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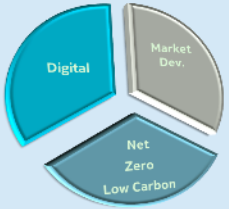
joint radio company jrc

Market Developments supporting the Digitisation of Energy Networks and delivering the ‘Net Zero’ Agenda



Nigel Nawacki – Pre Sales CTO – Nokia Energy Utility Segment

nigel.nawacki@nokia.com

Briefing …

Regulation or Innovation (RIIO-ED/TD) (NIA,NIC)

JRC – Wireless Heritage
What about Fibre and OTN

IEC 101/IEC 104
DNP 3/ Modbus
IEC 61850 future

Not Just a Connectivity Theme
Devices , Latency, Bandwidth

New Technology
-Wireless DA
- Fibre

Market Developments supporting the Digitisation of Energy Networks and delivering the 'Net Zero' Agenda

The days of a small number of power stations feeding power through cables and transformers are numbered.

Up to 65% of power generation could be localised by 2050 (National Grid, 2018). Distributed generation from wind turbines, solar panels, and other renewable sources will become the norm, rather than the exception.

https://www.theblackoutreport.co.uk/wp-content/uploads/2020/01/blackout_report.pdf

Internationally standardised technology
Harmonised spectrum bands.

New business models

Challenges

Western Australia
Reduced demand and 300K household solar panels output could overwhelm system
ABC news, 17 April

New threats

Path to decarbonization

Tesla virtual power plant

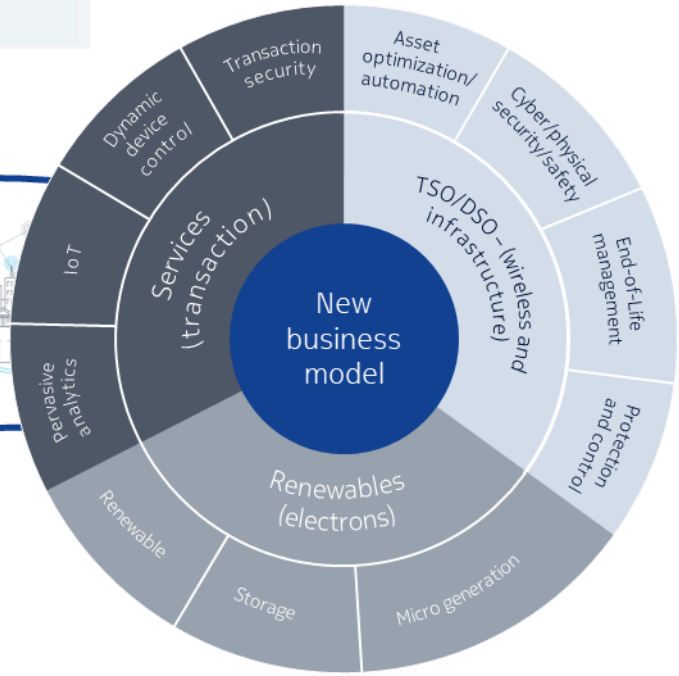
Potential new market entrants

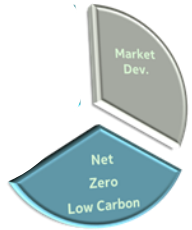
Greater customer market participation and choice

New business model

- Digitalization
- Automation

Safety, reliability and quality





Net Zero means - New services revenues

Smart home – security, automation, energy, health

Broadband

DCI, backhaul, wavelength

FTTx/FWA

Ethernet VPN or IP-VPN

Control center

New business model: U-Telco

Fiber

New energy services

Application development and hosting

Multi-tenanted IoT platform

Communications and IoT connectivity

Infrastructure access

Smart lighting

City Wi-Fi

Waste management

New business model: smart cities

5G/ LTE

Fiber

5G/ LTE

Water management

Smart parking, security cameras, video analytics

RAN sharing/ neutral host

Poles for small cells

Cellular AnyHaul

New business model: Open access provider

Fiber

Open Access

Continuing innovation:

EV charging

VPP

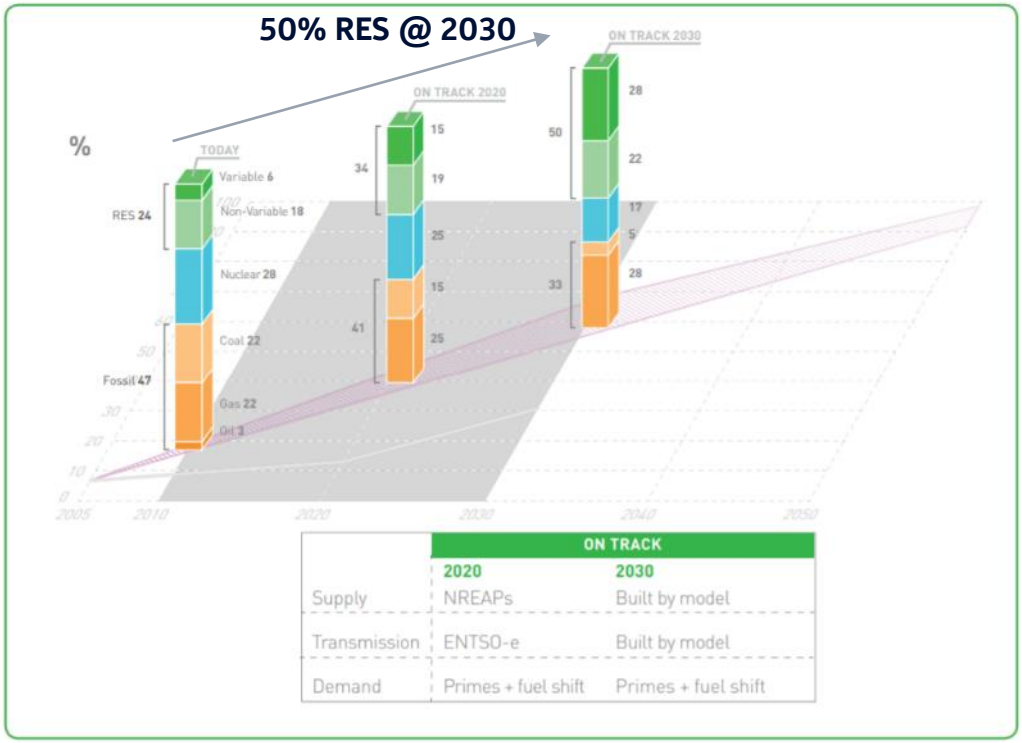
DERMS support and management

Fiber

Substation

Secure Infrastructure and **Energy value chain**

Political and Government Statute and Industry prediction



	ON TRACK	
	2020	2030
Supply	NREAPs	Built by model
Transmission	ENTSO-e	Built by model
Demand	Primes + fuel shift	Primes + fuel shift

https://www.roadmap2050.eu/attachments/files/PowerPerspectives2030_ExecutiveSummary.pdf

The analysis shows LCOE numbers of €89/MWh in 2020 and €85/MWh in 2030 for new builds, including CO2 prices, which is only a small increase compared to the estimated value of €82/MWh for new generation added in the previous decade . These estimates are comparable to the numbers in last year's Roadmap 2050 report which showed a backcasted LCOE of €84/MWh in 2020 and €86/MWh in 2030.

The analysis thus shows it is feasible to keep LCOE under control through the decades of transition to a fully decarbonised power sector. The increase in upfront investments will have to be incentivised appropriately but will pay–off through decreasing operating costs.

levelised cost of electricity (LCOE)

Regulatory – Capital Investment - Incentivised Investment Low Carbon Strategies

European Investment Bank The EU bank

Projects › Projects to be financed ›

LOW CARBON EUROPEAN RENEWABLES FUND

ofgem Making a positive difference for energy consumers

About us | Consumers | Gas | Electricity | Environmental Programmes | Investigations | Consultations | News & Blog | Data Portal

- Return to Ofgem, data and cyber security

Digitalisation Strategies for Modernising Energy Data

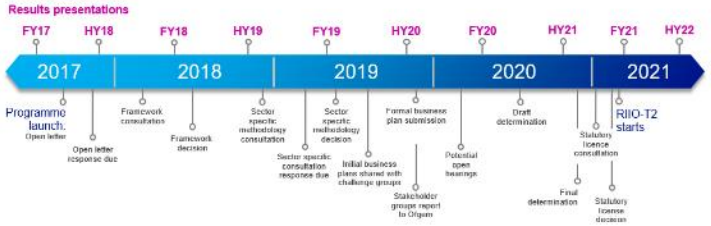
Publication date	17th December 2019
Information types	Open letters and correspondence
Policy areas	Business consumers

ena energy networks association

ena

Our members are:

Cadent | electricity north west | ESB NETWORKS | gtc | nationalgrid | Northern Gas Networks | Northern Ireland Electricity Networks | NORTHERN POWERGRID | Scottish & Southern Electricity Networks | SGN | SP ENERGY NETWORKS | UK Power Networks | WALES&WEST UTILITIES | WESTERN POWER DISTRIBUTION



Key Innovations RIIO 2 …

ANM, TANM , Flexibility Schemes , Demand Response ,

Open Net, LV Monitors etc

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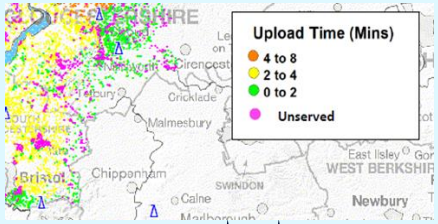
Smart Grid Communications

Transformation to “Net Zero”

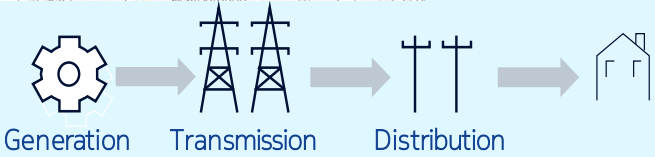
Unidirectional flow of power

Climate Change unconsicous

Fixed Pricing



Things don’t (didn’t) change that much (CEGB)

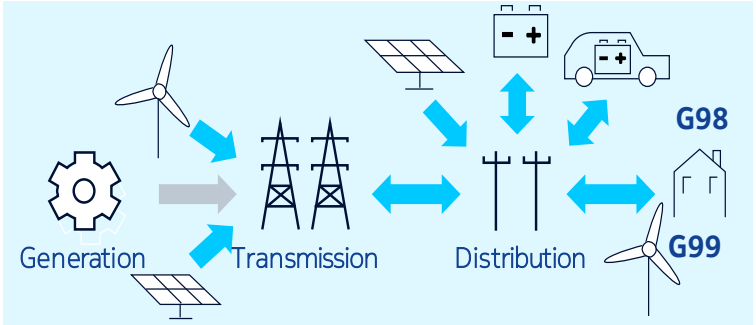


Distributed, multiple power sources

Climate change demands increased efficiency

Dynamic Pricing

More competitive and stringent regulatory environment



Business/ Transactive

Operational Telecom - > ENABLING THE SHIFT

Control of the decentralized network of renewable, intermittent power sources through a reliable wireless network with guaranteed latency guaranteed standards guaranteed performance (not really shared) !

Improve the reliability, safety, availability, efficiency of power grid through communications. Current approach is fiber between nodes with DWDM and IP/MPLS; distance between relays determined by delay constraint, edge is largely Private LTE

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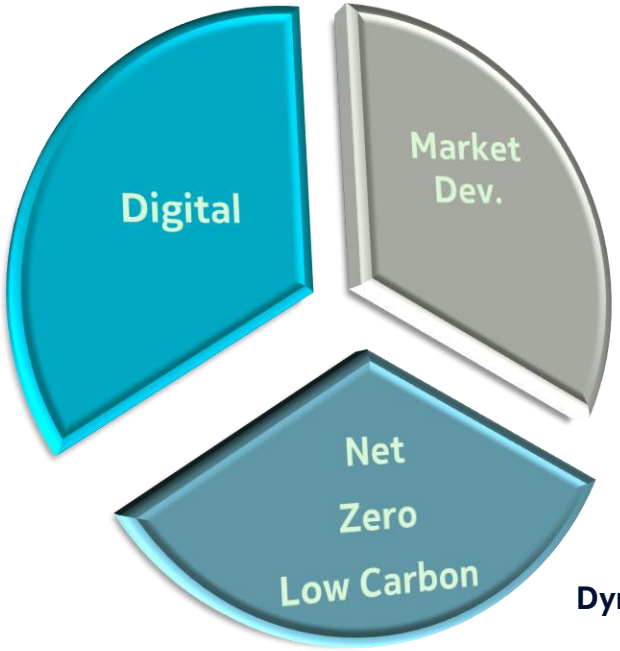
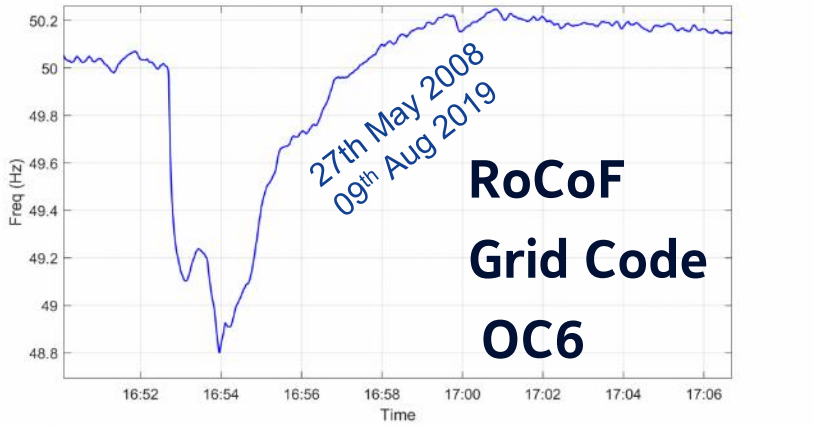
Keeping those Lights on ! Renewables and Balancing Acts ! Need Responsive Operational Telecom !





Dynamic……

Fast Response …..

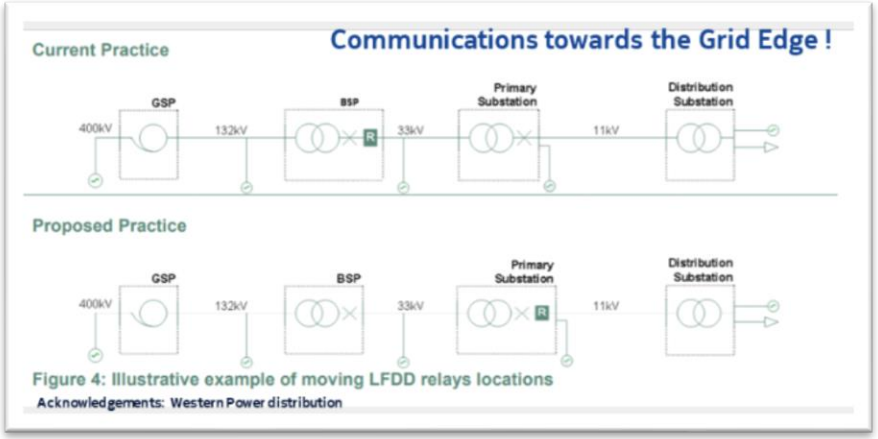
Virtual Power Plant …..

Landscape is changing for GSP and Telecoms Administration

Operational SCADA / Telecoms	Immediacy
Fault Detection	10 mS Responses
Phasor Management Measures / LFDD	< 2-3 mS / >500 mS
Frequency Fast Response	100-1000mS
Traditional SCADA Poll	60,000 to 180,000 mS

Hong_etal_ACDC2018_Fast_frequency_response_for_effective_frequency_control.pdf

- Edge
- Performance
- Interoperability
- Longevity



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With changing Landscape to “Zero Carbon” is Tradition really enough ?

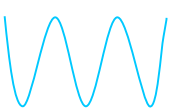
- **DMR /LMR Radio** Push-to-Talk communications during catastrophe to a mobile and increasingly connected workforce
- **Wireless/ Mesh Systems – (LPWA) WiMax/ AMI** Metering features such as billing information and limited latent services or Endpoint manufacturer
- **UHF Narrow band 12.5Khz Networks** for telemetry and SCADA to monitor and remotely control plant and equipment – long duty cycle but ideal bands
- **Fixed Wireless / P2MP microwave** useful adaption but challenged due to spectrum shifts (1.4Ghz) -> X

= Silo’s Radio systems that often require own real estate , imagine each of us using voice video and data terminals separately – we would certainly need big pockets today !

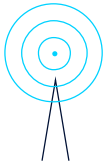
What does a Utility Telecoms network look like in Future ?

The huge leap forward in speed and performance requires some new technology building blocks

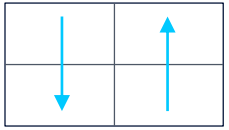
These Market features are present today ….



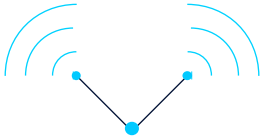
New spectrum options
<3 GHz, 3-6 GHz, cm/mmWave



Massive MIMO
& beamforming



Flexible air interface



Multi-connectivity
Aggregation and duplication

Cloud native &
Network slicing
Centralized and distributed

Connectionless
Communication
Efficient massive IoT

Present Today

Forward Looking 5G & URLLC Use Cases

Nokia /Customer Validations in Progress

	Proven Use-Cases	Service Type	Bandwidth	Latency	QoS	High Availability	Security	NB-IoT Support
Distribution	Distribution Automation	MPLS, IPSec	Low	100-300 ms	Must	Must, geo-redundancy, fast-failover	Must, onsite assets and control	Partial
	AMI Backhaul	MPLS, IPSec	Medium	100-300 ms	Desired			Supported
	Fallen Conductor Protection	MPLS	High	50 ms	Must			Not Supported
	Mobile WorkForce	Mobile Terminals	Medium	100 ms	Must			Not Supported
	PTT/PTV/LMR Replacement	MPLS	Medium-Low	175 ms	Must			Not Supported
	Physical Security	MPLS, IPSec	High	100-300 ms	Must			Not Supported
	CCTV		High	175 ms	Must			Not Supported
	IT/Office		High	100-300 ms	Not required			Not Supported
Transmission	AMI	URLLC	Very low	300 ms	Not required	Yes	Must, onsite assets and control	Supported
	Smart City	IP	Very low	300 ms	Desired	Yes		Supported
	Smart Poles	IP	Very low	300 ms	Not required	Yes		Supported
	CCTV HD*	IP	Very High	175 ms	Must	Yes		Not Supported

* Dependent on available spectrum

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3GPP releases timeline – Longivity !

Standard timeline, typically available in products 18 months after standard finalisation

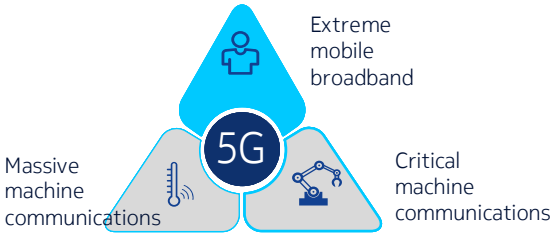
2019

3GPP Rel-15

June 2019

5G Phase 1

Focus on mobile broadband CSP deployments



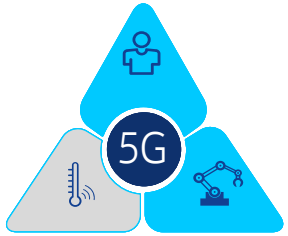
2020

3GPP Rel-16

June 2020

5G Phase 2 *

- Industrial IOT enhancements (URLLC)
- Internet access and backhaul
- NR in unlicensed band eMBB in 5 and 6 GHz

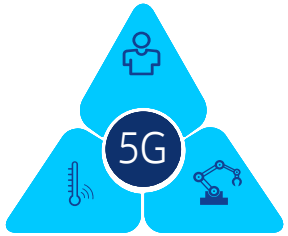


2021

3GPP Rel-17

June 2021

- Massive “NR light” foundation
- Neutral host
- Drones, non-terrestrial networks
- Analytics powered network
- Optimized edge computing



* Subset of Rel-16 features

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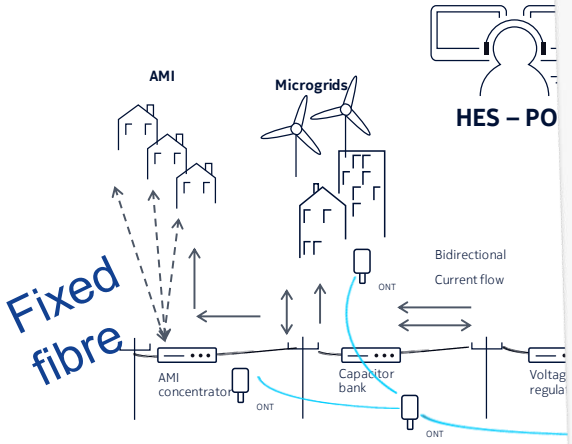
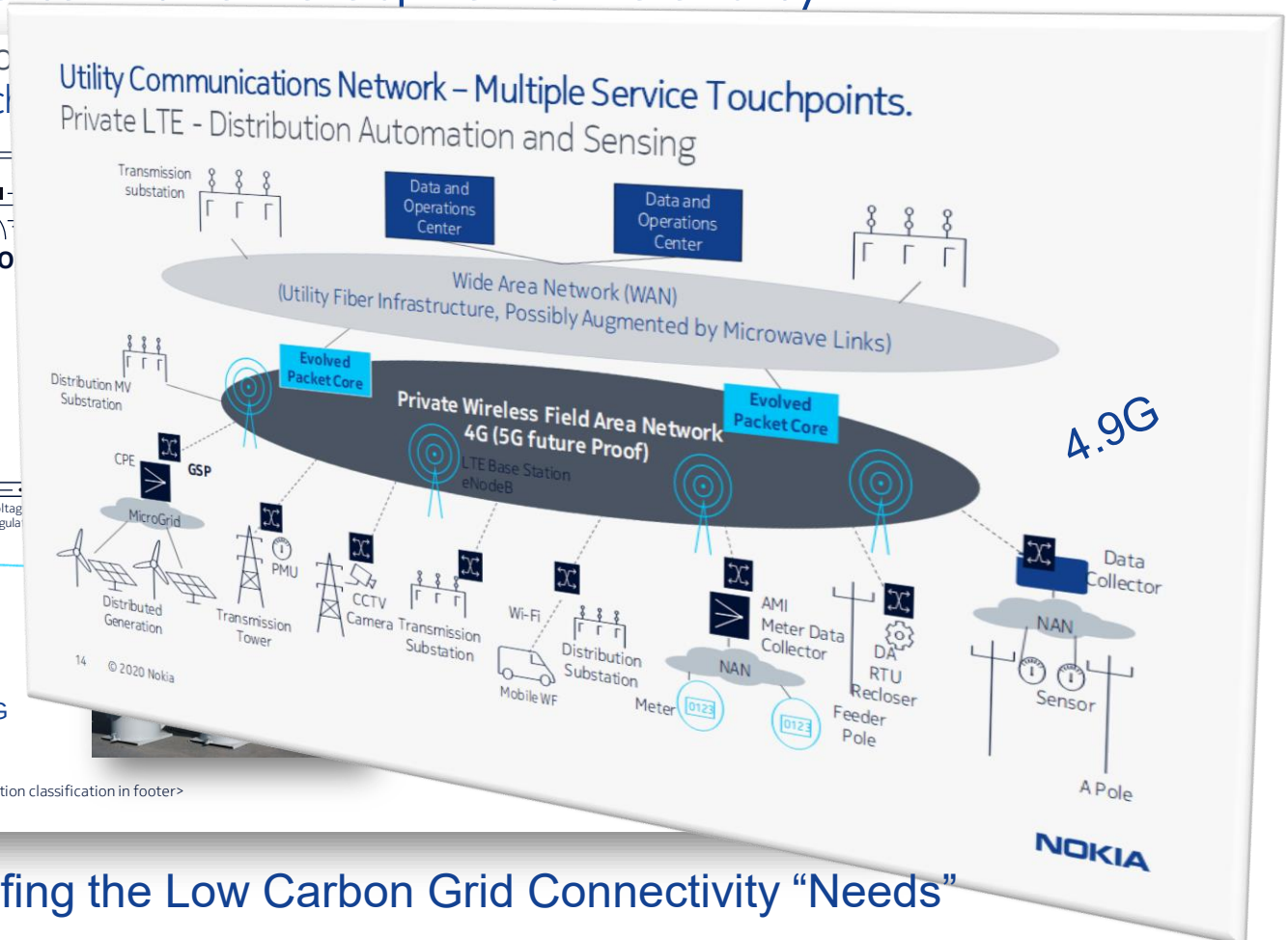
Fixed and Mobile Convergence - Market Development is There Today

E2E support for communicatio
Nokia Approach to common cl



Integrating DER - Power Flow Monitoring;
Sensors – Fault Path
Operations – Automation / Interruption);
GSP and 33kV networks with high levels of DG
Conductor Temperature Monitoring



Future Proofing the Low Carbon Grid Connectivity “Needs”

Customer Examples

*The Nokia Private LTE pilot has successfully provided outstanding relia
We have expanded to a network of 19 distribution automation line device
enodeB. The flexibility of this system will provide Ameren with a fast pa
we move into grid modernization. Troy Tipsword – AIC Sup. DA & Ops

High Level Use Case	Use Case
900 MHz Use Cases	Switching between private and pub
	S&C Teaming/Intellirupters
	Engineering Access
	VOIP
	Corp LAN
	SCADA-Ethernet
	SCADA-Serial
	AMI/Smart Meter Collector
	Seri red Bits
NB-IOT Use Cases	
	ore Install
	Cap Bank Controller – strong RSSI
	Cap Bank Controller – mid RSSI
	Cap Bank Controller – fringe RSSI
	Underground Install

CONVERGENCE

PoC Test Scope

Utility Use cases in B31 450 MHz 2x

- Establish evidence that pLTE 450 MHz can replace TETRA for field force enablement
- Test coverage for Push-to-Talk (PTT) and Push-to-Video (PTV) in the field
- Test performance of SCADA & Distribution automation applications over pLTE
- Test Smart ... with ... coverage

21 © 2019 Nokia

COMMUNICATION

Brazil, World largest wind generator

- Grid monitoring to prevent illegal tapping and increase grid reliability
- Grid automation for maintaining quality

Regio... ...ess net...
cover... ...coverage from CSP n...

- 78,000 smart meters
- 1,300 load balancers
- 850 concentrators

CONCENTRATION

North Atlantic Offshore Windfarm

Four Mini-macros 2x20W B38 deployed on the OHVS platform

COORDINATION

North America , South America - Brazil , European Deployments – ON and Offshore

https://www.smart-energy.com/industry-sectors/iot/webinar-private-lte-communications-empowering-north-sea-wind-farm/

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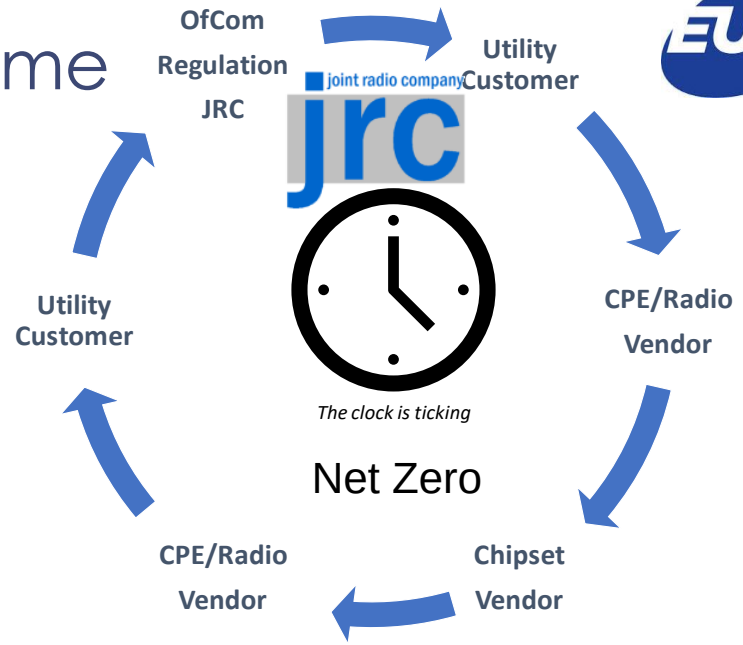
Net Zero
"Field of Dreams" Syndrome

- Utilities need More Comms /Spectrum
- Vendors rely on chipset
- Chipset needs TAM commitment
- Utilities need established eco-system for long term assets



3GPP
A GLOBAL INITIATIVE

Utilities Technology Council

UTC TELECOM & TECHNOLOGY
VIRTUAL EVENT
AUG 18-SEPT 4, 2020


Defense
Public Sector
Public Safety
Smart City
Healthcare
Hyperscale Enterprises
Retail
Financial Services
Manufacturing
Logistics
Energy+Resources
Power Utilities
Welcome to
Allwhere
Where networking solutions for the new age of industry live.
Aviation
Oil+Gas
Mining
Transportation
Railways
Maritime