Capturing the societal benefits of 5G

Telenor exists to connect our customers to what matters most. Our strategy is driven by the ambition to continuously improve the customer experience. The introduction of 5G offers new opportunities that will provide significant benefits to citizens, businesses and the public sector. To fully realise this socio-economic potential, broad collaboration will be key.

The next generation mobile platform, 5G, has been coined a General Purpose Technology with the potential to drastically alter societies through its impact on economic and social structures. 5G is expected to fuel the future growth in several industries and society at large, supporting a broad set of use cases and ultimately sparking a new era of enhanced digitisation of our society. Today, however, the business models and corresponding business cases related to 5G are still incomplete and significant investment in this new technology will be required before any expected benefits can materialise.

In this paper we describe Telenor's position on key areas where private and public sectors should collaborate to gain from and contribute to the opportunities offered by 5G. To fully capture the benefits of 5G we believe focus should be on the following:

1. *Open systems and cross-sector innovation*

2. *Timely and flexible spectrum allocation and licensing*

3. *Effective local level infrastructure regulation and policy*

4. *Tailored use of network resources*

After an introduction to 5G, each of these areas is described.

Introduction to 5G

Telenor is involved in several activities related to 5G. In Norway, Telenor is running several 5G pilots in cooperation with private and public sectors within areas such as autonomous vehicles, remote health services and disaster management. We are also piloting in Denmark and have conducted showcases in Thailand and Malaysia. Further, Telenor is leading a 3-year pan-European research and innovation project (*the ViNNi-project*)[1] with 23 partner organizations. The purpose of this EU-funded project is to accelerate the uptake of 5G in Europe by providing an end-to-end facility that validates the performance of new 5G technologies by operating trials of advanced vertical sector services. Telenor is also engaging with key international bodies such as 3GPP, the main engine for standardizing 5G and exchanging 5G learnings with other operators.

As with any mobile technology generation the transition to 5G will be gradual and offer new and welfare enhancing capabilities and services[2]. During the next years, 4G technologies will continue to be utilized and developed as these technologies currently give society the most effective

---

[1] For more information refer to: https://5g-ppp.eu/5g-vinni/

[2] See for example the following study from the European Commission forecasting the socio-economic benefits of 5G: https://ec.europa.eu/digital-single-market/en/news/5g-deployment-could-bring-millions-jobs-and-billions-euros-benefits-study-finds

solutions. 5G will be introduced in steps based on local market needs as 5G technology matures and new business cases are developed. This means that 4G will play a supporting role to 5G during the initial roll-out phases.

5G will be more efficient than previous generations, and will pave the way for new and innovative ways of digitalising operations in both public and private sectors with additional benefits such as reduced environmental impact (e.g. reduced carbon footprint).

Three main use case categories have been defined for 5G:

1. **Enhanced Mobile BroadBand, eMBB**: Builds on the existing 4G mobile broadband model by providing higher bit rates and improved efficiencies. Mobile operators recognize this need given the expected growth in general mobile usage of internet-based content and services. Several markets, like Japan and South Korea are driving eMBB to support the growing density of traffic in their major cities. In addition, several early initiatives are underway to use mobile systems to provide cost efficient alternatives to fixed services (Fixed Wireless Access) to homes and offices.

2. **Massive Internet of Things, mIoT:**[3] Addresses the support for high density of connected devices, e.g. related to smart cities, smart energy grids, and so forth. Sensors, control units, and other connected devices will be used to optimize time, effort and performance in various contexts. Besides supporting a huge number of devices, power consumption of the devices is reduced to allow for extended battery operation of up to 10 years. Many companies and the public sector deem mIoT as interesting for addressing new business verticals such as eHealth monitoring, transport management and production control.

3. **Ultra-Reliable Low Latency Communication, URLLC**: Is designed to support business or mission critical communication scenarios, such as during emergency situations. Remotely operated or autonomous vehicles or robots also belong to this category. Many use cases are still to emerge, and we expect governmental agencies and specific industries and possibly gaming to drive this. Examples include public safety services (police, ambulance and fire departments), remote operation of excavator/mining vehicles, industrial robots and virtual and augmented reality used for remote inspection, remote medical intervention, and entertainment.

The different use cases will create value to the society in various ways and their introduction will depend on the value they contribute to the actors involved.

Many of the expected use cases can be introduced using 4G and will be further improved or scaled by 5G. The key improvements offered by 5G will be lower latency, higher peak rates, better resource utilization and more flexible business models/partnerships. It will take some time before 5G handsets are widely available, but several use cases such as those within mIoT will not depend on mass market device availability.

Initially 5G coverage may be spotty, meaning that a smooth integration with 4G is needed. This will also be important to take into account when deciding upon support for certain use cases. If, for example, autonomous vehicles depend on 5G coverage, 5G will have to be rolled out according to the relevant geographical areas and somewhat lower service levels have to be planned for when outside of 5G coverage.

---

[3] This is named massive Machine Type Communication (mMTC) by International Telecommunication Union.

Open systems and cross-sector innovation

5G will by design be more open[4] than previous generations of technology, thus increasing opportunities for cross-sector innovation. New 5G capabilities and use cases will be key components and enablers for future innovation in sectors such as the medicine, manufacturing, transportation, agriculture and several others. To seize these opportunities a number of elements must come together.

First, industry standardization must continue. As with previous generations of technology, clearly defined standards have ensured interoperability, economies of scale, and innovation. This will also be important for 5G. Second, for Telenor to fulfil its 5G ambitions and ensure successful innovation, it is important to engage a larger cross-industry ecosystem through open access to relevant platforms. This requires new partnerships to be formed with strengthened focus on cooperation both within different sectors, but also between industry, governments and regulators. The public sector, in particular can play a key role as a driving force behind 5G by facilitating cooperation through private public partnerships. Third, national regulation must support scale, efficiency and innovation initiatives for all areas addressed in this document as long as the citizens' rights and safety are not at risk. Finally, intensified harmonization efforts across countries and sectors will increase benefits related to services and cost levels, for public sector, businesses and citizens in general.

Telenor engages in several innovation projects both internationally and within specific countries. We believe in an ecosystem approach to leverage joint ambitions to provide services and technical solutions. Telenor is also engaging in industry standardization and partnerships to harmonize and drive the solutions in the direction of openness, value-creating capabilities, economies of scale and effectiveness.

Timely and flexible spectrum allocations and licensing

Best-practice spectrum management will support an economically efficient introduction of5G services. As described in our public policy position paper on spectrum, this entails:

- *Reduction of spectrum scarcity,* e.g. by introduction of technology neutrality

- *Promotion of effective and sustainable competition*, e.g. by use of "spectrum caps" when needed, to safeguard competition

- *Reduction of investment risk* through long license durations, strong legal protection of usage rights to spectrum, and permission to trade spectrum

- *A market based allocation method* that promotes efficient use of spectrum whilst permitting governments to collect revenues to the benefit of society

Realistic revenue and price expectations will be of vital importance to the introduction of 5G. Many of the expected benefits from 5G depend on larger bandwidths than are used today. In several markets, effective release of new spectrum will require significantly lower spectrum prices per MHz. Early 5G business cases will not support acquisition of large bandwidths by operators if spectrum reserve prices are too high or due to onerous usage or roll-out conditions.

---

[4] Open refers to defined and recognized interfaces and services that tend to be implemented by several companies to support collaboration

Effective local level infrastructure regulation and policy

Both coverage and capacity are essential factors to plan for in 5G. For an effective mobile network it is essential that the physical infrastructure such as base station sites and backhaul (for connection of the base stations to the core network) are readily available.

For the eMBB use case, 5G will initially leverage from the established infrastructure. However, as traffic increases and higher spectrum bands are used, a denser network will be required to provide adequate services to the citizens - in particular in urban areas with high traffic. Local and central authorities need to ensure that permissions to establish or lease access to base station sites and backhaul are smoothly obtained on cost efficient terms. These aspects may be even more important for other use cases. For example, several of the IoT and critical communication use cases imply a specific need for coverage and/or capacity and may need base stations and antennas to be located in different ways than today in order to provide the requested services to the society. The mobile network ecosystem is working on integrating the technical solutions into street furniture and mounting it on walls as discreetly as possible.

The densification of the networks may be costly. Collaboration between public and private sectors is needed to optimize investments and ensure that societal benefits are realised across the 5G use cases. Similarly, network sharing between operators should be strengthened. Telenor firmly believes that network sharing must be allowed between operators in any market. This will improve both network quality and efficiency to the benefit of society at large. Scarce resources like spectrum, energy and locations will thus be utilised more effectively and with minimum environmental impact.

Tailored use of network resources

5G is designed so that the same physical network will be able to support numerous "virtual networks" tailored for specific services. Using the same physical network for multiple purposes leads to higher resource utilization, economies of scale and scope, shorter time to market and gives clear synergies and increased value and benefit to society.

Serving such a multitude of use cases with one network, increases complexity, which must be managed to secure expected quality for each use case. To harness these benefits network slicing is required. Network slicing is a concept where portions of the end-to-end network resources may be used for specifically defined services by setting up separate logical networks over the same physical network.

One example is a "public emergency services slice" set-up to provide priority access to information and communication during emergency situations. The same set of resources can be available for other uses although priority may be given to the public services slice during critical incidents. Network slicing can also be used for other purposes such as sharing network resources with partners. As slicing is a way to separate network resources, it can also be used as a tool to mitigate security attacks by having other network resources ready to take over during an attack. However, additional mechanisms and solutions are needed to more fully respond to the security and resilience challenges.

As more and more business and mission critical communications are implemented on the same network resources, network slicing becomes increasingly critical. It is important that regulations, such as net neutrality regulation, are not designed to prohibit or restrict the use of network slicing. Without network slicing many of the benefits from use cases like mission critical communication will be hampered.

November 2019

Telenor's Commitment

Telenor is committed to contribute to realizing the immense positive potential for societal benefits offered by 5G. Through trials and broad collaboration we are exploring the opportunities presented and will invest in 5G as it becomes commercially attractive and can provide clear benefits to our customers. This is part of our vision to connect our customers to what matters most and empowering societies.

To reap the full benefits of 5G an ecosystem perspective is needed where both private and public sectors participate and contribute. In particular, it is important that public ambitions are stated in a way that gives the best incentives to invest, operate and innovate. Getting this right 5G will deliver significant value to a broad set of stakeholders by lowering the innovation threshold and improving scale and synergies across public and private initiatives.