

The place of LTE technology in the transition to a fully digitalised energy network.

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DIGITAL INDUSTRIES PRACTICE - Utilities / Energy

The Nokia logo is displayed in white, uppercase letters within a large, semi-transparent white circle on the right side of the slide. The background of the slide is a dark green with a grid of glowing green and blue lines, suggesting a digital or network environment.

- Headquarters in Espoo, Finland
- Solid presence in Europe
 - 37.700 employees
 - 80 office locations
 - 9 Nokia Bell Labs locations
- Strong presence in UK/I
- +1500 employees across 4 sites



Strong Localisation across UK / I



Trusted
supplier

TA35DT

📍 Change Location



Mobile and broadband checker

CONINGRE, CREECH HEATHFIELD ROAD

Indoor

Outdoor

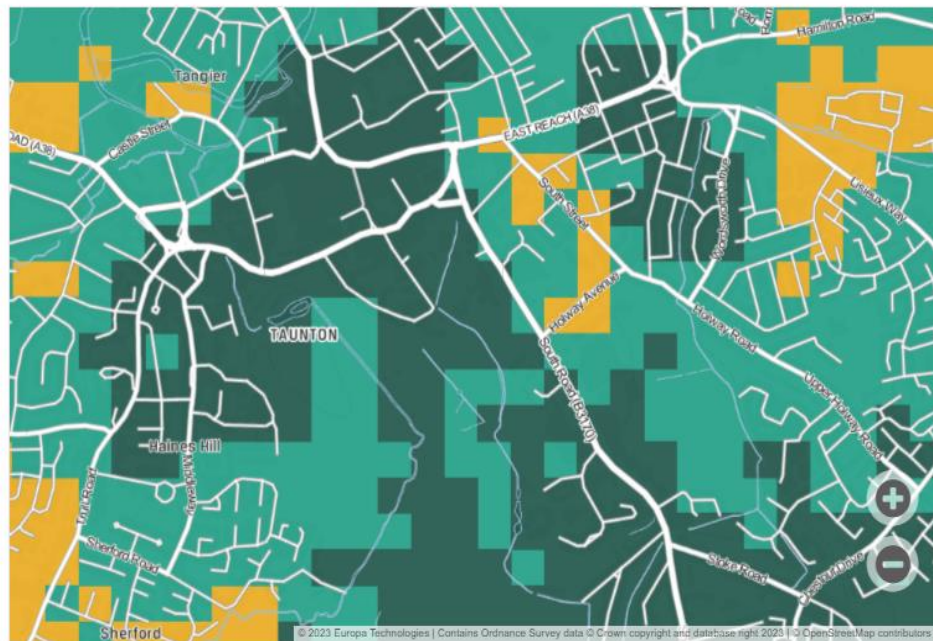
This map shows the predicted mobile availability in your area. Please select your network to view availability from your provider.

EE

Voice

Data

5G Data



Good coverage

OK coverage

Some problems

No coverage



The nervous system of the grid

– 4.9G – 5G – 5G Adv

Fully Digitalised Private Energy System “everywhere”

AR/VR

- Field ops and remote assistance
- Training

Drones

- Line Inspection
- Vegetation Inspection
- Asset inspection

Distribution Automation

- Reclosers
- Capacitor Banks
- Switches
- Intelliruptor
- FPI

Secondary Substations

- RTUs
- Distribution transformer monitors
- ANM / LV Monitoring

Transmission & Primary Substations

- CCTV
- SCADA
- DER Protection



Power Factor = Real Power / Apparent Power

New Grid Sensors

- μ PMUs
- VAR
- CT/VT

Mobile Field Force

- Critical PTT and PTV
- Data access
- Voice calls

Smart Lighting

DER / GSP

- Protection
- Local condition awareness and coordination
- State estimation and local control

AMI

- Smart meters
- Metering as a service

IoT Sensors (Pole-top)

- Predictive maintenance

EV Charging

- Controlled charging
- V2G (grid-managed batteries)

Massively scale existing grid management:

- Advanced metering infrastructure (AMI)
- Distribution automation and SCADA
- Grid monitoring down to LV
- Asset condition monitoring

Enable safer and more efficient field operations:

- PTV to complement critical PTT for enhanced field coordination
- Drones for lines and vegetation inspections (bVLOS, real time HD video and thermal video streaming, C&C)
- Pervasive CCTV for safety, security, anti-vandalism and asset inspection
- AR/VR for field operations support
- Ground robots (eg Spot) for inspections

Better integrate DER and EV with new methods to Monitor, Control and Protect the grid:

- μ PMUs for realtime state estimation, ...
- DERMS-integration, VPP, FCAS, ...
- (R-)GOOSE based protection

Elon Musk shares images of "Moon Base Alpha" and "Mars City"



How do we /would we manage a remote energy / micro grid network on the Moon ?





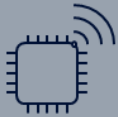
Where is the place for LTE in transition to a digital (compute) energy grid



Fast, reliable, and secure mobile data connectivity



Mission-critical voice and video communications



SCADA, DNP3 Profinet: plant monitoring and control IEC 10x



Real-time video: security, safety, asset inspections



Robots and drones: plant inspection, maintenance



AR/VR: remote field ops, assistance

Geo-location, geo-tracking and geo-fencing



Low-latency for extreme autonomy and automation

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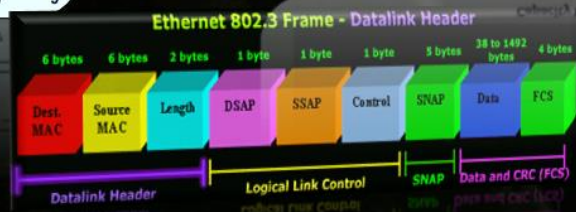
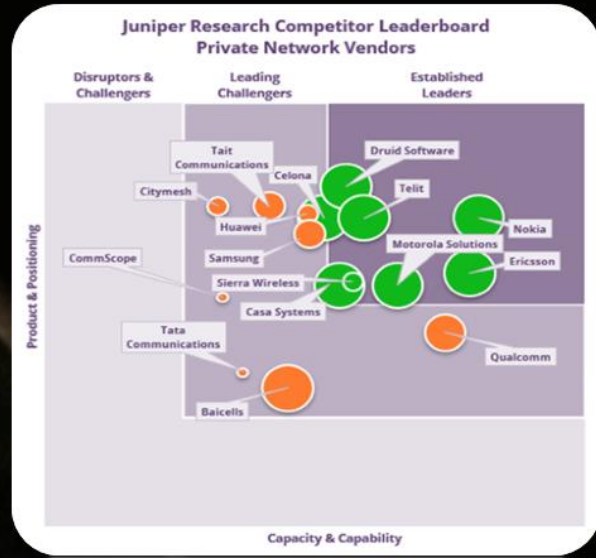
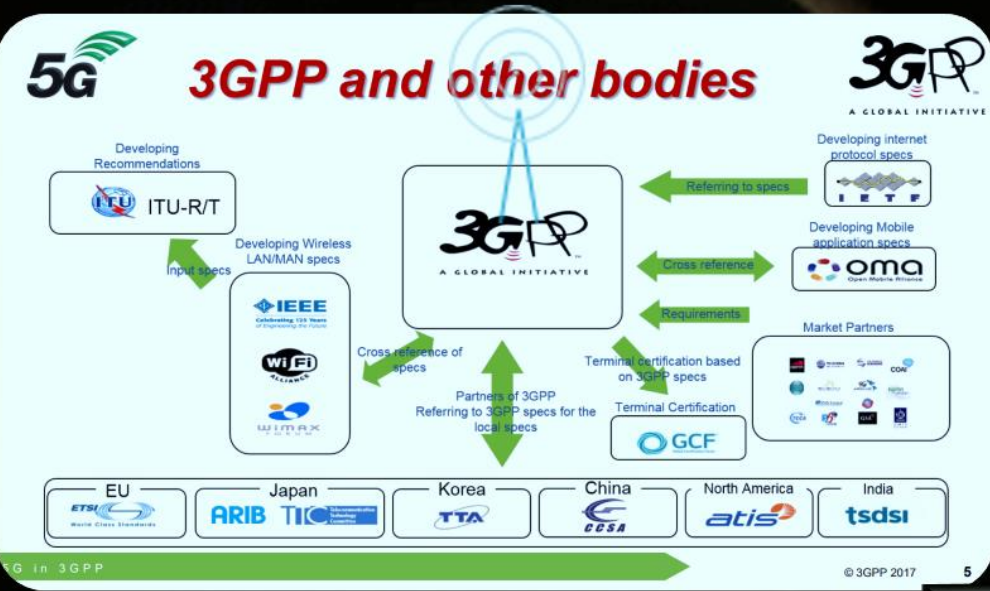
NOKIA

We are entering an exciting new era
of space exploration

End to End "Docking" is assured UE/eNB/gNB/EPC/5GSA/5GNSA



Utility Data comms predicated upon GLOBAL - 3GPP / IP / IEEE standards



The image features the Nokia logo in the top left corner. The background is a photograph of a power plant or substation at sunset. The sky is a mix of blue and orange, with the sun low on the right side. Silhouetted against this light are numerous high-voltage power lines and metal towers. The overall mood is industrial and technological.

NOKIA

The place of LTE technology in the transition to a fully digitalised energy network.

Industrial-grade 3GPP always On Private wireless for secure, reliable & predictable performance

Energy UK

ofgem Making a positive difference for energy consumers

Department for Energy Security & Net Zero

northern ireland water Delivering what matters

Scottish Government Rìghdhalas na h-Alba

ena energy networks association

jrc

Ofcom making communications work for everyone

OFWAT

MULTI SERVICE FOUNDATION – Supporting End-to-end solutions from end-points to analytics
The Place for Unified National Spectrum



Use Case 1: Field Force Enablement For Energy Operations – Less Truckroll = Less Cost

Customer challenge

- Maintaining separate Tetra or P25 PMR infrastructure for mobile field force communication
- Expensive handsets, closed & limited ecosystem
- Need for remote video assistance

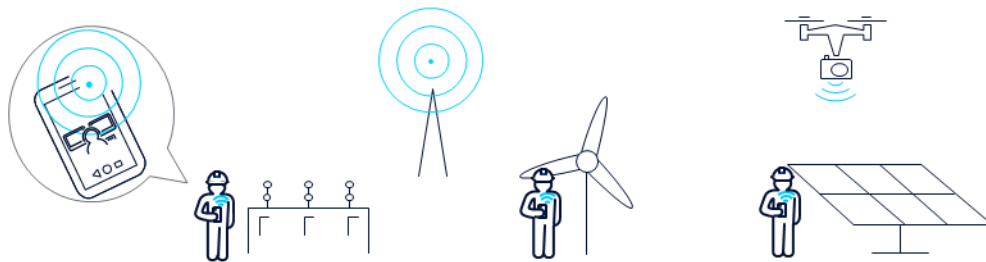


Nokia approach

- Deploy Private Wireless to enable field force applications
- Converged Private Wireless network serving field force as well as other use cases in the wind farm
- Enabling Push-to-Talk and Push-To-Video with Nokia Group Communication

Business benefits

- Optimize cost and reliability by providing a single network for voice and data in the field
- Support digital transformation in the utility by providing business critical applications and intelligence to field workers
- Remote assistance for complex jobs reduces truck rolls



Customer challenge

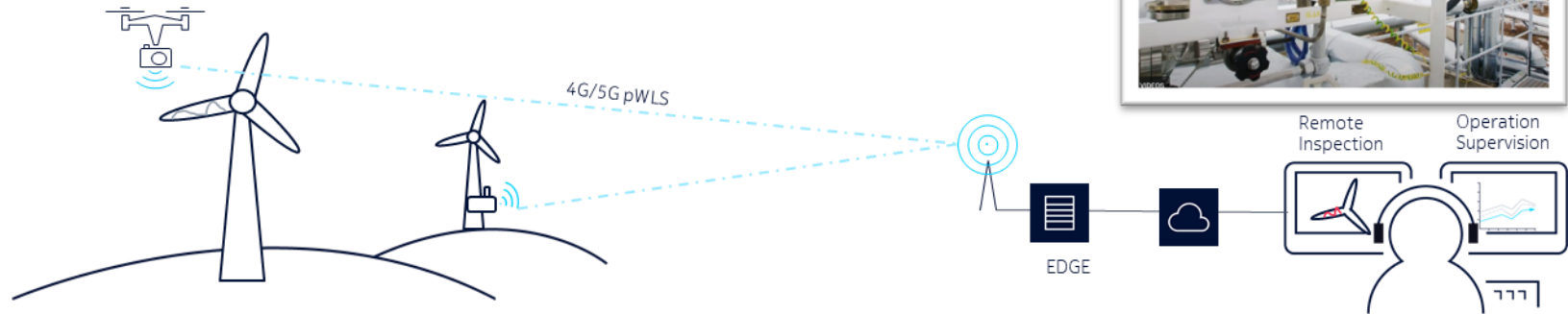
- Keep large distributed systems operational
- Keep energy production optimal
- Extend lifecycle of assets
- Reduce maintenance costs

Nokia approach

- Private wireless network with remote controlled drones
- Scene analytics to detect damage on turbines and vegetation management,
- Grid control systems to have granular control over the wind turbines, circuit breakers/reclosers...

Business benefits

- Maximise RoI on assets
- Reduce outages & maintenance costs
- Help to meet carbon emission targets
- Simplified management of the infrastructure



Use Case 3: Perimeter security Scene analytics license plate & face recognition

Customer challenge

- Detecting & Preventing unauthorized access to substations
- Detect presence in hazardous areas
- Detect unusual events
- Ensuring staff safety on-site
- Preventing asset theft

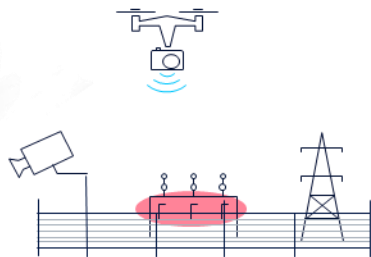
Nokia approach

- Nokia Scene Analytics enabling:
 - License plate recognition
 - Face recognition
 - Event detection: flooding, smoke, overheating, fire, geofence crossing
 - Detect presence of animals
 - Machine learning driven approach
- Use of drones

Business benefits

- Reuse installed CCTV, thermal cameras
- Integrate IoT sensors into scene monitoring
- Fast to deploy & onboard custom algorithms
- Out of the box integration with Milestone Video Surveillance solution[™]
- Machine learning for continuous improvement
- Forensic reporting for NCSC / NIS compliance

ABLOY



Customer challenge

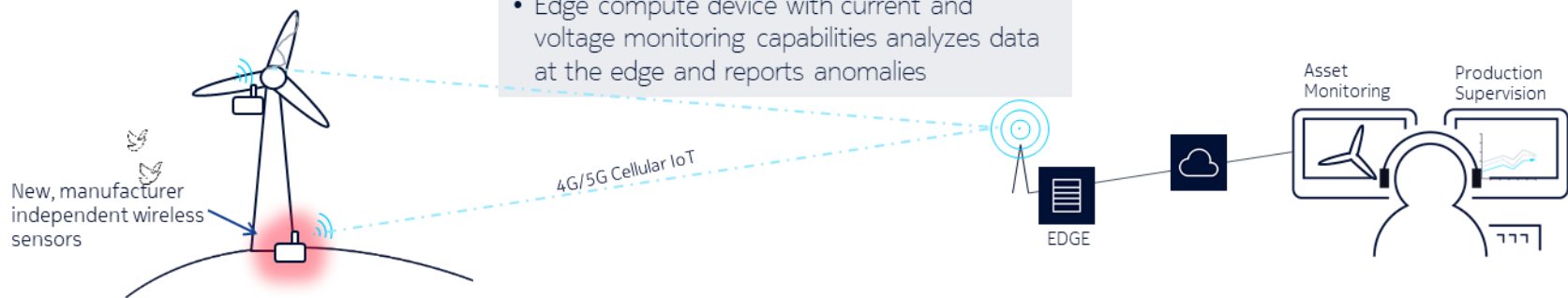
- Keep large distributed systems operational
- Keep energy production optimal
- Extend lifecycle of wind assets
- Reduce maintenance costs
- Predict future generation capacity

Nokia approach

- Private wireless network to enable deployment of new industrial sensors in partnership with OSISoft.
- Structural health monitoring with sensors such as rust detection, lightning damage detection, vibration sensors.
- Acoustic sensors to determine blade condition reporting on cracks, splits, holes, pitting and erosion.
- Edge compute device with current and voltage monitoring capabilities analyzes data at the edge and reports anomalies

Business benefits

- Maximize RoI on assets
- Reduce outages & maintenance costs
- Additional data collected from wind turbines minimized downtime and increases performance of the assets
- Standardised applications for performance monitoring & prediction



Use Case 5: Wide LTE Coverage

Enabling Critical Communications everywhere.

Customer challenge

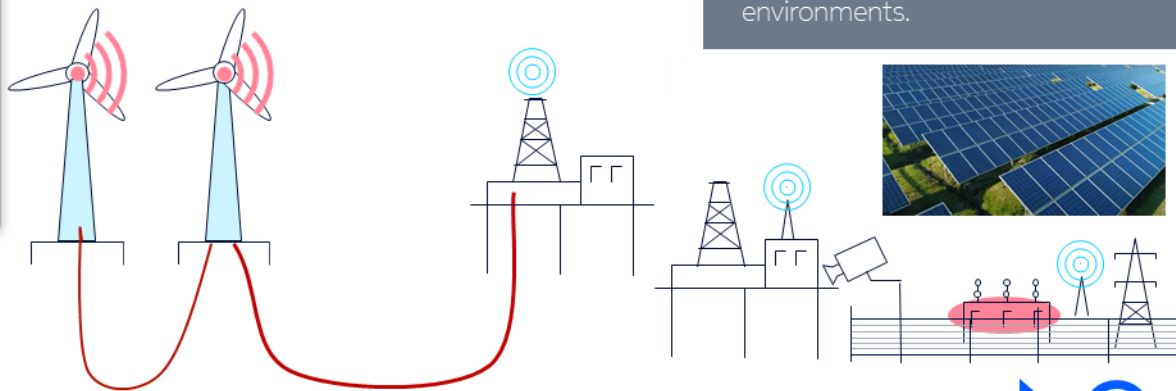
- Providing coverage inside substations.
- Safety for workers climbing at height.
- Enabling voice, video and data in mission sensitive areas.
- Securing mission-critical SCADA communications.

Nokia approach

- With low power, low cost Pico cells, mobile coverage can be extended inside hard to reach locations.
- Extended coverage can be managed as with the external radio network.
- Transmission of SCADA traffic over LTE.

Business benefits

- Field Crew are always connected.
- Seamless coverage for voice and data services.
- Enabler for new technologies such as Augmented Reality.
- Direct video feed from head/body cameras to the SOV or control center.
- Added safety coverage for high risk environments.



Use Case 6 – Health & Safety Lone Worker Access & Tracking Wearables

Customer challenge

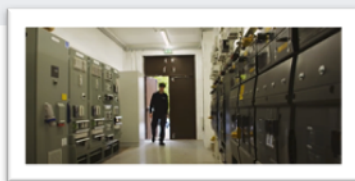
- Ensuring maximum safety of personnel and assets
- Monitoring hazardous areas
- Emergency altering
- **Access control for qualified personnel**
- Optimized operations through remote assistance

Nokia approach

- Integration of safety wearables or smart phone applications over pLTE.
- High precision location tracking of employees
- Enablement of augmented reality solutions for remote engineers
- Open APIs for rapid implementation of new applications.

Business benefits

- Reduction in serious injury due in hazardous working environments.
- Accurate training of staff in remote site
- Automatic monitoring of unauthorized movements in the wind farms.



4G/5G Cellular IoT



4G/5G Cellular IoT



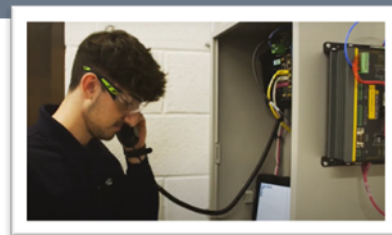
EDGE



Geofencing



Dispatching and Supervision



In summary

The Nokia logo is a large, white, stylized arrow pointing to the left, set against a background that transitions from dark purple at the top to a reddish-pink at the bottom. The word "NOKIA" is written in white, uppercase letters inside the arrow's shaft.

NOKIA

The place of LTE technology in the transition to a fully digitalised energy network.

Solution highlights

- **Converged as a platform for Field distribution automation**
- **Strong redundancy by dual-homing with private and commercial LTE networks**
- **Secure communications protected by latest IETF / IEE/ 3GPP Encryption**

• Utility benefits

- **Heightened grid monitoring**
- **Strengthening power reliability - CML**
- **Highly Reliable and Secure Communication**
- **Feature Rich and Proven technology**
- **Reduced OPEX**
- **Continuous Technology 3gPP**

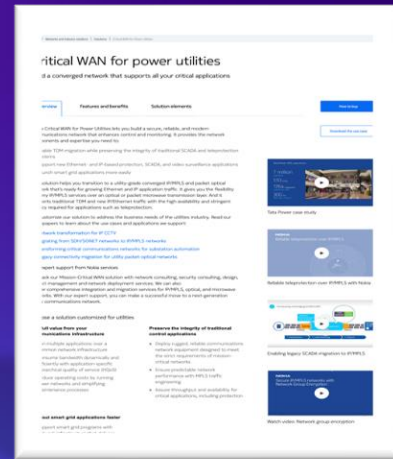
Q&A



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<https://www.nokia.com/networks/solutions/mission-critical-wan-for-power-utilities/>





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