The risk is that the voice of the user community is not well represented, and that governments and regulators representing the interests of consumers are largely absent, leaving a gap in consideration of the social consequences. BEREC rightly considers empowering and protecting end users one of its strategic priorities, but this requires wider participation in the standards-making process either directly or through collaboration by governments and regulators with end-users such as consumer groups, health care, utilities, transportation and public safety.

- 5G is set to impact almost every aspect of our lives and the economy, but all these areas are governed by different government policy departments and regulators. If Europe is to derive the full benefit of 5G, regulators must work more closely together to align policy objectives and investment cycles. In the case of utilities, electronic communications regulators must engage with energy and environmental regulators to ensure regulatory frameworks reflect over-riding objectives of carbon reduction, sustainability and security. EUTC encourages BEREC not only to strive to enhance its cooperation with the EU institutions and international fora, but also to work together as national regulators to avoid conflicting policy objectives among electronic communications and energy and environmental regulators. The enabling roles of utilities, and the relevance of the electricity service for electronic communications should be explicitly addressed, to find synergies in the collaboration of both regulators for the benefit of society with better electronic communications over a more reliable electricity grid.

Policy consequences

5G faces some policy challenges which experts in the field are discussing openly in technical briefings but receive little attention in high-profile public pronouncements. A few illustrative examples may help.

Base Station Sites

5G will require many more base station sites, one order of magnitude or more possibly. Finding suitable sites will be a major challenge. Massive MiMo antennas required to deliver the advanced beam steering and enhanced data rates may be physically quite large. Technological developments will not be able to reduce their size as space diversity is an essential component, although disguising them or concealing behind other features such as advertising billboards or shop signs is an option in some locations.

At the higher frequencies being envisaged for 5G (24 GHz and above), physical obstructions and rain become a significant blockage to the wave path, and base station coverage areas are likely to be less than 100 meters. Thus, for example, in many cities where it has been suggested base stations can be incorporated into street lights, trees may well block or diminish coverage, especially when the leaves are wet.

However, above all these requirements is the need for much more back-haul, especially fibreoptic, and reliable power supplies.

Backhaul

One of the problems with the rapid roll out of existing 4G/LTE networks has been backhaul. Creating base stations with multiple antennas and multi-frequency bands has created the requirement for gigabit backhaul which many existing sites have not been able to accommodate. Ideally, 5G sites will have fibre backhaul, but connectivity with backhaul fibre for the dense network of base stations envisaged for small 5G cells is likely to be expensive, especially in areas not already well served by fibre. One solution may to use high frequency radio backhaul up to 100 GHz and beyond, although at these frequencies (as noted above) obstruction becomes the challenge. "In band" backhaul using the same radio frequency as the link to the consumer device to the base station may make planning easier. In addition, possibly hopping from one base station to another and then into the core in a similar manner as a mesh network may offer low cost solutions at the expense of reduced data rate.

The policy challenge here is the availability of space for these antenna as well as the expectation of reliable electricity service.

Electricity Power Supply

The vast number of small radio sites envisaged will require electricity supply. The cost of installing and maintaining these power sources reliably may create a significant overhead cost. In a world of increasing energy costs and sensitivity to power consumption and emissions, these supplies may need to be metered independently of power supplied to the building or infrastructure to which the base station is attached.

Power Consumption

Related to the power supply issues described above, the power consumption of the dense network of base stations with complex signal processing requirements needs to be assessed. The power consumption of individual base stations must be reduced by an order of magnitude just to keep costs level if the number of base stations increases as predicted. The way in which this is achieved may have an impact on the 5G services utilities might want to access. Two scenarios that might deliver these savings, but also might have a negative impact on the reliability of utility services are:

- Base stations being shut down when traffic is light, either during the night, e.g., midnight to 6:00 am; or when facilities are provided to a venue but not in use, e.g., sports venues. In these situations, it might be conceivable that capacity is reduced by closing down the small cells, retaining macrocells for wide-area coverage, but there are likely to be coverage blackspots from such a strategy.
- Using only renewable/sustainable energy to power base stations with batteries powered by solar cells and/or wind turbines. In these scenarios, 15 base stations would be planned to a given availability, possibly even 99%, but unlikely to be 99.999% as required by utilities to meet the expectations of their customers and regulators (where applicable).

Rural and underground coverage

Rural areas are not of great interest to commercial telecommunications operators, and networks to these rural communities and assets will have to be externally stimulated. Utilities have a need and the infrastructure to access them, and should be able to make a positive contribution to a 5G world.

Underground coverage is key for M2M type communications (as those of Smart Grids), and M2M-accessible assets are often disguised and/or buried not to interfere with urban and suburban areas. As revenue is limited for this market segment, infrastructure to produce this coverage will not be produced unless stimulated; utilities do have needs here, and their assets can play a role in this domain.

Radiofrequency (RF) Safety

When mobile phones first started to become commonly used, there was a lot of concern about possible detrimental health impacts from using radio emitting devices for sustained periods close to the body. These fears have largely evaporated in recent years, but the growth of 5G in microwave bands could reignite health concerns. The new 5G microwave bands around 24-28 GHz are 10 times the frequency of previous mobile devices using 800 MHz to 2400 MHz. Determining public response to new technology is always tricky: for example, there were concerns about Wi-Fi in the 2.4 GHz band with some schools initially banning Wi-Fi networks on school grounds, whereas there is no obvious concern about infrared devices at 24,000 GHz or children using pocket flashlights emitting electromagnetic radiation at 700,000 GHz. [Note: the energy density is more important than the frequency.]

Planning Consent/Zoning

Network operators sometimes highlight planning /zoning processes as major constraints on network construction, pressing for automatic rights to attach their base stations to public – or even private – assets at regulated low-cost rates. Although not necessarily a major issue, the fact that operators raise the issue in advance of widespread network rollouts indicates the scale of their concerns. The issue may be more related to the time taken to obtain permits and the bureaucracy involved rather than the on-going cost. In some countries, the regulatory authorities have granted accelerated rights for small cell deployment, but this has become a major issue in the U.S. in recent years as some carriers have sought to bypass local jurisdictions' and even safety processes.

5G carries a risk of traffic congestion such that critical data does not get through within the necessary time frame. Because of the massive potential capacity of 5G networks, this is seen as less of a problem than previous 4G networks, and before them 3G/2G/1G and the original analogue manual telephone service.

Security

Cybersecurity is frequently raised as a major issue for 5G networks, particularly related to equipment vendors, although it is not clear that 5G will be any more vulnerable than previous generations of mobile networks. If all telecoms networks are treated as "untrusted" (which radio networks must usually be as no one can prevent over the air monitoring and attack), then appropriate security measures can be applied to the traffic conveyed via the network.

Denial of Service is a key threat to radio networks which is difficult to counter if the source is radio jamming. However, this can only be a local issue, and is not a likely 16 method for serious attack as it discloses the location of the source of the interference which can then be traced and eliminated.

Traffic Prioritization/Net Neutrality

What still appears to be an issue is the concept of net neutrality and the freedom of a carrier to prioritize one organization's traffic over another. [Not to be confused with priority afforded to different services such that a real-time video call can be prioritized over a video download.]

Some operators claim that they cannot prioritize utility SCADA traffic over email as it is all data; or utility emergency voice over general commercial voice. This is more of a policy or regulatory issue than a technological one. It will be important that utilities stress to regulators that if utilities are to make use of 5G commercial networks, their traffic has to be prioritized. Thus far, utilities have been unsuccessful in efforts treated in the same category as public safety, so it is critical to ensure that the future does not replicate the past.

ITU Policy challenges

Utilities use a variety of telecoms solutions to meet their diverse needs which vary with parameters beyond their control, such as geographic terrain, regulatory constraints and environmental factors. Spectrum sources to support wireless networks include:

- Licensed of spectrum;
- Licence-exempt spectrum
- Third-party providers of telecoms networks or spectrum; and
- Commercial using network mobile operator solutions.

As you can imagine 5G requires significant amount of spectrum. Many countries and regional organizations have identified and allocated spectrum for terrestrial (as opposed to satellite) 5G. Unlike LTE, 5G operates in three different areas of the radio spectrum. While this may not seem important, it will have a dramatic effect on users' experience of 5G. Developments in worldwide spectrum policy take place in the ITU's World Radiocommunications Conference.

5G is presented as a global race with those at the back of the pack relegated to nearly third-world status. This has led to the debate in the ITU becoming politicized. In spectrum bands, this relates to:

- The number of bands a chip has to support which is constrained by the capability of the silicon designers; and
- Those bands which are globally harmonized and therefore incorporated into every chip and handset.

At the lower end of the frequency range, only 700 MHz appears to have been identified for 5G in Europe. With only 2 x 30 MHz available for FDD and 20 MHz for SDL in the European band plan, there is not much space for either capacity or multiple operators. One might have expected the lower frequency bands to be a priority for countries with larger geographic land masses to cover as this is easier at lower frequencies, but it may indicate that most countries foresee 5G as a dense urban area technology/hot-spot solution, and are therefore focusing on spectrum more suited to this environment than wide-area coverage which will remain with 4G/LTE for the foreseeable future.

3.4-3.6 GHz is the centre of the band on which most international activity is focused, with extensions to 4.2 GHz. Existing incumbents using WiMAX or LTE in 3.5 GHz bands are less vocal as they may get a windfall commercial gain.

The "pioneer" futuristic region is the microwave or millimetre wavebands of 24-28 GHz where there is intense competition between the U.S., Europe and Asia. Europe is driving hard at 24.25-27.5 GHz as they have a lot of fixed links in 28 GHz, whereas the U.S. has decided on the 28 GHz band. There is potential for a compromise at 26- 28 GHz using the top of the European band and bottom of the U.S. band to be within the tuning range of a single device which, as of this writing, may likely be the outcome of the World Radiocommunications Conference in November 2019.

Europe has harmonized the 27.5-29.5 GHz band for broadband satellite and is supportive of the worldwide use of this band for ESIM (Earth Stations in Motion, e.g., satellite terminals on trains to deliver broadband internet to passengers). In Europe's opinion, this band is therefore not available for 5G.

The GSM Association (GSMA), the global trade association for mobile network operators wants the best of both worlds. 26 GHz is one of the bands WRC-19's Agenda Item 1.13 is looking at. In GSMA's view: "*For regulators and governments, it is a great opportunity to lay the groundwork for successful 5G rollouts. At the same time, the global marketplace is driving the need for additional frequencies to meet 5G demands, such as the 28 GHz band. The GSMA recognizes and supports actions by governments and operators in many countries to test and allocate the 28 GHz band for 5G under an existing mobile allocation in the ITU's Radio Regulations. In the end, it is up to countries to decide how they want to move forward. The important part is that operators get the opportunity to show 5G's true potential*."

ABOUT EUTC

The European Utilities Telecom Council (EUTC) is a non-profit organization delivering education, collaboration, best practices and thought leadership in telecommunication technology to utilities, other critical infrastructure providers and regulators, ensuring efficient, secure, sustainable and affordable smart infrastructure solutions. For more information, please visit our website www.eutc.org

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