

Study Committee D2

Information Systems and Telecommunication

Paper 10187_2022

REFLECTIONS ON THE POTENTIAL USE OF 5G TECHNOLOGIES IN THE ELECTRIC SECTOR

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BRAZIL

Motivation

- The inevitable dominance of 5G technologies as a communication platform in the coming years.

Method/Approach

- Analysis of the characteristics of 5G and its impacts on the operational functions of the Electric Sector.

Objects of investigation

- An attempt was made to distribute 5G in topics covering all aspects of interest to the Electricity Sector, grouping them according to the best fit with operational reality.

Discussion

- The effects of 5G were analyzed on the following topics:

Main 5G resources: the direct impact of these new technologies on the Electric Sector.

Infrastructure and security: The Electric Sector requires reliable and secure communication infrastructure.

Electromagnetic aspects: The new electromagnetic environment must be well understood.

Business models: Huge investments must be well designed.

Asset Management: New technologies can bring about changes in the way assets can be managed.

Conclusion

- 5G can bring big productivity gains to EPU.
- The magnitude of the benefits will be a consequence of a good understanding of the possibilities and the correct choice of technologies to be adopted.
- More details can be found in the paper.

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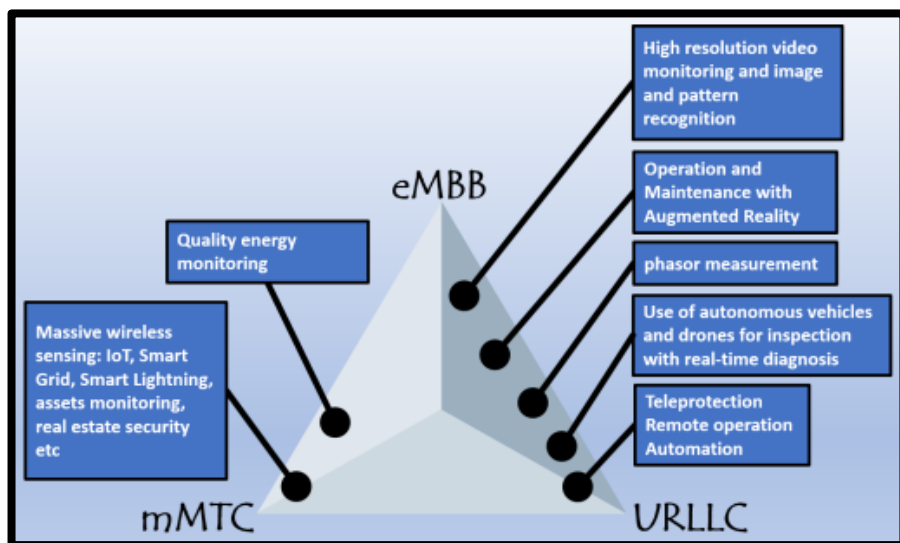
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Technology			Characteristics			
			Bandwidth	Accesses (/km2)	Latency (Ms)	Safety
1G	1980s	Start of mobile voice usage	Analog	-	N/A	N/A
2G	1990s	Start of mobile data use	9.6kb/s	-	600	Introduction of the SIM card
3G	2003	Start of mobile multimedia usage	2Mb/s	-	150	Mutual authentication SIM card / cellular network
4G	2010	Wide use of smartphone	300Mb/s	100k	30-50	Authentications and authorizations on IP networks
5G	2020	Use in critical applications	1.5Gb/s	1M	1-5	Increased IoT privacy and inclusion

- Evolution of mobile phone technologies



- Main 5G resources applied to the Electric Sector

- Wave 1: eMBB (enhanced Mobile Broadband) will operate on networks with high spectral efficiency and high bandwidth.
- Wave 2: mMTC (massive Machine Type Communications) will allow immense number of multiple accesses.
- Wave 3: URLLC (Ultra Reliable Low Latency Communication) will enable, from short messages, critical applications dependent on low latency.

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- 5G technologies will dominate the telecommunications arena for years to come. It is up to the sectors of Society, Commerce and Industry to prepare for the effects that these imminent novelties will cause. Thus, the Electric Sector must prospect and investigate trends in order to be prepared with the caution that its critical mission requires.
- The intrinsic characteristics of these technologies will allow the implementation of new solutions. With the high bands provided by the eMBB it will be possible to secure assets with high resolution images and facial recognition. The unprecedented number of accesses per area that will be made possible by mMTC will leverage smart grid solutions and enable major advances in the operation and maintenance of distribution networks. With the low latency of communications that will be provided by the URLLC, it will be possible to use teleprotection and automation completely wirelessly. That's just to name a few possibilities.
- Other aspects to be deeply explored revolve around the impacts on the management of assets and business models that will allow economically favourable scenarios to the large investments that will be demanded for the construction and expansion of 5G networks.
- Network infrastructures should not cause any concern as they are being designed and implemented for high reliability, especially considering the adoption of lithium batteries as standard.
- The frequency band used do not raise concerns about electromagnetic interference and impacts on workers' health, but caution should be exercised regarding the use of drone fleets in inspection and maintenance tasks.
- Solutions using open networks can be attractive from the points of view of flexibility and fidelity but should be compared with proprietary solutions in terms of reliability.
- Lastly, it should be emphasized that this work aims to establish an initial view from which other professionals in the Electric Sector can continue the reflections and investigations necessary for the coming years. For this purpose, it seems sensible to establish as soon as possible research and test centres to give satisfactory conditions to the important decision-making that is to come.