- 5G SLICING -

Challenges and opportunities from Verticals

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Efacec is a technology driven company providing integrated turnkey solutions and professional services for three main sectors:

Power Energy

- Power & distribution transformers
- Customized mobile substations
- Switchgear equipment/systems
- Advanced solutions for energy automation & smart grids
- Turnkey solutions for solar, thermal and hydro power plants

Environment & Industry

- Turnkey solutions for water supply
- Systems for water & waste treatment
- Biological treatment solid waste
- Biogas and valorization systems
- Systems for O&G refineries, paper mills, cement, …

Mobility & Transportation

- Turnkey solutions for LRT & railways
- Railway signaling systems
- Operational fleet and depot management systems
- Full range of EVC solutions (leader on DC fast charge)

Shift is happening (also) in Verticals

- Some keystones:
  - Verticals are moving to on-demand access digital economy;
  - NEWBIE – being updated is the new default for every “asset”
  - Pace of innovation is increasing in all sectors and comes more and more from combining different competencies and technologies;
  - “Everything” is becoming connected and providing data.
  - ➢ *These “new data-driven businesses” require specific, secure, on-demand, high-flexibility ICT capabilities, at a competitive cost.*
  - Will 5G Slicing attend to these expectations?

If so, that’s a big challenge for 5G Slicing, but also a huge opportunity.

- What will be **5G Slicing**? - will it be networking + processing + storage ?

Verticals challenges to “5G Slicing”

- Functional safe, very high-availability, e2e extremely reduced latency (*e-health, autonomous vehicles, energy, railways,…*)
- High-volume real-time mobile data (*m-health, mobile HDV, automotive, railways*, …)
- Low-latency hot-spot M2M communications (*machinery control, industry 4.0 factories*, …)
- High-volume media services within ultra-dense hot-spot and static-to-low mobility environments (*stadia sports, multimedia festivals*, …)
- Very large number of “still” connected devices with variable data rates (*IoT, smart cities, systems automation*, …)
- Adaptable high-capacity, high QoE, low-delay and low-cost of deployment (*media & entertainment events, emerging interactive services using AR/VR*, …)
- High-bandwidth, low-latency and flexible dynamic configuration (*advanced media apps*, …)
- On-demand and “on-time” service creation and release (*augmented reality supported services, gaming*, …)
- Security, data privacy, dynamic on-time service creation & release, cost-competitive (*all applications*)
- ….

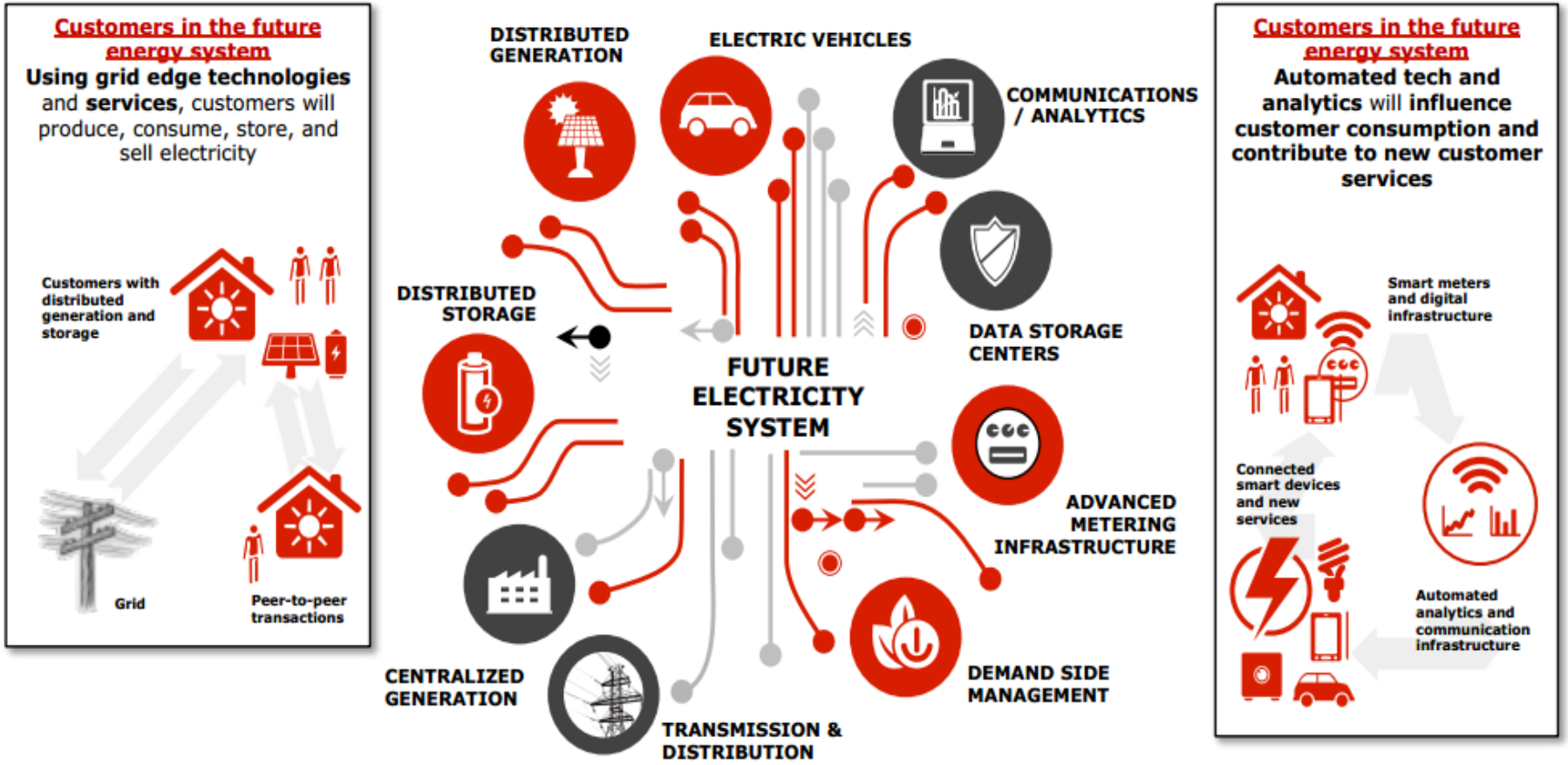
Use Case: *The Energy System*

Generation → Transmission → Distribution → Consumer

- Conservative static unidirectional grid, where longevities of 20+ years are normal - deploy and operate “forever” concept;
- Over-dimensioned infrastructure to accommodate future demand;
- ICT assured by utility owned assets with considerable CAPEX + OPEX.

- A shift is underway… *where a closed, monolithic, unidirectional and highly predictable grid infrastructure and is becoming an open, multi-owned, bidirectional, decentralized ecosystem.*

Use Case: *Future Energy Ecosystem*



Source: *World Economic Forum: The Future of Electricity*

Use Case: *Future Energy Ecosystem*

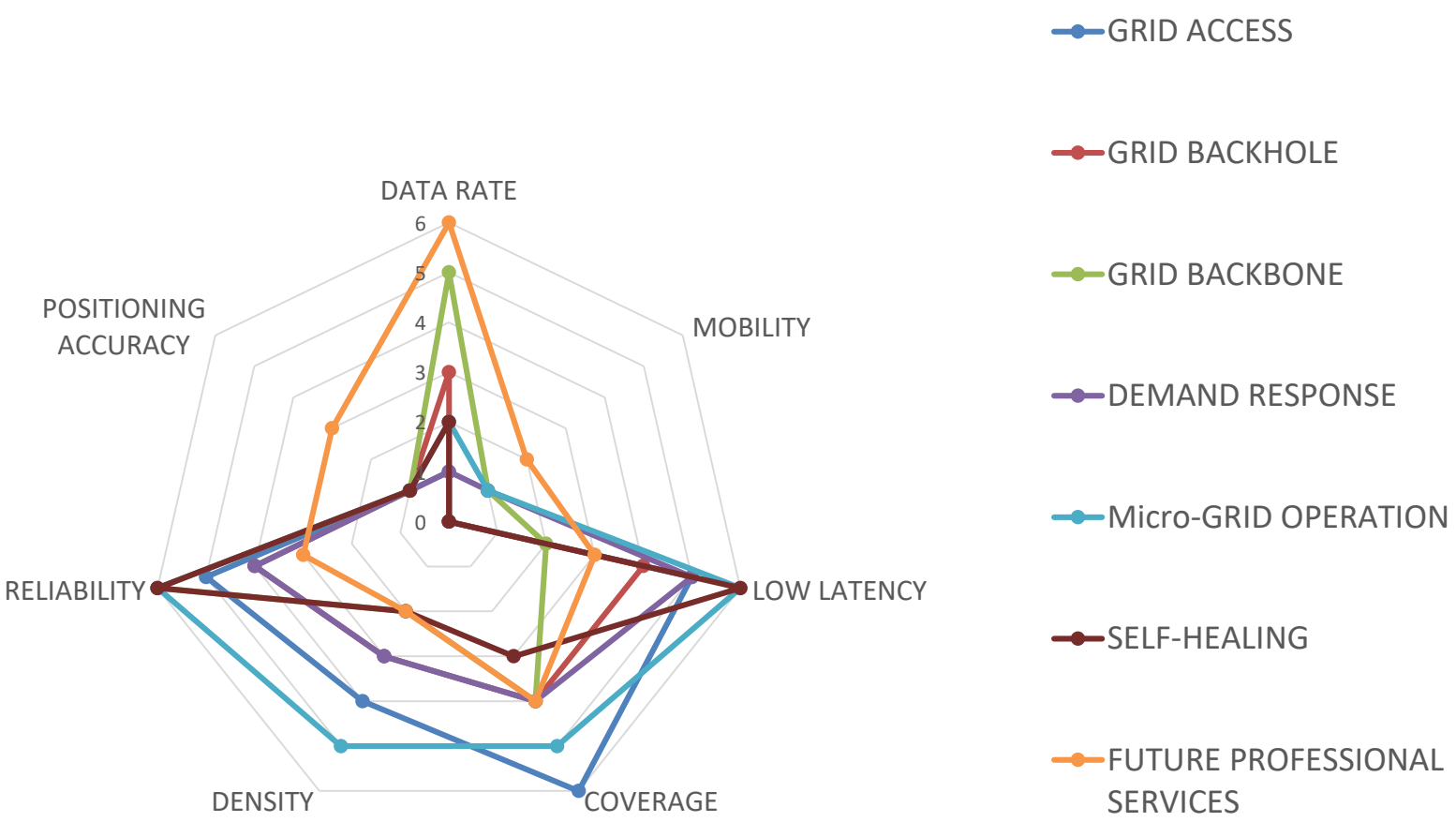
5G Slicing main challenges:

- e2e latencies below 1 ms – for grid protection and control, micro-grid operation, …
- Cyber security and data integrity/privacy;
- Extreme availability and reliability (>99,9999%);
- Cost competitive, “built-to-order” service oriented with reduced setup & release time;
- Build confidence within energy “community” to use a shared network for critical data applications.

5G Slicing opportunities are huge in energy machine-type communications:

- Smart metering and IoT sensoring applications;
- Forecast energy production (Wind, Sun, …) and consumption;
- Demand response / load shift / storage control;
- Voltage regulation;
- Micro-grid market interactions;
- Actual and future advanced service support, …

Use Case: *Future Energy Ecosystem requirements*



5G Slicing – final recommendations

- Range of requirements from Verticals is broad and some are not straightforward – it is essential a close collaboration with Verticals to understand key features of each business, as well as future trends and expectations;
- Cyber security is very critical, also data integrity and privacy;
- Slicing should be fully service oriented and really easy to setup;
- Building confidence within Verticals personnel is quite important;
- Standardization will be crucial for future success.

Thank you very much!

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