Empowering utilities with LTE and 5G private wireless networks

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CONTENTS

KEY TAKEAWAYS

- The power utility market is undergoing significant changes. Distributed energy resources (DER) radically alter the power generation model, and sustainability goals change how energy is distributed and consumed. The new grid must support multidirectional energy flow. The expansion of DER, load monitoring, and advanced metering infrastructure (AMI) require the monitoring and control of large numbers of assets and devices distributed across the whole footprint of the utility.
- Widespread coverage alongside the traditional high-performance requirement (e.g., predictable latency for grid monitoring) of the communication network underpinning the smart grid cannot be met by legacy connectivity options such as narrowband power line communications (PLC) or LoRaWAN, which were used by the utility for specific, single-use-case scenarios.
- Private LTE and 5G networks bring several benefits to the utility, including control of the network, high speed, low latency data, back up options, and rollout plans; security features such as traffic encryption and SIM-based authentication; performance; and redundancy.
- Private cellular networks are a future-proof choice, which enables the utility to deploy its network and later decide when and how to expand and evolve it according to the new standards and thus benefit from newer features. It is also a network that will increase efficiencies since it can support multiple use cases, such as distribution automation, load monitoring and control, AMI, and drones' inspection and monitoring. According to Omdia data, a third of utilities see the ability to use private LTE and 5G networks to consolidate existing technologies as a key benefit of the solution.

RECOMMENDATIONS

1. **It is important for utilities to learn from the experience of other utilities that have already undertaken the deployment of a private LTE or 5G network.** Depending on the region and on their ownership (private or public), each utility will have a unique path, but some elements and experiences will be common to all utilities.

2. **The utility should evaluate all use cases that can be supported by a private LTE and 5G network and must prioritize a handful of use cases that are of prime importance for its operation.** For instance, a utility that operates in an area that is at high risk of fire incidents prioritizes detection of falling power lines and drone monitoring.

3. **Utilities should work with private network wireless partners to understand how specific network features meet their own requirements.** Utilities should seek to gain a clear understanding of what network type and network performance they require by combining a mature understanding of the trends that are transforming its operations with the selection of key use cases.

4. **Given the strengths in coverage, security, and performance of private LTE and 5G networks, utilities should consider this option instead of other legacy technologies.** When thinking about a private LTE or 5G network, the utility will need to decide its preferred technology (LTE, 5G nonstandalone, 5G standalone), spectrum availability, and how to leverage existing assets.

Introduction to the power utility vertical and to private networks

The key trends influencing the power utility vertical create new requirements that are not met by legacy connectivity technologies

Trends shaping the market: Toward a different way of creating and consuming energy

The utility market is being shaped by a revolution in the way energy is created and consumed. This is underpinned by the shift from a one-directional grid, where electricity flows exclusively from the energy source to the consumer, to a multidirectional one, in which energy flows from a power station to the consumer but also from new energy sources and the consumer into the grid.

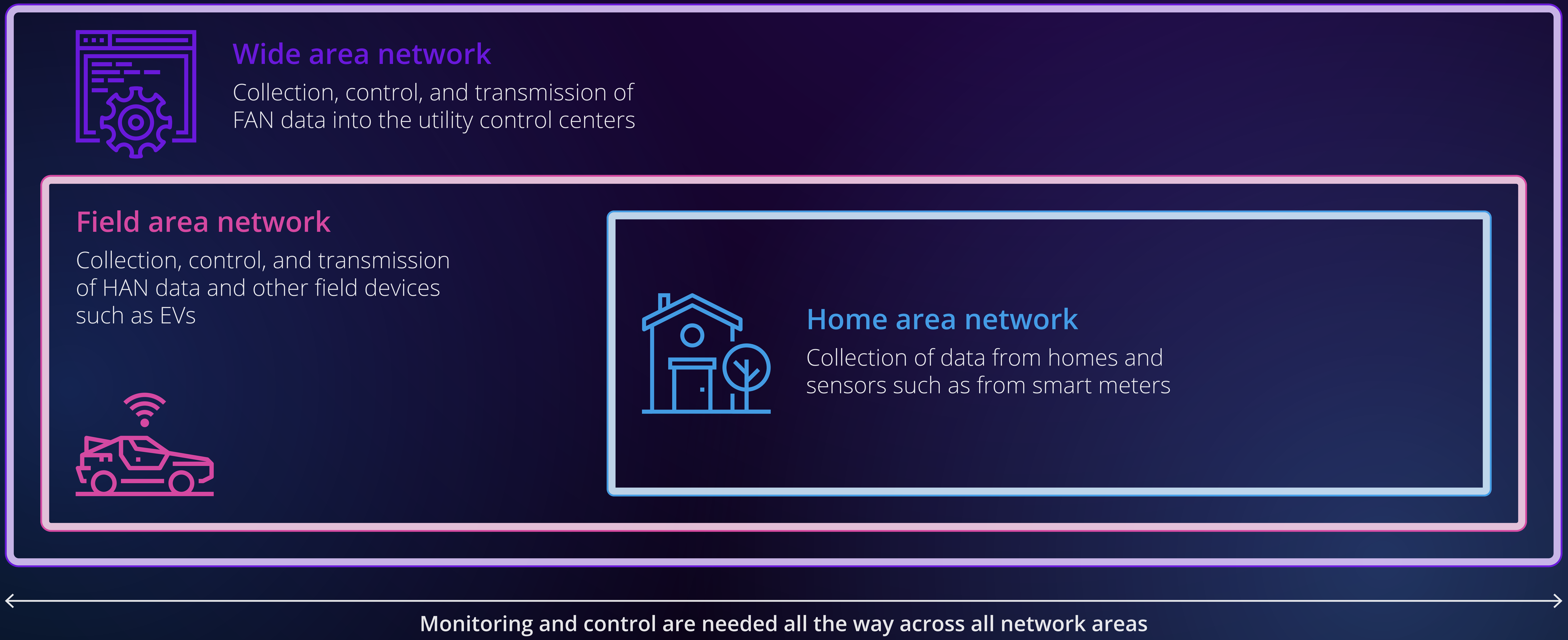
New scenarios and use cases and the need to leverage increasingly large amounts of data demand a new communication network. The proliferation of DER is part of the wider societal trend of decarbonization and the shift of many industries to electricity and away from fossil fuels. DER such as solar plants and wind farms—but also consumer- or enterprise-generated energy sources such as solar rooftops—bring new intermittent energy sources into the grid. The expansion of electric vehicles and charging stations, microgrids for cities or enterprises, and other use cases all contribute to different load and demand scenarios, which require the whole grid to have a higher level of observability and control to maintain reliable operations. This will need to happen well beyond the substation as it is traditionally done, all the way to a now widely distributed environment.

The utility will need more devices to control the grid and will need better capability to analyze the data it is generating (e.g., artificial intelligence). There needs to be significantly more communication than in the past between existing and new devices that monitor and control the grid across all network segmentations.

Since moving to IP-based assets increases the risk of exposure to cybersecurity vulnerability, security strategies must be employed alongside this grid transformation.

Figure 1, on the next slide, shows a schematic representation of how every part of the utility from it wide area assets to its local (home) area assets now need monitoring and control.

Figure 1: Schematic representations of different areas within the utility network



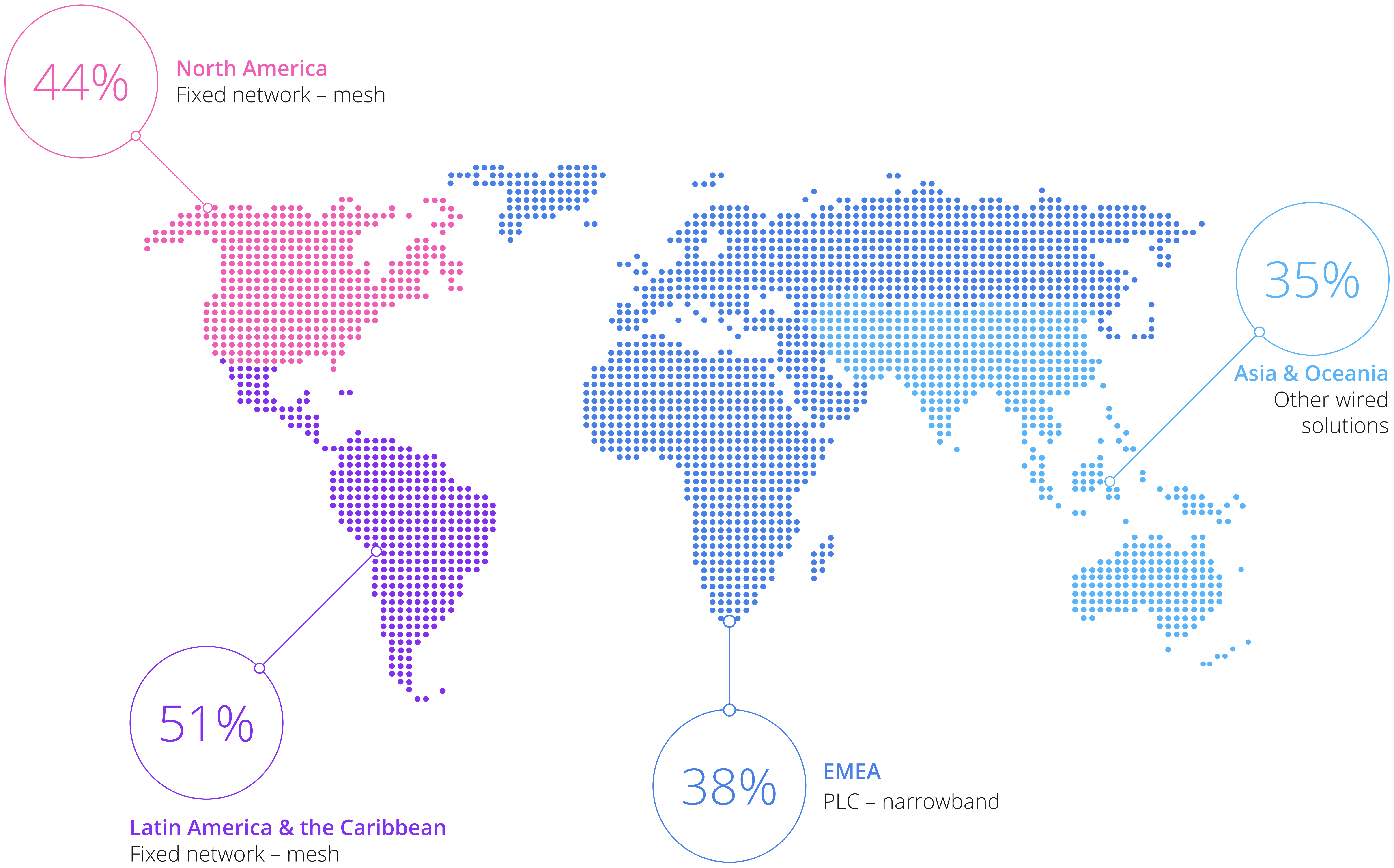
SOURCE: OMDIA

A market with regional flavors means that each region will develop differentlyy

Though the trends shaping the market are global in nature, each region and country is unique. Differences emerge in technology adoption, ecosystems, regulations (including spectrum), and funds. For instance, current technologies differ by region, as depicted in Table 1.

- In the US, the Bipartisan Infrastructure Law in 2021 provided policy support and financial resources for the development of smart grids including $65bn in funds to support grid modernization.
- The EU is actively pushing for a clean energy transition through various initiatives, including the European Green Deal (2020) and the Fit for 55 packages (2023). These programs all play a role in advancing smart grids and ambitious renewable energy targets. The EU has a binding target of 42.5% of its overall energy consumption to be supplied from renewable energy sources by 2030.

Table 1: Leading AMI technology by region (2023 shipments)



SOURCE: OMDIA

An introduction to the power utility ecosystem

A utility's power grid includes the site where the power is generated, the transmission system that ensures that the electricity is transmitted, and distribution stations that coordinate the distribution of electricity to consumers and enterprises. The grid currently uses various devices and applications that collect, process, and communicate information on power line data (e.g., voltage levels).

Traditionally, substations have a variety of intelligent electronic devices, which are microprocessor-based power system equipment such as circuit breakers, voltage regulators, and recloser controllers. Intelligent electronic devices receive and process data from sensors and other equipment to issue control commands. Substations also have remote terminal units, which are devices that use microprocessors and communication interfaces to monitor and control field devices and to work with supervisory control and data acquisition (SCADA) systems. From a communication network perspective, ultra-low latency is an essential part of monitoring, protecting, and controlling the power grid.

A smart grid is a further innovative step from a traditional grid: one of the main differences lies in its need to effectively manage the variable output of renewable sources. To do so, the smart grid employs technologies such as AMI, DER management systems, and energy storage. These technologies enable real-time monitoring of energy consumption, generation, and grid conditions. This evolution requires the extension of use cases such as distribution automation and load monitoring across new devices and new parts of the grid.

The smart grid is seeing the increased deployment of intelligent electronic devices in new scenarios such as DER, EV charging stations, or AMI with communication capabilities, and this results in an increased volume of data that must be collected and processed. This requires low-latency capabilities (in line with the needs of the traditional grid) but also the ability to support a large number of devices, because more use cases such as distributed-generation integration, automatic fault isolation, and reclosing are being added to the smart grid, requiring more monitoring and control sensors and devices.

The power utility ecosystem is complex and large. OEM players include makers of different types of devices (e.g., meters). This category includes players such as Honeywell and Emerson Electric Co. Software players include SAP and Hitachi Energy. Consultancies and system integrators include Accenture and Tata Communication Services. Connectivity players are abundant in the market because of the many networks and technologies traditionally used by the utility. These include the likes of Itron and Motorola.

From a cellular connectivity point of view, the vendors can primarily be divided into two categories:

- **End-to-end network infrastructure vendors:** They have a portfolio that covers both radio access network (RAN) and core and can therefore provide the whole private LTE or 5G solution. These also tend to be the leading vendors in the public network space. The category includes Nokia, Ericsson, Huawei, and ZTE.
- **Niche vendors:** They provide only the core network part of the solution. Core-only vendors include Athonet (now part of HPE), AttoCore, Druid, Cisco, and Expeto. When deploying a private network they leverage RAN from end-to-end vendors but also from other RAN specialists such as Airspan or Acceleran.

AN OVERVIEW OF INCUMBENT COMMUNICATION TECHNOLOGIES IN THE POWER UTILITY SEGMENT

The utility is a complex enterprise running many different systems and use cases that have traditionally been siloed from one another. This has led to the deployment and use of different communication network technologies such as PLC and the more advanced wireless networks (Wi-Fi, cellular, and Zigbee) or fiber optics for each different system or use case. Until now, no communication network was able to serve multiple use cases in a cost-effective manner. This has resulted in the coexistence of a multitude of technologies being used to serve specific applications:

- **A mesh network** is one in which a node is connected to other nodes in a branched network architecture. This allows them to communicate directly with each other. Mesh networks can be wired or wireless. Limitations in range mean the use of repeaters, and this may affect latency.
- **PLC narrowband technologies** use the existing power line network as the communication medium. These deliver data rates in the range of kilobits per second and are traditionally used for AMI, but they are costly to scale and to support new use cases in a completely distributed and mobile environment.
- **Land mobile radio (LMR)** technologies provide push-to-talk (PTT) two-way communication between radio transceivers. They have been used for critical communication by the workforce; however, they cannot support data-intensive use cases.
- **LoRaWAN** is a low-power, wide area networking protocol built on top of the LoRa radio modulation technique. LoRaWAN is well suited for wide area coverage; however, it is not designed for high-bandwidth applications.
- **Wi-Fi** is a wireless networking technology built on the IEEE 802.11 family of standards that provides high-speed internet access. Wi-Fi can support metering, but it is not designed to support massive numbers of devices and wide area coverage, and it has limitations in terms of native security.
- **Fiber optics** is a technology that sends data as pulses of light through strands of glass. Fiber and other wired options are used; however, though fiber is high performing it is expensive and has high deployment and maintenance costs.

Introducing private LTE/5G networks for utilities: From a siloed to a holistic approach

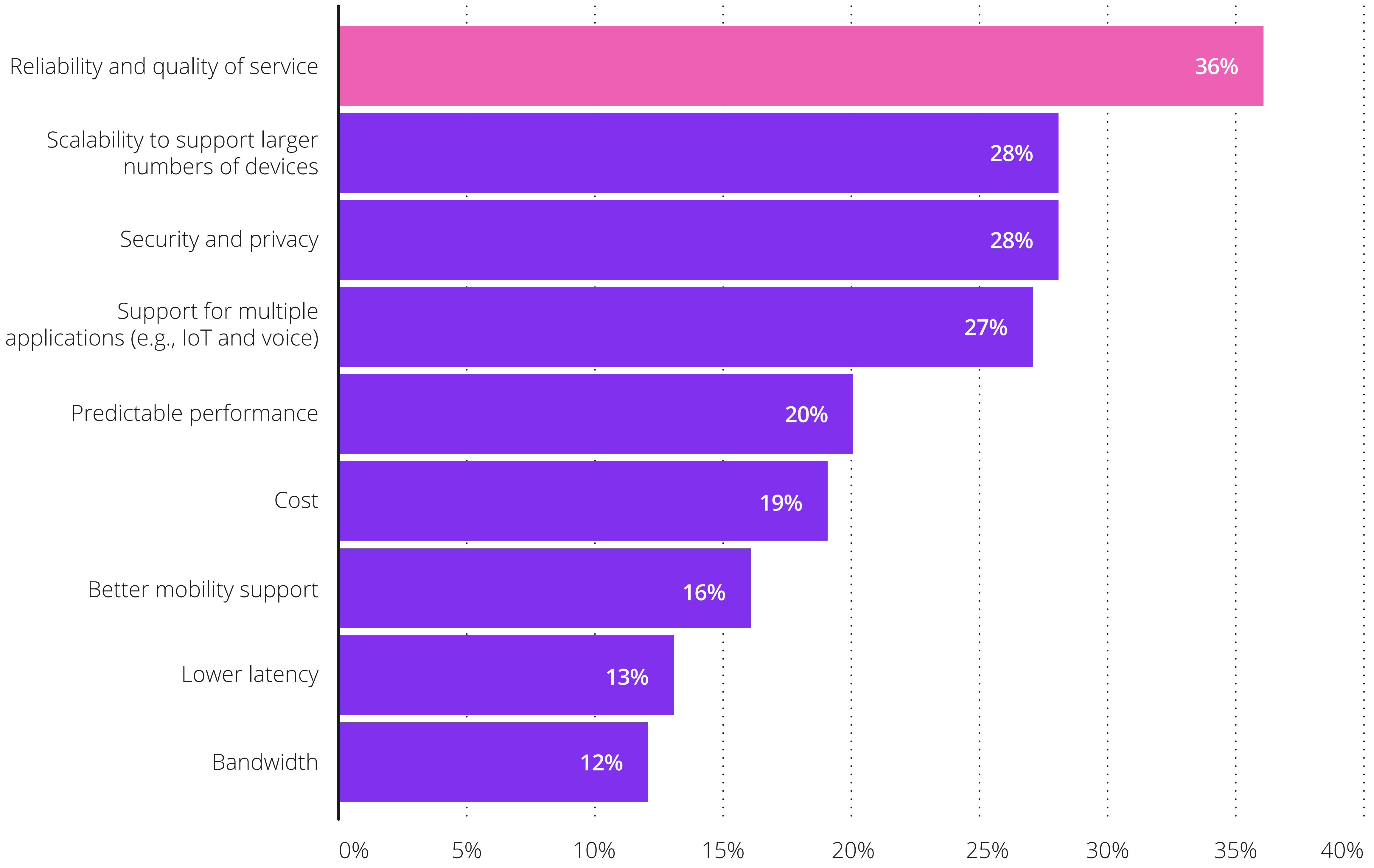
HOW DOES CELLULAR COMPARE WITH OTHER TECHNOLOGIES USED IN THE POWER UTILITY SPACE?

Most other technologies are deployed only in one use case or scenario, but a private LTE network can be deployed to serve several scenarios across the home area network (HAN), the field area network (FAN), and even as backup for the wide area network (WAN). In the eyes of the utility, private cellular has many advantages over other options.

From a qualitative perspective, the main advantages of private LTE can be divided into four categories:

- **Versatility:** The network can be adapted to serve different use cases including AMI, backhaul, and even PTT communication.
- **Control and security:** The utility is in control of the network, which is built and designed to serve its specific needs. The utility controls its own data flows.
- **Scalability:** This is a cost-effective network to bring wide area coverage but also to further expand the network at later stages.
- **Performance:** This is a high-performance network serving high-bandwidth needs with low latency, but it is also capable of supporting a massive number of devices.

Figure 2: What are the main advantages of private LTE/5G networks over other technology options?



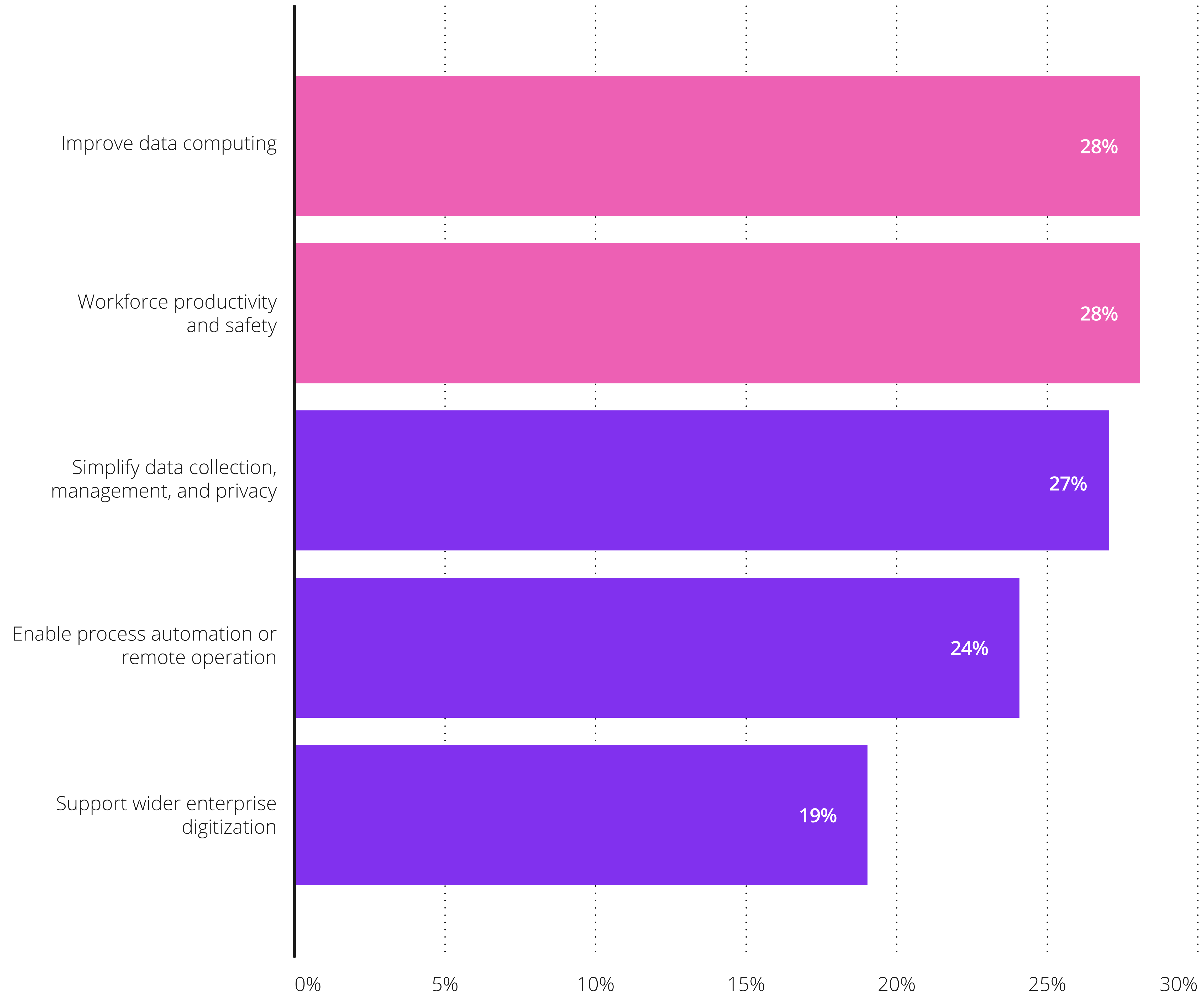
SOURCE: OMDIA **NOTE:** N=85 In 2024, Omdia conducted a survey about enterprises' private cellular networks' adoption and preferences. This included enterprises currently using, trialing, or planning to use a private cellular network. 85 utilities' respondents completed the survey.

DRIVERS

There are several drivers for utilities to deploy a private LTE network, including the need for a network to better handle, collect, and process data. The utility of the future must have better observability and control capabilities across its whole distribution.

To achieve these objectives the utility requires seamless communication and real-time monitoring. This will allow the utility to increase operational efficiency. Depending on its region, footprint, and customer-base the utility will need to support and prioritize different use cases from worker to EV charging stations. However, common to all use cases remains the need to generate and collect much higher quantity of data from an increasing number of assets. This underlying need will be a key driver for the adoption of private cellular networks.

Figure 3: Top five drivers for deployment



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The gains for the power utility from deploying a private LTE or 5G network

There are many gains to be had from adopting a private LTE/5G network. For instance, resiliency and redundancy are key features of a private LTE network. Traffic prioritization can also be delivered in the network at both a packet and application level. This is a secure technology with SIM-based security, encrypted traffic, and the ability to provide different quality of service (QoS) for different applications.

Control is a macro-level benefit obtained with the private LTE/5G network. The utility decides:

Coverage:

The network covers any desired area. The utility can decide the power backup of cell sites to ensure network operation.

Redundancy and reliability:

The network can be designed to guarantee five-9s reliability to serve critical use cases.

Performance:

The performance of the network is designed to serve specific use cases.

Data, security, and ownership:

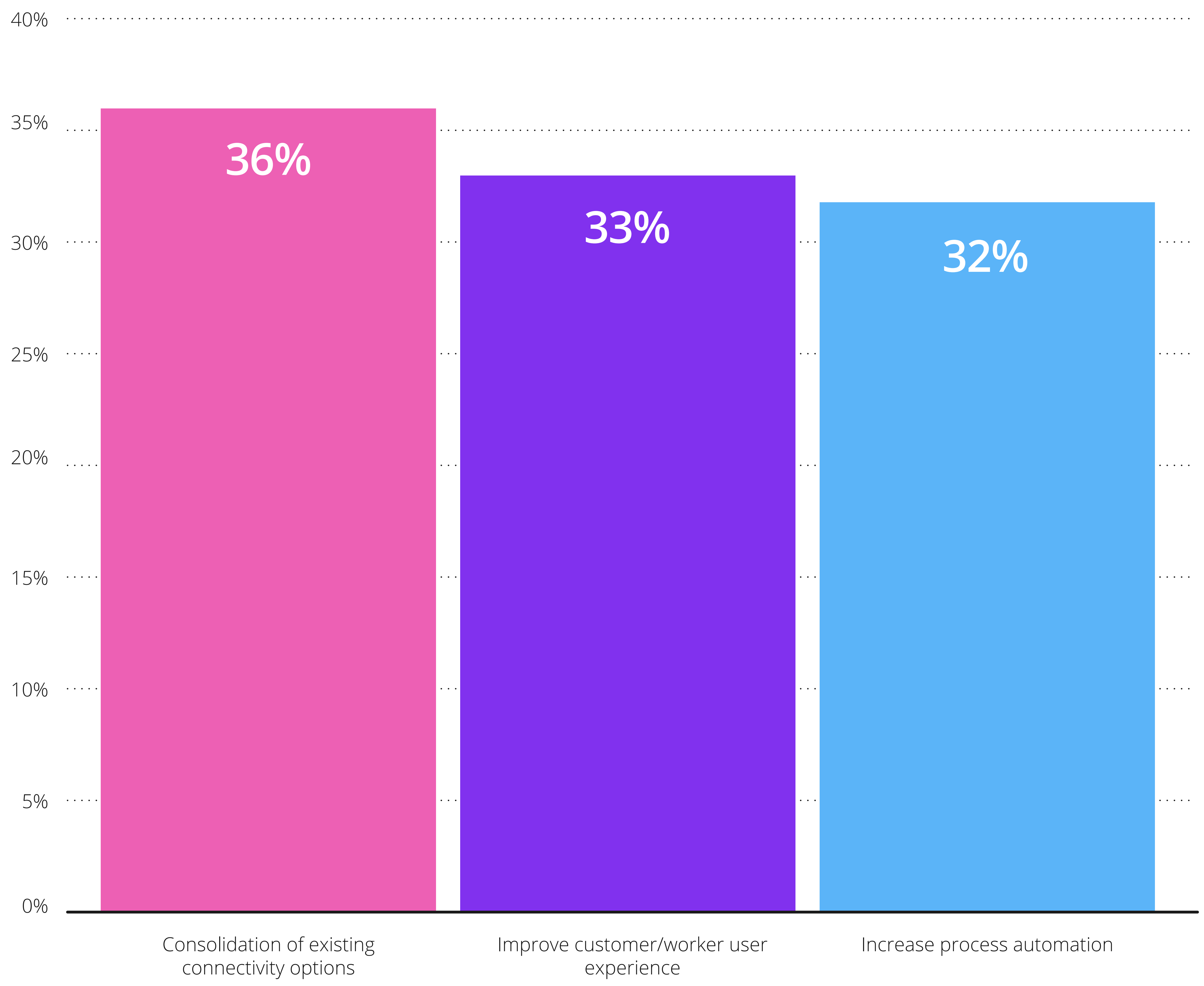
The data is owned and controlled by the utility. The maintenance and upgrade cycles are determined by the utility and not by a telecom operator.

THE VALUE OF PRIVATE CELLULAR NETWORKS

At a time when traditional connectivity options are unable to support all the utility's use cases and when public networks struggle with performance and coverage, private LTE networks emerge as a powerful solution. They create a dedicated and secure environment for smart grid communication, minimizing the risk of unauthorized access and data breaches. By offering dedicated bandwidth, private networks ensure reliable and timely data transmission. Critical smart grid data receives priority on this private network, guaranteeing it will reach control centers ahead of less urgent traffic.

Utilities (especially those that are not state owned) need to also consider the financial benefits of any new technology they want to adopt. Private LTE/5G networks generate clear financial benefits. For instance, by consolidating existing networking options the utility is reducing opex. Additionally, given its flexibility in supporting wide area needs, large number of devices, and high throughput, the private cellular network can enable the utility to explore new revenue streams. For instance, by capturing and sending a higher degree of data more frequently, the AMI infrastructure can be a platform used to further tailor price tariffs and other customer-centered solutions. This will help in securing new customers and in increasing existing customer spend.

Figure 4: Top three business benefits that utilities see from a private network



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THE PATH TO 5G

Though utilities may start with LTE, 5G is being deployed today worldwide, and provides many additional benefits. With Release 15 and Release 16, 5G brings new features. There are two approaches to 5G: 5G nonstandalone (NSA) and 5G standalone (SA). The former uses 5G New Radio with a 4G LTE core, and the latter uses both 5G New Radio and a 5G core. From a performance perspective, 5G NSA is suited to deliver enhanced mobile broadband (eMBB) capabilities with peak throughput of 10Gbps. However, for features such as ultra-reliable low-latency communication (uRLLC, aiming for 1ms latency) and massive machine-type communications (mMTC, aiming for up to 1 million devices per square kilometer), 5G SA is needed.

One of the strengths of 5G is that the utility can choose any starting point (LTE, 5G NSA, or 5G SA) and have a smooth path to future upgrades. The recently standardized Release 17 and Release 18 bring even more new features. The former enables features such as support for non-terrestrial networks (NTN), 5G IoT optimization, and RedCap (reduced capability), while the latter enables, among others, AI/ML enhancements for network automation and enhanced MIMO and positioning technologies.

Having a wide ecosystem will also be a key advantage that is being built within 5G. Additionally, 3GPP, the standards body for cellular, is increasingly liaising with vertical industries on the development of new standards. This means that the utility sector as a whole can help shape the future of cellular in line with its needs and priorities.

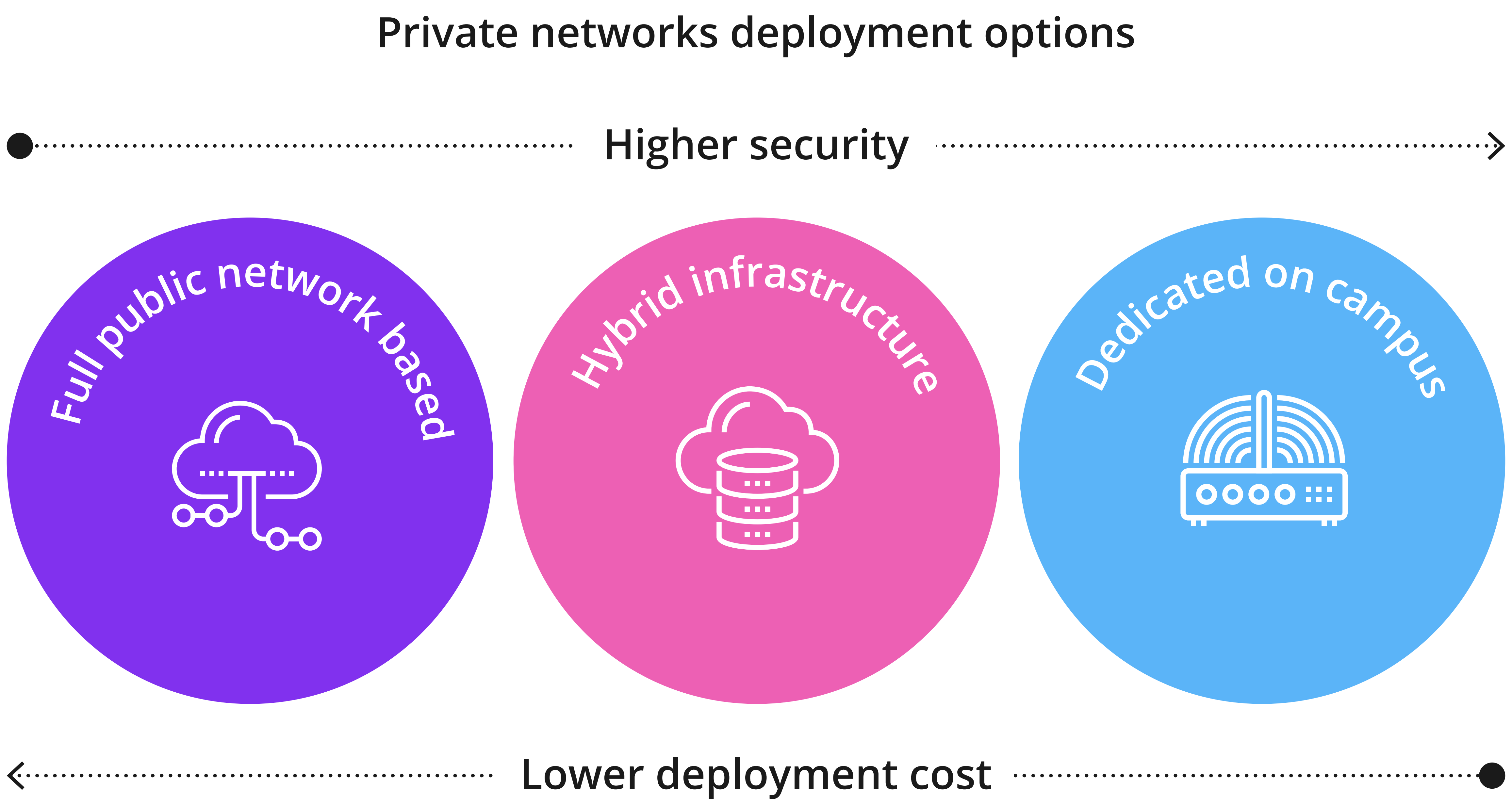
The decision-making journey for the power utility: What you need to know to deploy a private LTE/5G network

DEPLOYMENT OPTIONS: PRIVATE LTE/5G CAN BE TAILORED TO THE UTILITY'S NEEDS

When a utility is looking at cellular, it has different deployment options available:

- **Private network fully dependent on the public network:** This may be more cost-effective since it is making use of existing infrastructure. However, utilities relying on public network services may face limitations in their ability to customize (e.g., design, coverage, and backup power). The utility and the telco priority may also be misaligned..
- **Hybrid network:** This is a network with some infrastructure exclusive to the utility and some that is shared with the public network, for instance, a network with RAN dedicated to the utility and the core from the public network. This option trades the relinquishing of some control for lower cost.
- **Fully dedicated RAN and core exclusively for the power utility:** This is likely the most expensive option but also the one that more than any other can be tailored to serve all the needs of the utility.

Figure 5: Schematic representation of different architectural options



SOURCE: OMDIA

CHALLENGES

There are several challenges that the utility must consider when embarking on the private LTE journey:

- **Spectrum:** Spectrum availability and regulations differ depending on country and region. It can be obtained from the regulator or from a telco. Given the wide area needs of the utility, it is wise for it to secure some low-bandwidth spectrum, ideally sub-1GHz; this can then be complemented with higher-bandwidth spectrum for additional capacity.

  Depending on the region, different spectrum options may be available to the enterprise. For instance, in the US Anterix is leasing the 900MHz band for utilities; this can be augmented with Citizen Broadband Radio Services (CBRS) spectrum (3.55 GHz to 3.7 GHz).
- **Integration:** The private network will need to be integrated with both operational technology (OT) and IT processes of the utility.
- **Migration:** The utility must consider the rate at which it wants to transition use cases from existing connectivity solution into the private cellular network. Each use case will have a different transition time.
- **Technical aspects:** The utility must try to leverage existing assets to optimize its resources..

Even when the network is deployed, there are still challenges for the utility. According to Omdia data, in line with what is seen from other verticals, utilities using, trialing, or planning to use a private cellular network see cost and management as their key obstacles to day-to-day operation.

Figure 6: What are the key obstacles to day-to-day operation of a private LTE or 5G network?

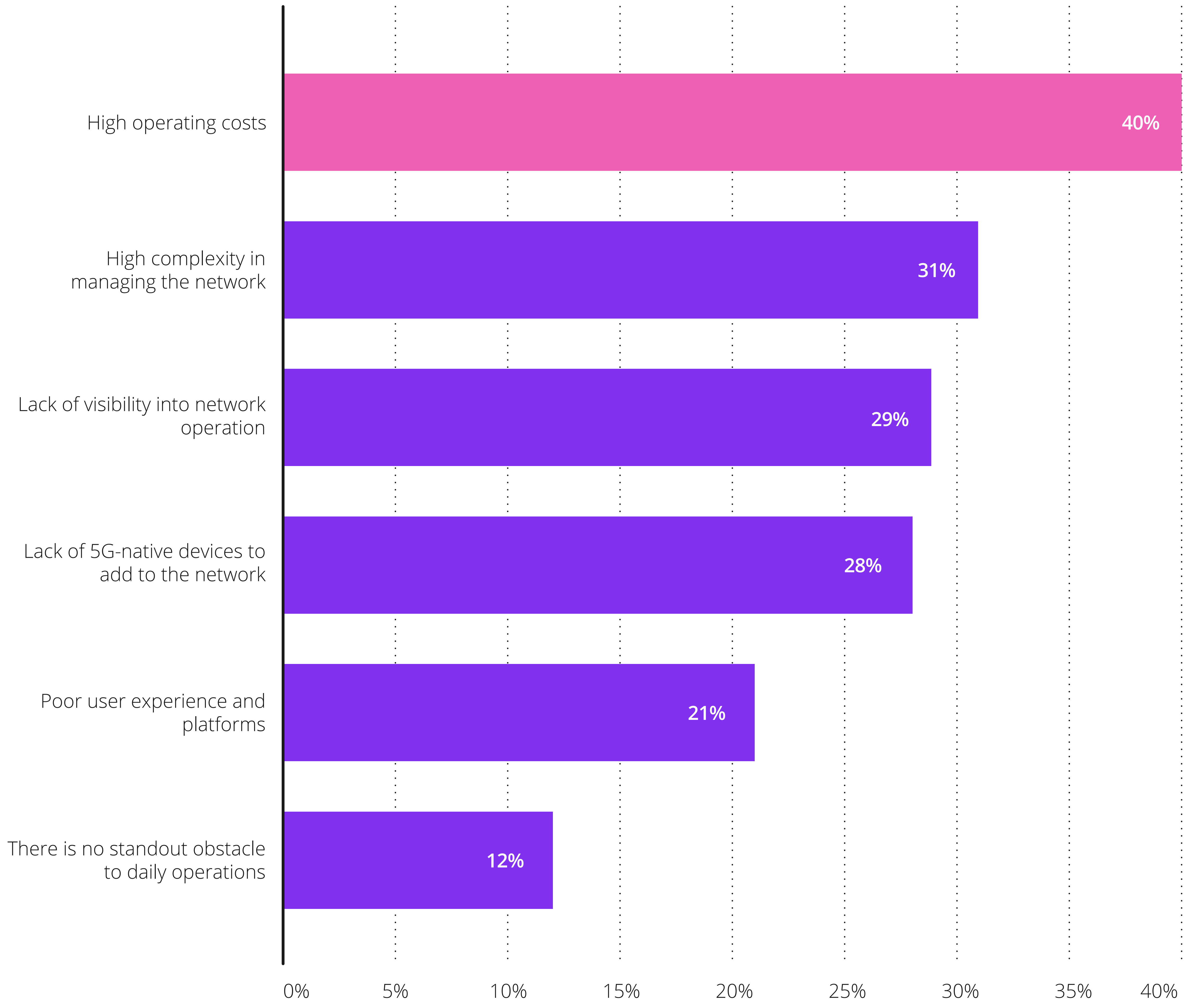


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Table 2: The deployment path for the utility

DEPLOYMENT PATH FOR THE UTILITY	DESCRIPTION
Decide what anchor use cases are	A utility should start its private LTE or 5G network journey by identifying the critical use cases that cannot be served effectively by legacy connectivity options.
LTE vs. 5G NSA vs. 5G SA	The utility should decide which cellular technology is better suited to deliver on its needs. Though there is no wrong choice, LTE or 5G SA are the most suitable choices. LTE has a larger ecosystem of devices and has already been deployed by some early movers. Though 5G SA brings improved features that are of great benefit for the utility, such as uRLLC and mMTC, its ecosystem of devices is not yet as well established. Availability of spectrum will also play a role in this decision.
Consider existing assets	The utility should consider what existing assets can be reused to ease the financial and logistical deployment of the private network. These include fiber, towers, etc., possibly owned by the utility but also, potentially, by third parties such as telcos.
Network design	Where to position new towers, what spectrum to use, and how to fine-tune the network depending on the use cases are all essential factors that the utility will need to work on alongside partners.
The question of RAN	It is necessary to determine whether the radio has an indoor or outdoor power supply and where to position it and to ensure that the site meets the needs imposed by the local environment. How to reuse existing assets such as fiber or dark fiber for radio backhaul purposes is a question that the utility and its partner must answer. If no fiber is available, microwave backhaul can be an option.
Capacity growth scenario	It is important for the utility to have a clear view of the future expectations for the network, particularly on how it wants the network to evolve and to expand in coverage and capacity to serve additional use cases.

SOURCE: OMDIA

Use cases

Advanced metering infrastructure: Beyond their traditional billing function, smart meters are integral to the modernization of the grid. They enable real-time energy consumption monitoring, facilitate the detection of anomalies such as leaks and theft, support network diagnostics, and provide data for advanced analytics. AMI data will increase in granularity and frequency.

Distribution automation: Distribution automation is a use case that includes several applications, including substation automation and feeder section switch control. This is based on a network capable of sending telemetry data from across the whole footprint. This scenario requires low latency and high reliability to ensure the correct functioning of the grid.

Load monitoring and control: Data is essential for the utility to adjust the power load from parts of the grid to guarantee its working under all circumstances. Applications such as fault isolation require very low latency. Monitoring and control alongside distribution automation are essential for DER integration.

Workforce critical communication: Mission-critical voice and data from workforce management applications to improve worker productivity and safety are essential to maintain a distributed environment. The network can be used to deliver PTT functions, essential in case of emergencies.

Falling power line detection: Falling conductor protection for wildfire mitigation is one of the key use cases for utilities. Using sensors and real-time connectivity, the utility can detect a broken wire and de-energize it before it touches the ground, preventing the risk of wildfires.

Remote inspection and monitoring: Drones can be used for remote inspection or maintenance. This is particularly useful for the inspection of remote areas to save the cost of sending workers to remote locations for routine inspections. Drones are equipped with high-resolution cameras and sensors, which enable them to deliver real-time data from regular inspections of critical infrastructure such as transformers and switches located in remote or hazardous areas.

An overview of technology features needed by the utility

HOW THE SOLUTION PROVIDERS WILL DELIVER ON THE UTILITY'S REQUIREMENTS

The utilities will benefit from private networks technologies to deliver the use cases discussed in the previous section, however, the solution provider must ensure it can deliver on five key delivery areas, such as trust, simple operations, interoperability, optimized and long-lived and evergreen.

Trust

Stakeholder trust is of utmost importance to the utilities. Some of their stakeholders include the regulatory organizations and the end customers and hence the utilities must ensure that the solution provider can meet all their requirements. Further, other requirements include having a secure and proven solution that will serve the utility both today and in the long term, supporting the utility over its lengthy deployment and innovative cycles. Others include:

- having a roadmap to 5G and beyond.
- solution vendor should deliver the same level of trust and security as it does to the large service providers..

Simple operations

Simplicity of operations is essential to ease the workload of utility networking teams. It is further essential that the network solution functions without errors and avoids service interruptions. Modern networks have thousands of parameters to maintain. Once these were optimized using manual activities, but in the Smart Grid era, the number of parameters will be several orders of magnitude higher, and manual changes to parameters will no longer scale given the complexity of the problem. Further:

- A core network solution should leverage the state-of-the-art automation processes that come with modern cloud-native solutions to reduce not only repetitive manual intensive tasks but also operational costs.
- The solution will need to have a reduced footprint to save on both cabinet space and power usage requirements.

Interoperability

The utility is a brownfield of different IT, OT, and connectivity technologies including MES, SCADA, AMI, and sensors. It is critical that any new solution can interoperate with existing technologies but also this will remain open throughout the whole lifespan of the private network. For this reason, the core network solution provider must ensure adequate backward compatibility to ensure it can connect the next-generation network with legacy systems.

Optimized

A utility has very specific needs in terms of devices, coverage, resilience, reliability, cost, and scalability. It needs a solution fully tailored to its business to be forward looking in a highly competitive and regulated markets. In addition, the solution must leverage cloud native technologies to deliver on size, capabilities and able to be updated as new technologies emerge.

- In today's world, management of the total cost of ownership (TCO) is at the top of most service provider organizations' requirements: vendors must leverage all the tools that cloud-native design brings, such as containerization, to better manage the platform's resource requirements and cater for future capacity needs.
- Network and resource scalability is an important feature of 5G networks, for example, when the devices require higher bandwidth for a specific time, the core network must scale the necessary resources dynamically to deliver those requirements and then scale them down when no longer required, releasing the resources to another customer. Only today's cloud-native-based networks are capable of such agility and resource usage optimization.
- The utilities should also leverage cloud native technologies to easily modify the network functions present (mutability) and ensure the right network function elements are present to deliver the necessary functionalities.

Long-lived and evergreen

The trends shaping the utility are starting now, but they will not end anytime soon: the assets are expected to last more than 10 years. The utility's communication network needs to be able to continue support and evolve alongside the growth of these trends:

- Future-proofing investments is a major concern of utility organizations, given that many expect the lifespan of these networks to be more than 10 years. Networks and software solutions evolve continuously over time, and without planned platform upgrades the networks can become obsolete and not deliver communication based on the 3GPP specifications between the network and devices or deliver on the latest features that 5G or, later, 6G will bring.

NOKIA'S PRIVATE WIRELESS SOLUTIONS CAN HELP MEET THE NEEDS OF UTILITIES

To cater to utility organizations' requirements, Nokia has developed its Core Enterprise Solution for Power Utilities to provide the foundation for private LTE and 5G wireless networks. Utilities can start with an LTE system upgradable to 5G, deploy both 4G and 5G simultaneously, or even build a 5G-only network. This solution is designed to deliver the utility's needs for trust, simple operations, interoperability, optimization, and longevity.

Case study: First movers gain competitive advantage

A NORTH AMERICAN POWER UTILITY COMPANY

A leading utility in North America serving millions of customers over an extensive regional service territory was faced with several challenges including a projected energy demand increase of 80% and the need to meet carbon reduction targets. To overcome these challenges, the power utility undertook various strategic initiatives including the strengthening and modernizing of its grid.

To this end, it opted to replace its legacy wireless field area network with a private 5G field area network (FAN). The decision was taken because its legacy network was approaching end of life and was not capable of meeting the new requirements of grid modernization and resiliency. The new network will connect a variety of devices including smart meters, distribution assets, control and protection equipment, and remote substation equipment.

Considerations inducing the utility to opt for a private network included system performance, cybersecurity, liability, technology control and rate protection, and coverage. At the time of writing the network is live and its deployment ongoing.

Table 3: Legacy network versus the new private 5G FAN

	Legacy network	FAN
Latency	20–120 seconds	<1 second
Throughput	19–115kbps	144kbps–10Mbps
Availability	95%	99.5%
Message priority	Limited	QoS

Table 4: Key features of the project

DEPLOYMENT PATH FOR THE UTILITY	DESCRIPTION
Technology features	A 4G/5G technology platform
	The ability to support millions of devices
	A Kubernetes network core
	Modern cybersecurity functionality
Deployment details and timeline	The network is currently live
	Hundreds of cell towers deployed
	Service territory of tens of thousands sq. miles
	Migration of devices across 10,000 field locations
	The creation of a new organization and system to build and operate FAN
	10-year project

Table 5: Use cases supported

DEPLOYMENT PATH FOR THE UTILITY	DESCRIPTION
Short term	Distribution automation
	Grid management system use cases
	DER integration and management
Mid to long term	Commercial and industrial metering
	Distribution open phase detection
	AMI backhaul
	Weather stations
	Mobile workforce automation
	Live HD video monitoring
	LMR
	AMI refresh

Overall, this North American Utility has so far identified four key advantages emerging from the deployment of the private 5G network:

Accelerated smart grid deployment thanks to real-time monitoring, advanced sensors, AMI, and automated controls deployed across the whole FAN

Enhanced DER integration and renewable energy management enabling dynamic resource allocation of DER

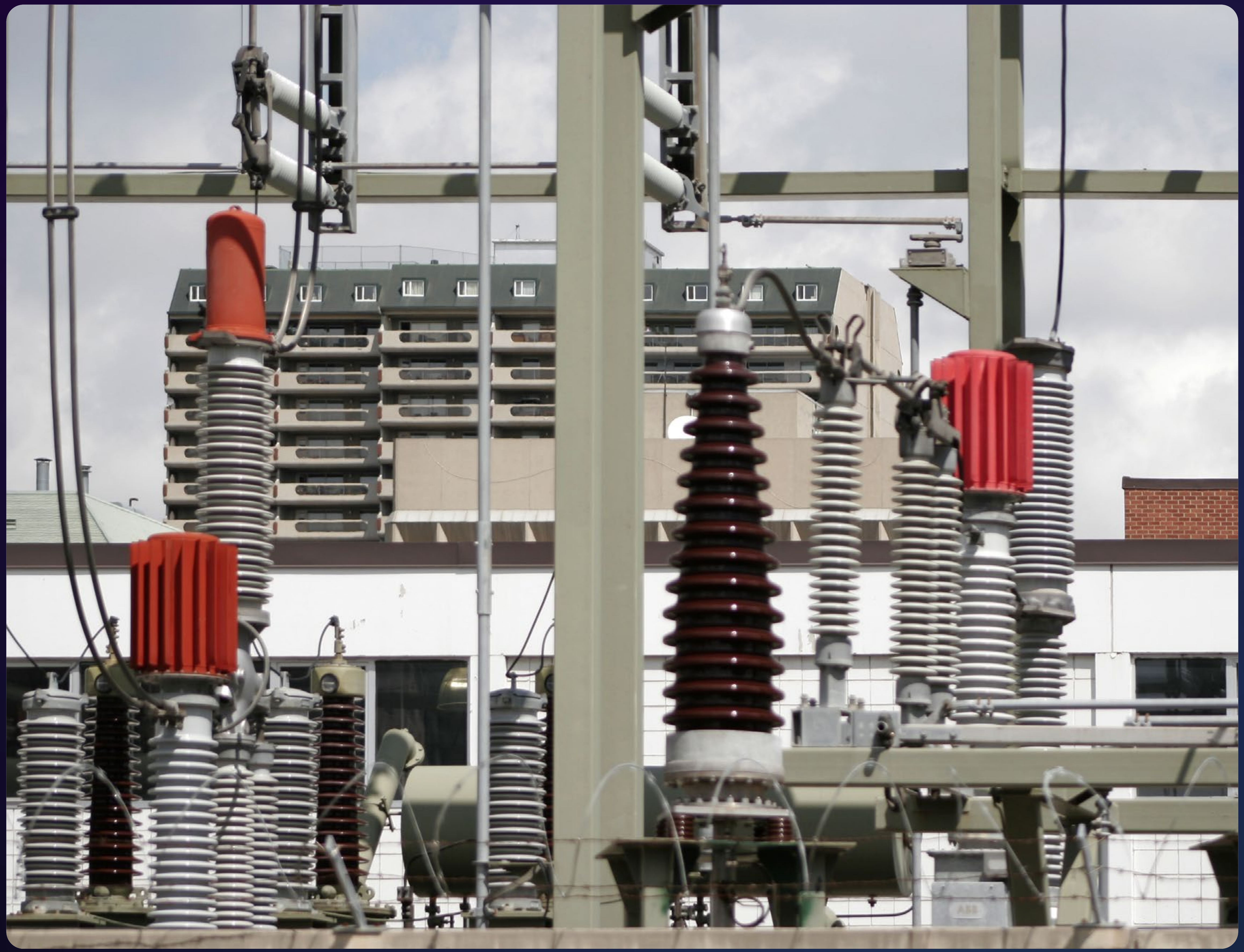
Automation at the grid edge with prioritization of critical grid functions at the edge

Improved worker safety and asset management with real-time data and improved situational awareness

Summary

The need for the utility to expand observability and control across the entirety of its grid to support new use cases such as DER or AMI has highlighted its necessity to look at a new connectivity paradigm. This alongside the fact that the communication networks currently used by the utility are use case specific and unable to meet the new demands of coverage, flexibility, reliability, and performance, are opening the door for private cellular networks as a significant option. Private cellular networks have the advantages of supporting multiple use cases with high performance connectivity while keeping the utility in control of the network and its data. This means that the utility can design its preferred network coverage, can decide whether to begin its journey with LTE, 5G-NSA, or 5G-SA and is in charge of choosing how it wants its network to evolve.

Additionally, because cellular is a standard-based technology, the utility can count on new features becoming available further strengthening the technologies in areas such as IoT support or additional bandwidth, as well as on a wide ecosystem of device OEMs. The first movers are already reaping the benefits generated by private cellular networks. A leading North American Utility for instance, deployed a private 5G network which helped the company to accelerate smart grid deployment, improve automation at the grid edge, enhance DER integration, and improve worker safety `and asset management thanks to real-time data and better situational awareness.



Appendix

About

Nokia

At Nokia, we create technology that helps the world act together.

As a trusted partner for critical networks, we are committed to innovation and technology leadership across mobile, fixed and cloud networks. We create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

Adhering to the highest standards of integrity and security, we help build the capabilities needed for a more productive, sustainable and inclusive world.

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