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The leading multi-network IoT operator

# SMART METERING WITH LORAWAN POV WHITEPAPER

The Key To A Sustainable Future In Utilities; Electricity, Water, and Gas.

# INTRODUCTION

The current scope of the utility landscape and the ever-growing demand for environmental sustainability create a unique opportunity to adopt smart meters for the management of utilities. These intelligent devices have been evolving ever since they hit the world market, and they have been revolutionizing the management of energy, water, gas, and other critical utilities. Deeply embedded in the smart grid concept, smart meters extend the focus from conventional meter-to-cash (M2C) use cases to more advanced uses such as improved operational efficiency, reduction of utility theft, improved customer experiences, data-driven decision making, environmental sustainability, etc.

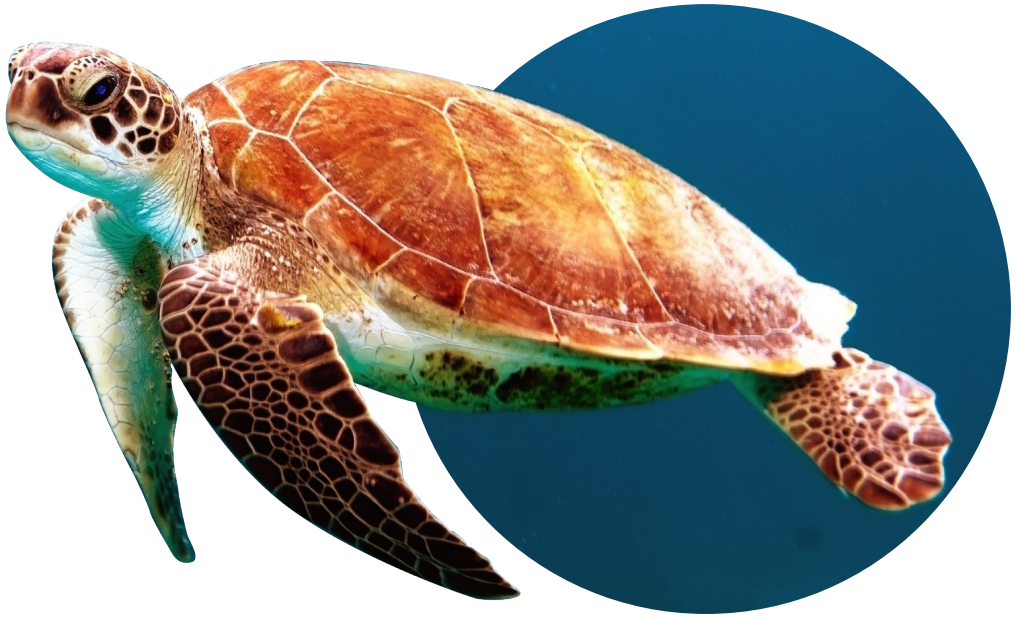
However, the real potential of these smart devices remains untapped because of the technical complexity of deploying such infrastructures. Most smart metering infrastructures deployed across the globe have not been effectively connected, which reduces their effectiveness in achieving the pre-conceived benefits. One of the primary reasons is the lack of a well-orchestrated data aggregation and analysis approach. Connectivity, therefore, becomes a vital element in launching successful smart metering campaigns. Smart meters need to be connected using robust, reliable, and cost-effective technologies.

LoRaWAN technology has proven the optimal connectivity of choice for utility providers to take their digital transformation efforts to a whole new stage. This is because connection technologies such as cellular networks, wired connections, RF Mesh, satellite connectivity, and other LPWA technologies such as Sigfox and NB-IoT lack the vital requirements needed to deploy smart meter solutions. Some critical pitfalls of these communication technologies include complexity, high Total Cost of Ownership (TCO), lack of reliable and comprehensive ground coverage, and high deployment and maintenance costs.

This whitepaper navigates the smart metering ecosystem on utilities, mainly energy, water, and gas. It provides essential insights into the smart metering ecosystem from its evolution, benefits, business use cases, and adoption and maintenance challenges. We also introduce you to the essential technologies required to create smart meters for different utilities.

It goes in-depth on environmental sustainability through the effective management of the aforementioned utilities, especially when the world is currently concerned about climate change and utility shortages. We also provide you with viable Netmore Smart Metering solutions built on the foundation of LoRaWAN and real-world case studies to help you grasp the smart metering imperative in the modern world.

Think of it as your comprehensive introduction to smart metering with LoRaWAN and how you can capitalize on it to eliminate glitches in the previous generation of utility meters while creating a culture that embraces innovation and environmental sustainability.



# SUMMARY

- McKinsey's recent "Global Energy Perspective 2022" highlights that the electricity demand will triple by 2050, resulting from net-zero carbon commitments by many countries, likely straining the utility sector.
- Smart meters can help consumers save £50-100 or more by being energy-wise, £90 by using energy at its cheapest, and £200 per year by changing the approach to buying power, Delta-ee Research And Consulting.
- In 2021, about 120 million smart devices had been installed in the EU, which accounted for 48% of the metering ecosystem.
- Smart metering is the leading driver of the LPWAN market, and energy and smart water meters will be the second greatest vertical IoT application in 2023, accounting for 33.3% of the global LPWAN device connections.
- LoRaWAN is the best connection technology for smart metering for utilities because of its low TCO, extensive geographical coverage, long-life battery life devices, and flexibility in network deployment.
- Digital metering systems can help stop water leaks, which may account for more than 1.3 million cubic meters ( up to 20%) of water.
- Smart meters provide a strong case for renewable energy management, which has proven to be difficult using traditional approaches. Smart grids can support 60% more solar energy than conventional grids.
- According to Navigant Research, the global penetration rate of smart electric meters was 41.2% in 2019 and may hit approximately 59% by 2022.
- According to Navigant Research, the global penetration rate of smart electric meters was 41.2% in 2019 and may hit approximately 59% by 2022.
- Smart meters account for 14% of utility meters (electricity, water, and gas) worldwide in 2019, IoT Analytics.

# DEFINITIONS

## LPWANs

Wireless telecommunication technologies explicitly made to connect devices and sensors are suitable for many IoT business cases, including smart meters, GPS trackers, weather stations, and many other 'things.'

## LoRaWAN

A Low Power, Wide Area (LPWA) networking protocol designed to wirelessly connect battery operated 'things' to the internet in regional, national, or global networks by targeting key Internet of Things (IoT) requirements such as bi-directional communication, end-to-end security, mobility and localization services.

## LoRa

A physical proprietary modulation mechanism based on CSS ( chirp spread spectrum) technology techniques.

## Smart meter

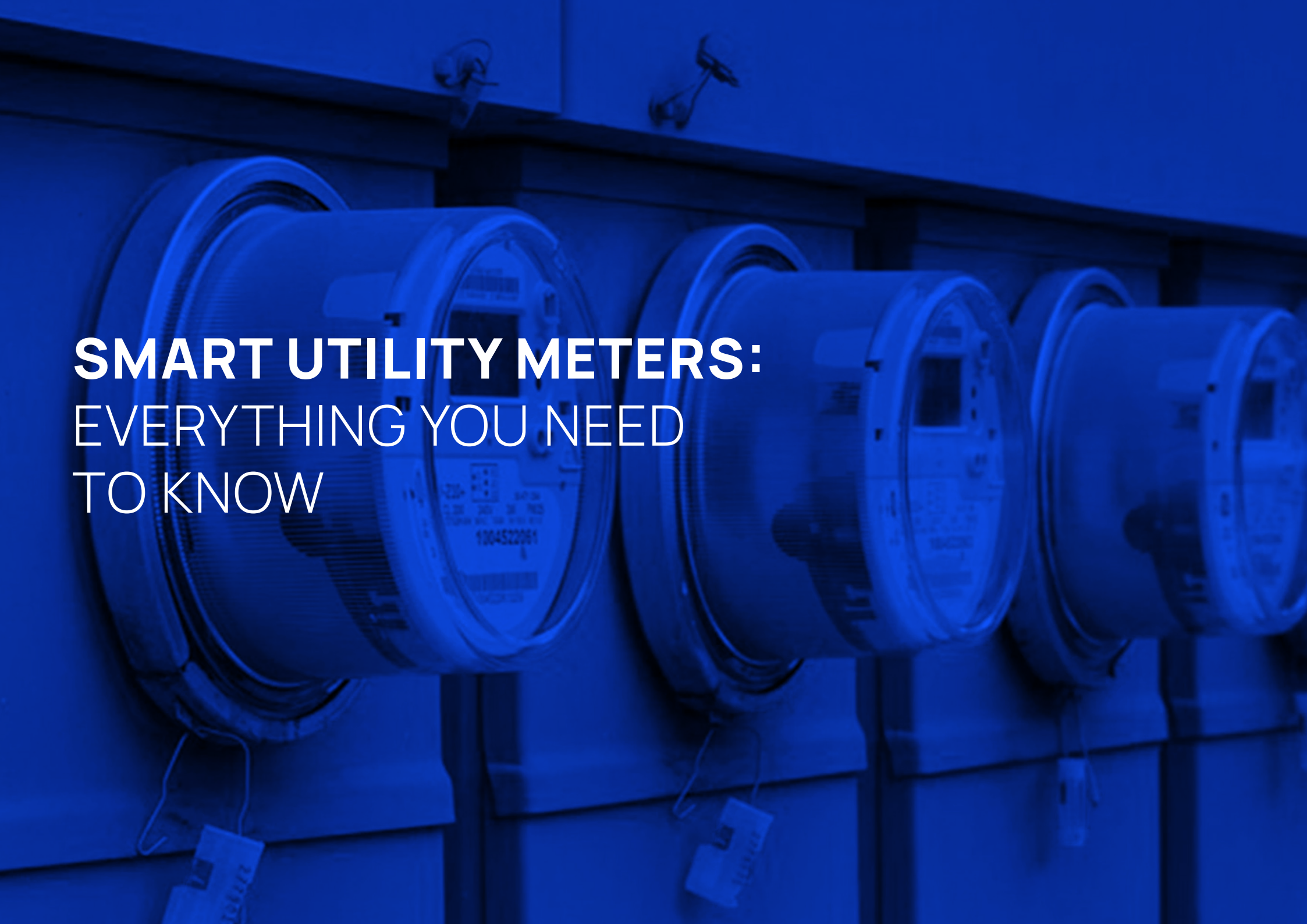
It is an intelligent IoT device that helps track the usage of utilities for billing purposes, analytics, and improved operational efficiency, especially in energy, water, and gas.

## NB-IoT

It is a global standard-based wireless communication technology developed to support the development of IoT device solutions and services. It is sometimes referred to as CAT-NB1, and is operated by conventional telecommunication companies globally, including Vodafone and Telstra. It is standardized by the 3rd Generation Partnership Project (3GPP).

# ABBREVIATIONS

| | |
|---|---|
| 3GPP | 3rd Generation Partnership Project |
| AMI | Advanced Metering Infrastructure |
| CX | Customer experience |
| CapEx | Capital Expenditure |
| CAGR | Compound annual growth rate |
| CSS | Chirp Spread Spectrum |
| ESG | Environmental, social, and corporate governance |
| FOTA | Firmware Over The Air |
| LoRaWAN | Long Range Wide Area |
| LTE | Long-Term Evolution |
| LPWANs | Low-power Wide Area Networks |
| NB-IoT | NarrowBand-Internet of Things |
| PLC | Power line communications |
| LoRa | Long-range |
| QoS | Quality of Service |
| SCHC | Static Context Header Compression |
| TCO | Total Cost Of Ownership |
| DER | Distributed energy resources |
| CSS | Chirp Spread Spectrum |



# **SMART UTILITY METERS:** EVERYTHING YOU NEED TO KNOW

# WHAT IS A SMART METER?

A smart meter is an intelligent IoT device that helps track the usage of utilities for billing purposes, analytics, and improved operational efficiency, especially in energy, water, and gas. The concept of the smart meter was initially intended for electricity. But with the rapid rise of the Internet of things (IoT) and other technologies, these capabilities were extended to other utilities, including gas, water, and district heating. Modern smart metering systems have more functionality, including preventive maintenance, automation, robust analytics tools, and remote monitoring and alerting.

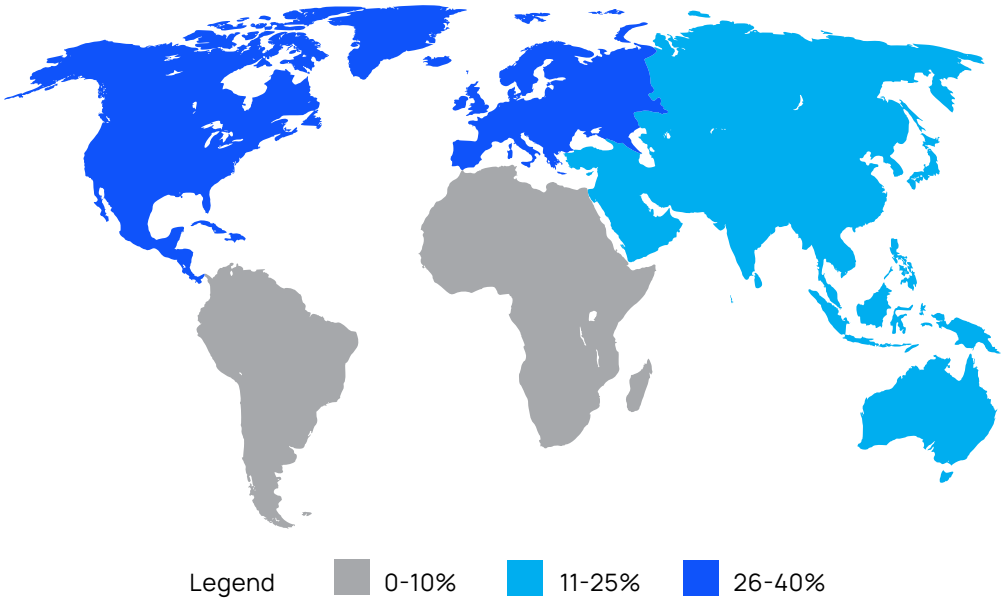
Smart meters have many benefits for different groups. For electricity companies, for example, they can be used to monitor the quality and enhance power flow, improve response time in case of outages, and enhance customer experience. Some parts of the grid infrastructure can also benefit from smart meters because they can come in handy in line sensing, equipment control, and substantiation automation. For the end-users, smart meters help them gain essential utility insights, which help them control their consumption, hence reducing their utility bills and reducing their carbon footprint.

According to a late 2019 research by IoT analytics, 14% of the world's water, electricity, and gas were smart meters. The devices also remain the most adopted IoT applications, with water, electricity, and gas smart meters expected to hit the 1 billion mark (November 2021).

With the rapid evolution of supporting technologies such as edge computing, security, and grid intelligence, along with the widespread awareness about the need to integrate sustainable investment models such as ESG into utility companies that power the global economy, smart meters will continue to penetrate the global economy.

## Global Smart Meter Penetration by region 2019

Average Global Penetration 2019: 14%




Global Smart Metering Penetration Rate By Region 2019: Source- IoT Analytics.

# HOW THE LORAWAN SMART METER WORKS

By using IoT technologies, the smart meters provide real-time data for utility companies, municipalities, and property owners. The data is collected using LoRaWAN devices and gateways, then transmitted to LoRaWAN network servers.

End-user data is used by smart meters to measure key utility metrics, such as voltage in electricity and frequency, or pressure in the water, in real-time. The data is regularly sent to network operators, innovative metering applications, and other parties who use the data to generate insights for billing and other purposes.

Smart meters have varied communication technologies, but the underlying infrastructure is built upon hardware and software components such as **LoRaWAN wireless sensors and transmitters**, gateways, network servers, and other elements.

The communication technologies used by smart meters to transmit end-user data vary from **Radio Frequency mesh-based systems (RF Mesh), power line communications (PLC), and Wireless Low-power Wide Area Networks (LPWANs)**. Every communication technology used in smart metering has its advantages and disadvantages depending on the deployment context.

But, several factors make LPWANs, specifically LoRaWAN, the perfect communication technology for utility smart metering solutions, including reliable data transmission, low power consumption, and extended geographical coverage. We will provide you with a background on LPWANs and LoRaWAN in the next section of the whitepaper.

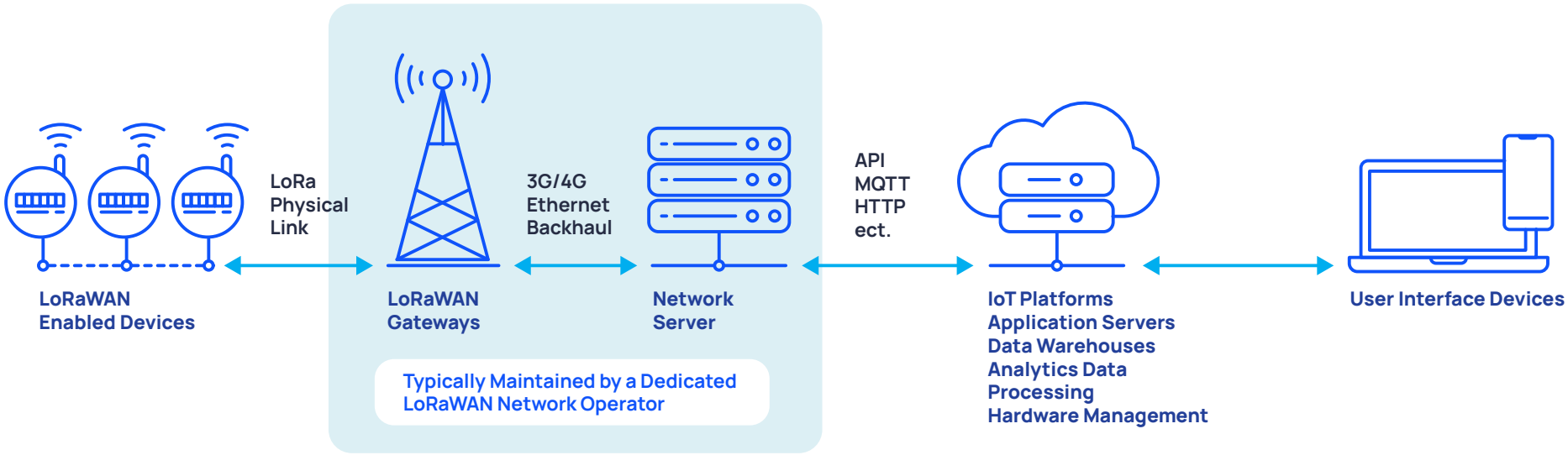
Once the utility data is collected and transmitted to the network servers, it is forwarded to the application servers (which support real-time analytics), where computing is done based on the business logic of the data captured by the smart metering technology stack. Such business logic includes power or water consumption or utility cost. An IoT platform at the edge provides the users with visualized insights.

Wideco's IoT smart metering solution is one good example of such a solution, which facilitates wireless water reading in real-time. The resulting insights, including hot or cold water consumption, are used by utility companies, municipalities, and real estate companies to streamline their services for elevated customer experience and improved ROI. Wideco's water metering solution leverages Netmore Group's network of solutions, including LoRaWAN IoT sensors, to deliver their solution. The Netmore Marketplace also boasts similar smart metering solutions, from some of the world's greatest innovators. Some solutions include smart energy management, smart asset tracking, and many other solutions.

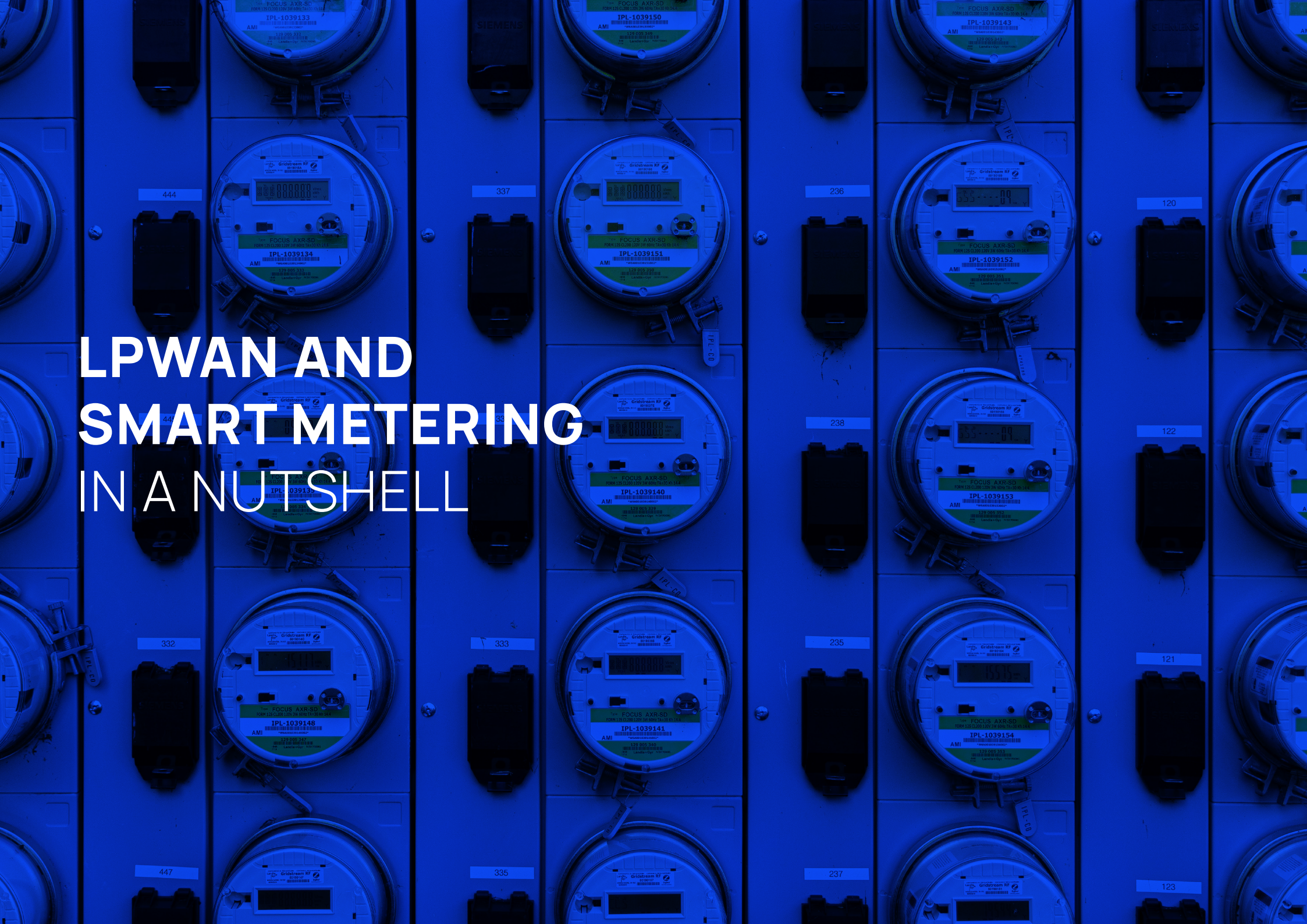
While other components, including hardware and cloud applications, play a critical role in ensuring the streamlined functioning and effectiveness of smart meters, the type of communication technology used determines the outcome. We have mentioned that LPWAN is the communication technology to use, but there are different types, including **LoRaWAN, Sigfox, and NB-IoT.**

The upcoming sections of the whitepaper sections will introduce you to LPWAN networks and present a case for the use of LoRaWAN for rolling out smart metering initiatives. We will also share real-world smart metering solutions developed using LoRaWAN and how you can also get started.

# LORAWAN SMART METERING ARCHITECTURE




LoRaWAN Smart Water Metering Solution Architecture: Image Source- Rian. tv



# LPWAN AND SMART METERING IN A NUTSHELL

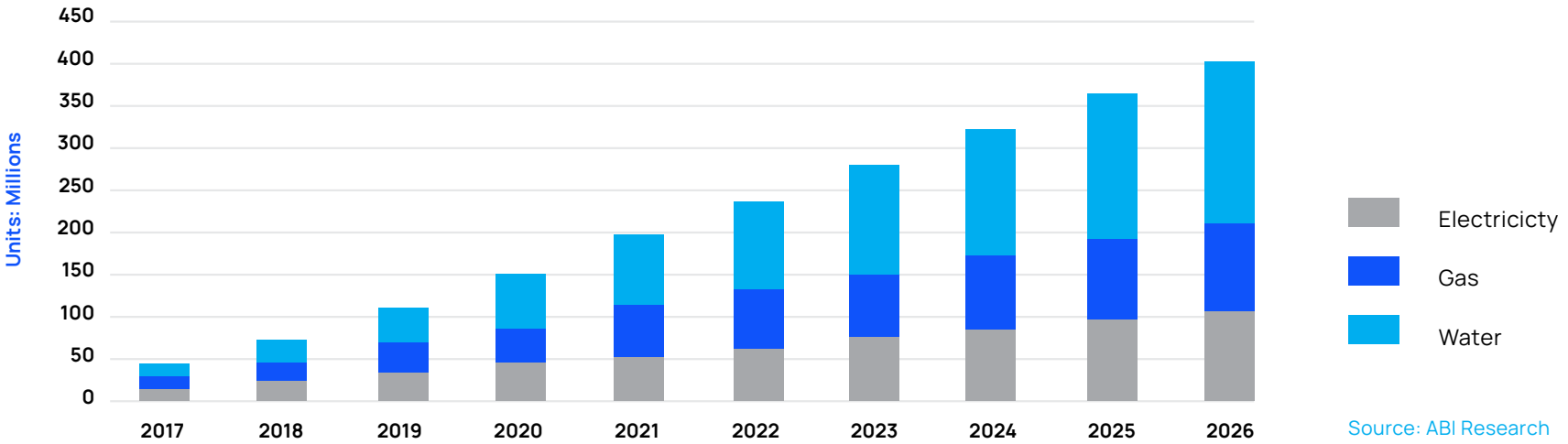
**Low-power wide-area networks (LPWANs)** or LPWA are wireless telecommunication technologies explicitly made to connect devices and sensors, suitable for many IoT business cases, including smart meters, GPS trackers, weather stations, and many other 'things.' They have become popular in industrial and research contexts because of their low power, long-range, and cost efficiency communication capabilities.

The difference between LPWAN and other communication technologies such as Wi-Fi or Bluetooth is their ability to interconnect with low bandwidth and battery-powered devices with low bit rates over extensive ranges. Despite being cost-effective, they offer low data rates compared to other networks such as 4G, which may not be suitable for applications requiring the transmission of high volumes of data, such as audio or video calls. LPWANs can transmit data packet sizes from 10 to 1,000 bytes with up to 200 kbps uplink speeds. Their geographical coverage ranges from 1-5 km in urban environments and 10-40kms in rural environments, depending on the communication technology, geography, obstructions, and other interference and spectrum traffic factors.

Smart metering is the leading driver of the LPWAN market, and energy and smart water meters will be the second greatest vertical IoT application in 2023, accounting for 33.3% of the global LPWAN device connections. ABI Research also predicted that by 2026, about 20% of water and Gas meters globally will be connected through noncellular LPWA networks.

Mainly relevant in the IoT and Machine-to-machine spaces, LPWANs are energy and cost-efficient over conventional cellular networks. They support smart city applications such as smart energy metering, gas metering, and district heating. There are different types of LPWANS, but the most frequent ones used in utilities include **LoRaWAN, Sigfox, and NB-IoT.**

## Non-Cellular LPWA Connections By Smart Meter Type




Source: ABI Research

# 1. LORAWAN

LoRaWAN is an acronym for 'Long Range Wide Area Network.' The LoRa AllianceTM defines the LoRaWAN Specification as a "Low Power, Wide Area (LPWA) networking protocol designed to wirelessly connect battery operated 'things' to the internet in regional, national or global networks by targeting key Internet of Things (IoT) requirements such as bi-directional communication, end-to-end security, mobility and localization services." The roots of LoRaWAN can be traced back to 2008, when LoRa, which is a physical wireless communication element, was developed by Cycleo. LoRaWAN is the protocol that facilitates data transmission from the physical infrastructure to the servers.

Despite being open-source, the underlying transceiver chip used to integrate LoRa is only accessible through the Semtech Corporation, the company which created the technology. LoRaWAN supports bi-directional communication, which facilitates both uplinks and downlinks. This aspect is powered by chirp spread spectrum (CSS) modulation, which echoes narrow-band signals over extensive channel bandwidth. LoRaWAN boasts a maximum payload length of 243 bytes. The maximum data rate of LoRaWAN is 50 kbps and covers a range of 5 km (urban), and 20 km (rural).

LoRaWAN networks are offered by more than 165 network operators globally, and LoRaWAN IoT deployments have been rolled out in more than 170 countries. Through the LoRa Alliance, a non-profit organization, LoRaWAN boasts a large ecosystem of 500+ members, including Netmore Group, Cisco, and Bosch.

An open ecosystem is a crucial differentiator for LoRaWAN as a communication technology when developing intelligent metering solutions. It helps avoid companies getting stuck in a 'Smart Metering Limbo' because of the complexity of the lack of interoperability of key components among multiple vendors. This and other factors such as battery life optimization (Up to 15 years), flexible deployment models, and low TCO make LoRaWAN the de facto connectivity protocol for utility smart metering campaigns.

More on this later in the whitepaper.

# LORAWAN VS. LORA: THE DIFFERENCE


Many times, these two words are used interchangeably. While it may be correct to an extent, there is a slight difference. LoRa is the technology that facilitates physical wireless communication between physical devices and gateways. At the same time, LoRAWAN is the protocol that enables data composition and transmission to receivers such as the LoRaWAN network server.

# 2. SIGFOX


Sigfox is a global LPWAN provider that offers IoT connectivity solutions built upon their proprietary technologies. It started as a French company in 2009 and has accelerated its rollout of infrastructure across the Globe. They deploy their proprietary base stations and use IP-based networks to connect back to their end servers. This is done through their global network of partners called local Sigfox Operators (SOs)

Unlike LoRaWAN, which uses CSS modulation, Sigfox uses binary phase-shift keying (BPSK) modulation to connect the base stations to end devices. It utilizes unlicensed ISM bands, for example, 915 MHz in North America and 868 MHz in Europe.  Sigfox archives low power consumption, moderate-cost antenna design, and high receiver sensitivity efficiently using frequency bandwidth.

Initially, Sigfox only supported uplink communication but pivoted to bi-directional communication. The maximum payload of Sigfox uplink messages is 12 bytes, and the messages are limited to 140 messages daily. But, downlink messages are limited to four a day, which means that uplink message acknowledgment is not supported. Consequently, packets sent back to the endpoint are prone to interference. It can deliver messages over 3-10 kms in urban environments and 30-50KMs in rural areas.

# 3. NB-IOT


NarrowBand-Internet of Things (NB-IoT) is a global standard-based wireless communication technology developed to support the development of IoT device solutions and services. It is sometimes called CAT-NB1, and is operated by conventional telecommunication companies globally, including Vodafone and Telstra. It is standardized by the 3rd Generation Partnership Project (3GPP).

NB-IoT is categorized as an LPWAN (Low Power Wide Area Network) and operates in existing cell towers. Its functionality only requires a software update on current and compatible infrastructure. This is perhaps its most significant advantage over other LPWA technologies, especially in intelligent metering campaigns.

NB-IoT has other capabilities that make it viable for innovative metering solutions, including high reliability, larger data packet sizes, and 10+ battery life. But, NB-IoT is a licensed protocol, which is more likely to increase the Total Cost Of Ownership (TCO) of IoT projects tremendously. It operates in existing GSM and LTE infrastructure and offers uplink and downlink speeds of up to 200 Kbps while using 200kHz of available bandwidth. While both technologies, LoRaWAN, and NB-IoT, have their perks in terms of the Quality of Service(QoS), NB-IoT is the best protocol for applications requiring frequent communications.

Other LPWAN technologies include WAVIoT, LTE-M(CAT-M1), and Symphony Link.

# THE SMART METERING IMPERATIVE
## IN THE UTILITY INDUSTRY

**“Smart meters will help the UK accelerate their journey to achieve their commitment to 80% reduction of CO2 emissions by 2050 and 57% by 2030. This will be made possible by using insight from smart meters to make consumers ‘energy-wise’ and inventing new ways to purchase utilities.”**
Delta-ee

Traditional meters were invented to accomplish a straightforward task; provide the exact amount of electricity, gas, or water flowing through a channel for a given period. But, with the rapid growth of technologies such as DER (distribution grid and distributed energy resources), elevated customer experience expectations, and the deterioration of natural resources, smart meters are evolving to meet new market demands.

Smart meters have numerous benefits across different utilities. The benefits discussed below cover a broad scope of critical elements, from operational efficiency and personal convenience to environmental sustainability. Some of the benefits of using smart meters to monitor utilities include:

## Environmental Sustainability

In 2016, an IBM article predicted that smart meters would play a critical role in adopting renewable energy. Forward 6 years, a chain of events, including the recent ‘Code red for humanity report’ and the carbon-neutral commitments by companies worldwide, made innovations such as smart grids a viable long-term solution. This can be achieved, for example, by enabling better solar panel integration. Navigant research concludes that unlike traditional electric grids, which can accommodate only a limited number of panels, smart grids can support 60% more solar energy than traditional grids.

Other ways smart utility meters empower environmental sustainability is by providing users with actionable insights to improve behavioral consumption patterns and by improving the maintenance processes by facilitating easy troubleshooting of utility infrastructure hence reducing theft and wastage.

## Cost-Effectiveness

Smart meters help customers track their utility consumptions and make data-driven decisions on how to manage them better. Utility companies can also use insights gathered from consumer behavior to optimize their underlying infrastructure for sustainable consumption. According to Delta EE, smart meters can help small to medium households save up to £115 or more in a year by assisting them in understanding their usage better.

## Elevated Customer Experience (CX)

The Covid-19 has played a critical role in shifting the crucial determiners of success from competitive pricing and quality to customer experience (CX). In 2022 and beyond, CX is king, and the utility industry is not an exception.

McKinsey estimates that shareholders get 3x their investments by pursuing solid CX initiatives. Smart meters help utility companies and property owners elevate CX by providing accurate billing, valuable insight into their utility consumption, and increasing efficiency.

## Predictive Maintenance

Poor maintenance is one of the main reasons for failing utility infrastructures. With smart meters, utility companies can gain immediate insight into areas that can cause outages and deal with them beforehand. This improves convenience and increases the lifespan of the underlying infrastructure.

## Lower Labor and Operational Costs

Smart meters eliminate the need for repetitive manual meter reading, reducing operation costs and encouraging employee productivity.

## Reduce Utility Service Theft

Smart meters help reduce electricity and water service theft, making them market drivers in regions like the Middle East, Asia Pacific, Africa, and Latin America. Electricity service theft can account for up to 20% or more of the total electricity supply in the regions mentioned above. Digital metering systems can also help stop water leaks in distribution channels, which may account for more than 1.3 million cubic meters ( up to 20%) of clean water worldwide. The energy also used in pumping the lost water increases the loss.  Inteligent meters  can reduce such losses significanltly by creating visibility through water and energy distribution channels. This helps utility companies account for every unit of water and elcetricty consumed.

## Advanced Automation Capabilities

Envision a future where all the devices in a specific setup can communicate to ensure sustainable water, energy, and gas consumption. Billing is automated, and utility companies can deal with power outages faster. Operation costs are lowered as maintenance becomes more seamless. IoT-based smart meters can do that, thanks to the ever-growing computing power and the rapid adoption of supporting technologies such as LoRaWAN, 5G, and Edge analytics.

# THE NEXT FRONTIER OF SMART METERING SOLUTIONS WITH NETMORE LORAWAN

Smart meters are not a new phenomenon. The energy industry has always been amused by the concept of the smart grid, and how it was expected to revolutionize the industry. For the past decade, smart electric networks have been developed using different wired and wireless technologies, including Power-Line communications (PLCs) and RF-Mesh networks. Despite PLCs accounting for 50% of worldwide smart meter connections and Mesh 27%, back in 2018 (ABI Research), the metrics have shifted to LPWA technologies. This is because they fill most of the loopholes existing in the preceding communication protocols.

LoRaWAN has proven each time and again to be the perfect approach to developing smart metering solutions. Most smart metering solutions require communication protocols with low monthly data throughputs, applications with excellent latency tolerance, and boast small chunks of data (tens of kilobytes). While communication protocols such as Narrowband IoT (NB-IoT) and Sigfox have had a lot of breakthroughs in the deployment of smart metering solutions, the LoRaWAN offers the best capabilities to ensure cost-effective, reliable, and successful deployment of smart utility solutions.

Some significant LoRaWAN capabilities for smart metering initiatives include;

# LORAWAN KEY CAPABILITIES FOR UTILITIES

## 1. Lower Total Cost Of Ownership Compared To NB-IoT

Smart metering initiatives are costly to integrate. Successful integration requires cost-effective hardware, licensing, and operational costs from the providers. LoRaWAN's solutions are vetted in cost-benefit analysis. They have established pragmatic ways to lower the total cost of ownership, including affordable and energy-friendly devices (Up to 15-year battery life). Compared to other communication technologies such as Sigfox and NB-IoT, essential elements (devices, gateways, and networking), LoRaWAN offers a much better deal.

## 2. Resilient End-To-End Security

IoT devices are the lifeline of smart utility solutions because they provide the data needed to generate actionable insight for end users and utility companies. With IoT devices being one of the greatest points of entry for cybersecurity attacks, a well-structured cybersecurity framework is required. The LoRaWAN community has ensured the integration of an effective and sophisticated security mechanism into every component that makes up the standard. The protocol boasts reliable security features, including using AES algorithms for authentication and a two-layered cryptography mechanism for encryption. The LoRa Alliance ensures that the standards' security is ever-ever evolving, and integrates the latest novel technologies and best practices in cybersecurity.

## 3. Bi-Directional Communication

Bi-directional capabilities in LoRaWAN support the transmission of messages in uplinks and downlinks. The downlink functionality is crucial in innovative metering campaigns because they leave room for functionality modification without physically going to the location to re-configure the device. Other essential benefits of bi-directional communication in LoRaWAn include the support of firmware over the air (FOTA), which facilitates minor software updates and bug fixes and package acknowledgment.

## 4. Reliable Battery Life Of Up To 15 Years

Battery life is crucial when deciding on which devices or communication technologies to use in your smart metering projects. LPWA technologies are generally optimized for long battery life, but the lifespans vary depending on functionality and signal quality. LoRaWAN has several mechanisms to increase battery life beyond other technologies such as NB-IoT and Sigfox. First, it requires a tremendously low power to turn on the radio module. Secondly, it extends battery life by sacrificing spectrum utilization for cost and battery life. The total cost of ownership is hence reduced massively.

## 5. Standards and System Interoperability

The open nature of LoRaWAN makes it capable of supporting popular metering standards, including DLMS and OMS. In water metering, for instance, LoRaWAN elevates the functionality of conventional SCADA systems, which are used in the critical networking of water utilities. Using LoRaWAN, existing SCADA infrastructure, and other applications, water utilities can develop an end-to-end solution that results in data-driven decision making, better monitoring, and favorable CapEx projections.

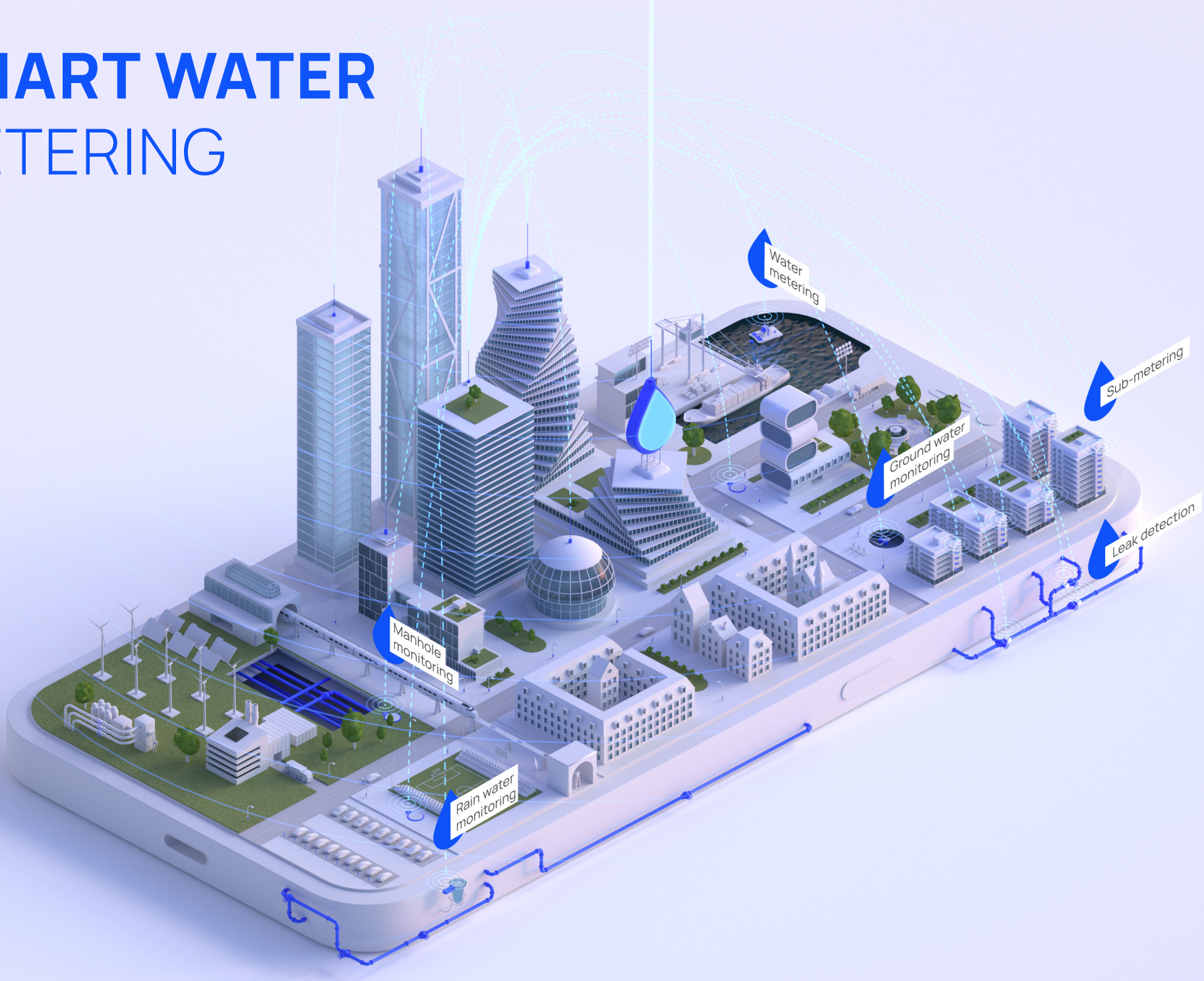
## 6. Robust, Extensive Coverage

Sparsely populated areas that want to integrate smart utility metering solutions may have connectivity issues, mainly because the best connections are in urban environments. Installing network infrastructure ground up in such areas is expensive and time-consuming and lacks a favorable cost-benefit outcome. LoRaWAN provides scalable and flexible architectures for these situations compared to satellite, NB-IoT, or cellular solutions. LoRaWAN is available in 162 countries.

## 7. Flexible Deployment Models

Utility smart metering solutions can either be deployed on existing public LoRaWAN networks, secure private LoRaWAN networks, or both in a hybrid architecture. LoRaWAN networks are deployed by partners referenced by the LoRa Alliance, including Netmore Group.

# SMART WATER METERING



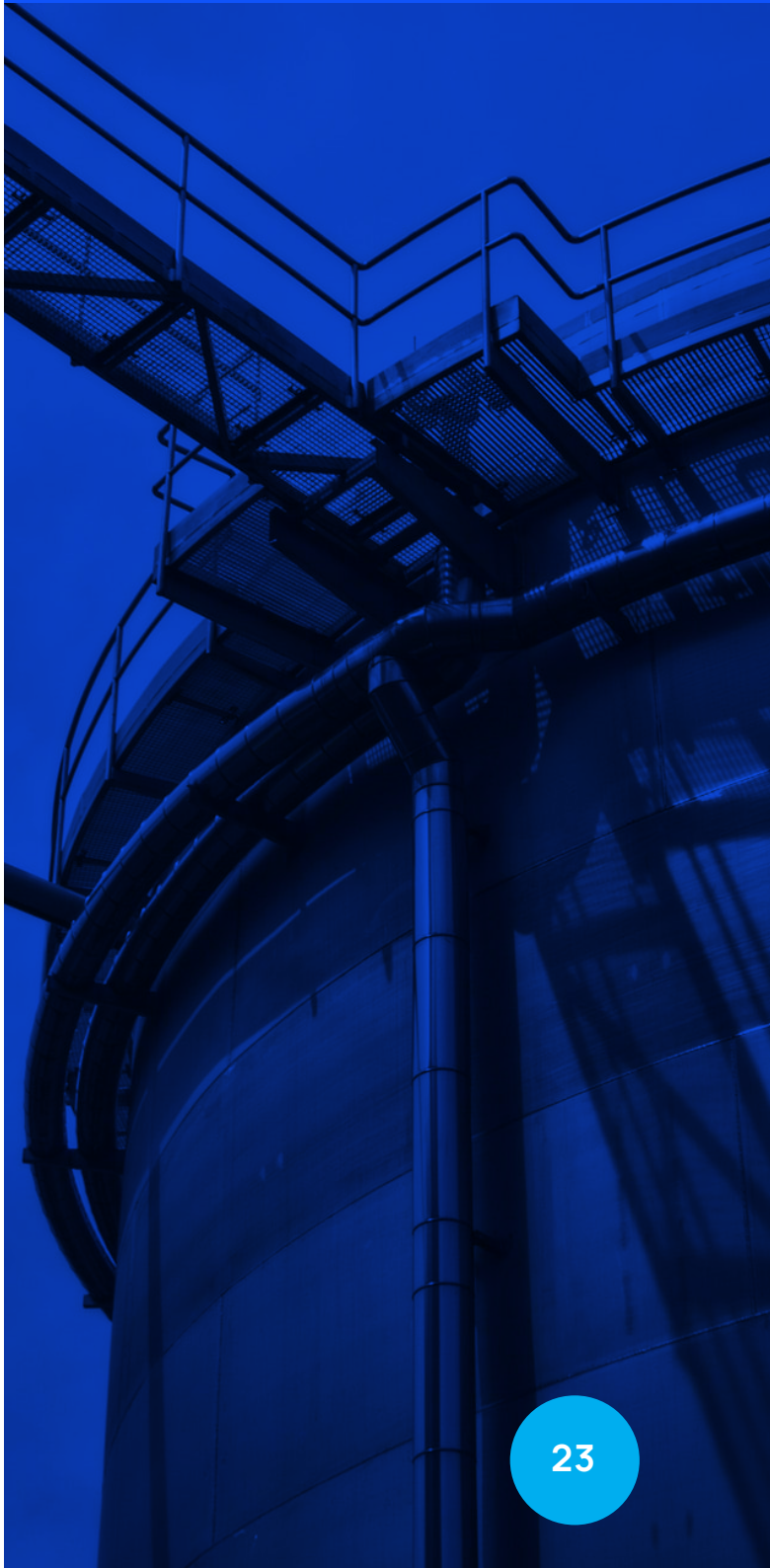
# INTRODUCTION

Climate change, population growth, and economic development have made water a rapidly deteriorating resource. Every drop of freshwater matters, and that's why the water industry is looking toward smart metering to solve some of its main challenges; Non-revenue water, which results from poor infrastructure maintenance, theft, tampering, meter failures, and poor customer experiences.

The International Energy Agency estimates that more than 34% of water is lost to these challenges.

Smart water meters can help alleviate some of these problems by providing control over the water pipeline, helping prevent leakages, and gaining insight into critical metrics such as pressure and flow. These market drivers have seen the smart water metering market surpass $1.5 billion in 2021 and are expected to grow at a CAGR of more than 23% from 2022 to 2028.

To capitalize on opportunities born from this trend, and contribute toward a sustainable future through efficient water management, utility management companies and public service operators need to integrate LoRaWAN-based smart water metering solutions.



# LORAWAN SMART WATER METERING USE CASES

Smart metering with LoRaWAN provides numerous business cases for utility companies, municipalities, and property owners. Some ways LoRaWAN-based smart meters can improve the efficiency and sustainability of water management include;

## 1. Water Metering

The advanced capabilities of LoRaWAN connectivity, including high-penetration rates and high-quality communication protocols, ensures that high-quality data is collected, even in the most challenging locations. This can help utility companies detect utility theft, prevent leakages, and provide end-consumers with insights to help them tame their water usage. Other opportunities for smart metering with LoRaWAN include;

- Consumption analytics and preventive maintenance.
- Elevate customer experience by quickly fixing outages, providing accurate billing, and providing real-time consumption analytics.
- Improve operational efficiency and costs
- Monitor water quality and ensure compliance with local regulatory boards
- Accurately predict water demand, optimizing distribution pipelines to ensure seamless, safe,  and cost-effective transition to water reservoirs.

## 2. Water Supply Network Monitoring

Real-time data by LoRaWAN devices provides utility companies with important insights, including water pressure, valve operation, and quality, which can be used to make data-driven decisions in case of unexpected events such as water contamination or leaking pipe systems. The insights can also help reduce operating costs and streamline complex processes.

## 3. Sewerage System

Sewage systems remain vital components of urban environments. Predictive maintenance with real-time data provided by LoRaWAN devices helps streamline the sewage management process. Thanks to sensor data and advanced analytics applications, valuable insights into sewage systems such as overflows and flow control can be used to improve important procedures. Some benefits of integrating LoRaWAN into sewerage systems include:

- Remote monitoring capabilities enable one to keep track of vitals such as flow and pressure.
- Pressure sensors and sewage monitoring elements are used for preventive maintenance, which helps lower operational and maintenance costs.
- Monitor important sewage system infrastructure components such as backup power sources.
- Manage disasters such as sewage overflows.


GAS SMART
METERING

# INTRODUCTION

Research by the U.S. Energy Information Administration shows that the use of natural gas in the US has increased by 77% in the last three decades and may increase by 53% come 2050. Globally, Gminsights projects that the annual growth rate of gas will rapidly increase at 1.6% in the next five years, with the overall consumption expected to be more than 4,000 billion cubic meters in 2022, which is a substantial rise from 3,630 billion cubic meters in 2016. This is a wake-up call for utility companies and consumers to adopt management frameworks that facilitate the sustainable use of natural gas.

Smart gas meters empower end-users to control their consumption by providing real-time analytics on usage and other important metrics. It also helps with accurate billing and elevated customer experience. This solution comes in handy, especially when many governments and businesses push toward achieving their carbon-neutral goals. These, and other growth drivers, have made smart metering a lucrative market. The market size went beyond USD 4.4 billion in 2021 and is expected to grow at a CAGR of over 17% until 2028.

Since consumers don't contribute to the supply chain, utility, residential, and commercial entities, require ways to map out reliable distribution infrastructure while ensuring no leaks and utility theft occurs. These elements are critical, primarily when an average of 4,200 home structures result in 40 deaths annually. Similarly, local fire departments handle about 125,000 incidents resulting from natural gas leaks.

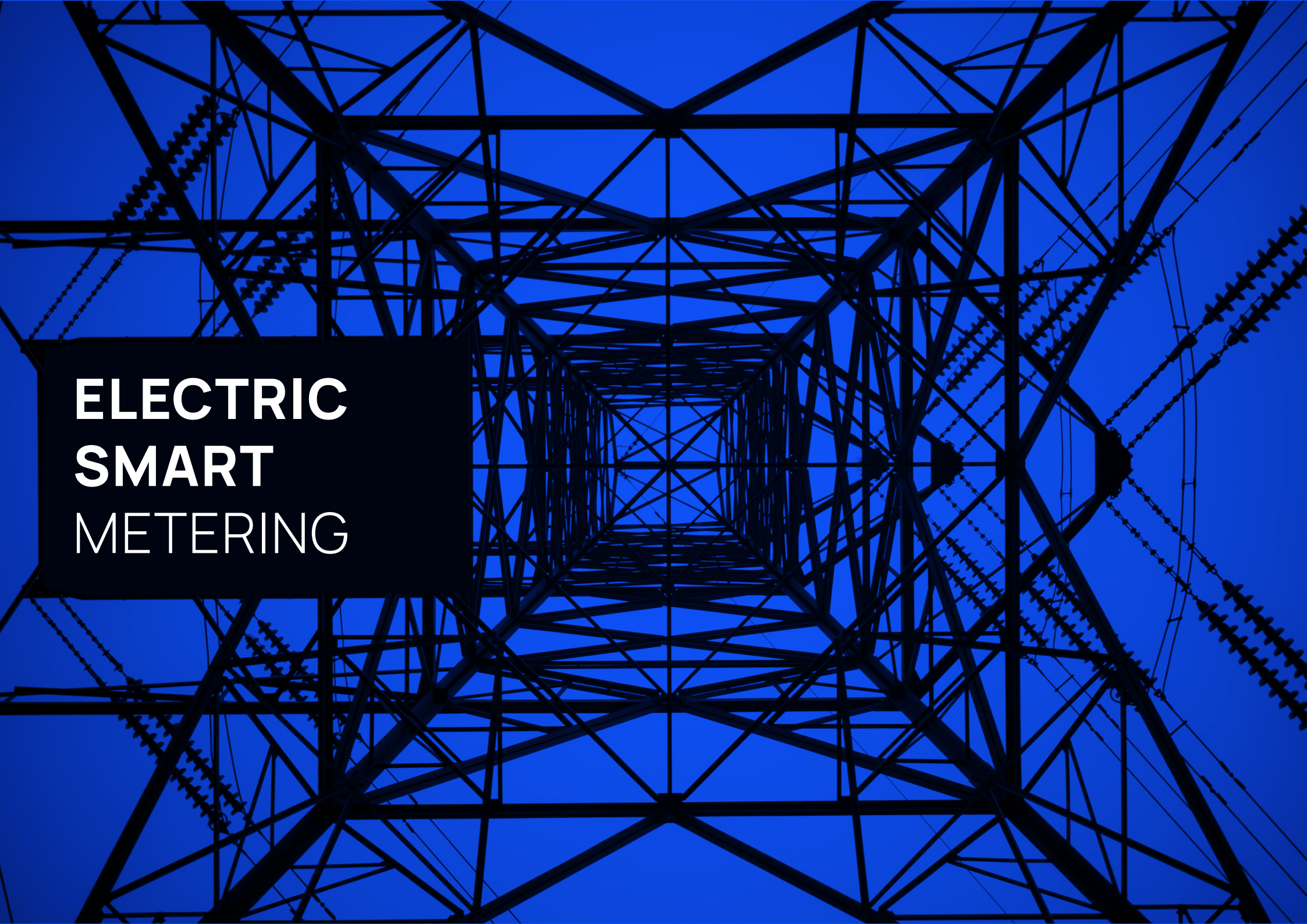
Innovative gas metering solutions can help alleviate these challenges through preventive maintenance and gas consumption analytics. This approach guarantees the safety of those we love and the environment. Despite the numerous benefits of smart gas meters, the problem of compatibility and other technical issues tend to 'dumb down' smart meters. Many smart metering players are working towards eliminating the little barrier to fully smart gas meters.

Netmore has been part of the successful adoption of smart gas meters that are intelligent, secure, automated, and safe.

# GAS SMART METERING BENEFITS

Smart meters offer several benefits to different parties, including commercial, residential, and utility ventures. Some of the benefits include:

- End-users have access to accurate, real-time insights, which can help them monitor and reduce their gas consumption.
- Accurate gas billing provided by smart meters helps elevate the customer experience.
- Smart gas metering enables utility companies to monitor gas infrastructure for leaks, significantly reducing accidents. Remote monitoring capabilities also help gas distributors keep track of supply-demand pipelines.
- Smart meters reduce natural gas theft significantly by giving the entire distribution network visibility.
- Smart gas meter capabilities such as remote monitoring and self-diagnostics reduce operational costs by eliminating unnecessary site visits.


ELECTRIC
SMART
METERING

# INTRODUCTION

Surging energy demands, the recent Covid-19 pandemic, geopolitical tensions in the east, the rapid rise of the 'conscious consumer,' and the pressure by government and environmental ventures to adopt more renewable energy sources have increased the demand for intelligent energy grids and other energy solutions. The price of electricity and other energy sources has accelerated due to the factors mentioned earlier. In 2021, the global electricity demand grew by 6%, a tremendous annual increase since the financial crisis in 2010. McKinsey's recent "Global Energy Perspective 2022" also highlights that the electricity demand will triple by 2050, resulting from net-zero carbon commitments by many countries.

There are many solutions to meet the increased demand for electricity while staying on track with their commitments. Some include adopting renewable energy sources such as wind and solar and equipping end-users with the tools required to manage their electricity consumption effectively. Smart electric meters have emerged as a viable solution for these concerns because they support the adoption of renewable energy such as solar and wind. Smart meters provide a strong case for adopting and managing renewable energy, which has proven difficult using traditional approaches. Smart grids can support 60% more solar energy than conventional grids.

The smart electric meter isn't a new concept. It has been around for more than a decade. It has existed as a vital component of the 'Smart Electric Grid' However, conventional meters lack the communication technologies required to fully capitalize on the smart grid.  When LPWANs were introduced, they complimented the Advanced Metering Infrastructure (AMIs) to enable utility companies to provide consumers with real-time energy consumption data quickly. This was made possible with LPWAN's extensive coverage and low power/throughput capabilities.

LoRaWAN takes this a step further by offering more capabilities for smart electric metering. Some of them include cost-effective IoT devices, a global IoT ecosystem, partner networks, and the development of new technologies such as SCHC **compression and fragmentation** (IETF RFC 8724), which facilitates the communication between devices LPWAN and Ip-Based networks.

The smart electric meter is a small lego block of the smart grid system that helps utility providers optimize energy infrastructure for seamless distribution while empowering users to make data-driven choices regarding energy consumption. It provides an immediate solution for involved parties to efficiently manage their electricity consumption and distribution while ensuring environmental sustainability. In the long term, more smart meter innovations will ensure more benefits.

# ELECTRIC SMART METERING BENEFITS

Conventional meters were limited in functionality and were mainly used to create estimates for billing purposes. Electric metering systems are becoming more intelligent with the evolution of distributed energy resources (DER) technologies, rapidly increasing computing power and other factors. Some of the benefits of using smart meters include:

## End Users

- **Data-Driven Energy Consumption**

According to a 2019 Delta-EE report, being 'energy-wise' is the first step to achieving carbon-zero commitments. This approach is essential, especially when countries like the UK are committed to 57% CO2 emissions by 2030 and 80% by 2050.

Smart meters can help increase awareness of the need for mindful electricity consumption. This is achieved by providing them with real-time data on their usage and valuable information on how to reduce their consumption. According to the report, smart meters can help users save on energy bills in the following ways;

- Real-time feedback can help households save about 5-15% of the energy used, about £50 annually.
- Gamification and other methods that reward efficient energy consumption can save annual electricity bills of £100 for individuals.
- Well visualized feedback on energy consumption can help households save £40 in electricity bills annually.

- **Using Energy At Its Cheapest**

As mentioned in the introduction, electricity will become more expensive soon. Smart meters can help households save money on electric bills by using electricity when not in high demand. This can save them £90 and £130 for those who own an electric car.

## Utility Companies

- **Elevated Customer Experience**

Customer experience remains the primary driver of success in the modern business world, above price and quality. Providing accurate billing and real-time consumption data to users ensures that consumers can make good decisions when interacting with the services, which improves customer satisfaction.

- **Reduced Energy Service Theft**

Electricity theft is prevalent, especially in emerging economies like Latin America, the Middle East, and Africa. This problem reduces revenue because the stolen electricity can account for 20% or more of the total electricity supply in the markets. Smart meters can help alleviate this problem by providing utility companies visibility into the electricity distribution pipeline.

- **Improved Operations and Reliability**

Two-way communication technologies embedded in smart electric meters support functionalities such as outage detection and preventive maintenance. This ensures that electricity is available to customers 24/7 and outages are fixed as quickly as possible.

- **Reduced labor and operation costs**

Traditional electric meters required close monitoring of infrastructure, high labor costs, and other labor-intensive activities. Remote capabilities enable utility companies to troubleshoot and fix faulty infrastructure components from control centers and only dispatch workers when the problems require on-site attention.

# CONCLUSION

More businesses and governments continue to commit to steep decarbonization commitments despite the increased demand, price, and deterioration of critical utilities. Most go-to solutions for such campaigns include adopting renewable energy and technologies like **Carbon Capture, Usage, and Storage (CCUS)**, which may only work long-term. The current utility landscape, especially in the energy and water industry, needs a solution that can positively affect both the short and long term. Utility companies are also under pressure to increase the efficiency of the distribution of these utilities. They need to invest more in solutions that streamline the distribution process while improving customer experience and reducing carbon emissions.

Throughout the whitepaper, we have established that smart metering with LoRaWAN has the potential to solve some of the problems mentioned. It has the power to streamline demand-supply processes, implement customer-centric business models in utilities, and help reduce carbon emissions on our planet. The possibilities of what it can do are infinite, especially with the increased integration of machine learning, edge computing, and advanced analytics into its operation process.

However, as we have seen in the whitepaper, connectivity, a vital component of smart metering, remains a challenge for those looking to roll out smart metering initiatives. There are many LPWAN communication technologies and hardware and software vendors. This makes it hard for businesses to select the right approach. The rapid technological advancement in smart metering makes it even harder for you to choose the best strategy. Other factors such as firmware failures, lack of well-orchestrated analytics strategy, licensing and standardization, and lack of awareness among stakeholders make it even harder for you to capitalize on smart metering opportunities.

For those looking to have a breakthrough with smart utility metering, it is critical to find ways to navigate these hurdles. To achieve this, you will need to hit certain touchpoints. Such touchpoints include having a well-defined requirements list, which helps you understand your mission and vision of rolling out such initiatives. It also helps you achieve labor, resource, and economic efficiency, which are requirements for the success of smart metering projects. You will also have to decide on what solutions to adopt. The solutions range from communication technologies, hardware, software, analytics, and many other solutions. Choosing the right solutions, especially with the oversaturated smart metering marketplace. This is just but a tip of the iceberg of the process involved in launching successful smart metering campaigns.

But there is a better way to achieve your smart metering objectives faster. The Netmore Group has created an ecosystem that supports the smart metering process. We provide you with LoRaWAN connectivity, which is the de facto of smart metering, and the hardware required to jumpstart your project in no time. Better still, our Netmore Marketplace provides you with ready-made smart metering solutions from the world's greatest IoT vendors. Our professionals have vetted all the solutions in the marketplace to deliver their main objectives. Visit the netmore Group Website today to explore LoRaWAN solutions, sensors and gateways, and other projects that will help you in your smart metering journey.

## The Netmore LoRaWAN Ecosystem

We provide nationwide LoRaWAN connectivity, purpose-built to onboard millions of devices. Access to the connectivity can be integrated as an integral part of our partners' applications, meaning we both enable scalability and increase the reach. On top of connectivity, we also provide an easy-to-use platform with advanced features to manage and control the devices and the network.

## Netmore LoRaWAN: European Coverage Guarantee

Network coverage and signal quality is key to scalability in many IoT cases. As a dedicated IoT operator, we deliver LoRaWAN coverage on-demand with a 7-day guarantee.

## Netmore Market

The hypercompetitive nature of the smart metering market makes it difficult for investors and other interested parties to access the best solutions. To help our clients find high-quality solutions, we created the 'Netmore Market,' a reliable and secure place for LoRaWAN vendors to market and sell their solutions. Netmore ensures that every product and solution meets our stringent quality requirements concerning hardware compatibility and software interoperability.

## About The Netmore IoT Networks

We are a dedicated IoT operator that drives digitalization by connecting properties to our property network, providing open access to 5G networks to asset owners, and enabling massive IoT connectivity by rolling out nationwide LoRaWAN infrastructure.

All our networks are purpose-built to serve the different key players that drive the development in the new era in which billions of devices will need robust, secure, and reliable connectivity in the next decade.

This means we take the role of an IoT enabler and work together with our partners in a collaborative effort to contribute to the digitalization which changes society for the better.

## About The LoRa Alliance

The LoRa Alliance® is an open, nonprofit association that has become one of the largest and fastest-growing alliances in the technology sector since its inception in 2015. Its members closely collaborate and share experiences to promote and drive the success of the LoRaWAN® standard as the leading open global standard for secure, carrier-grade IoT LPWAN connectivity. With the technical flexibility to address a broad range of IoT applications, both static and mobile, and a certification program to guarantee interoperability, LoRaWAN has already been deployed by major mobile network operators globally, with wide expansion into 2020 and beyond.

# REFERENCES AND ENDNOTES


1. Mckinsey. 2022. Global Energy Perspective 2022. [Online] Available At: Https://Www.Mckinsey.Com/~/Media/Mckinsey/Industries/Oil%20and%20gas/Our%20insights/Global%20energy%20perspective%202022/Global-Energy-Perspective-2022-Executive-Summary.Pdf

2. Delta-Ee Research And Consulting. 2019. Smart Meter Benefits Cost Savings Households Could Make Within A Smart Energy Future. [Online] Available At: Https://Www.Sms-Plc.Com/Media/4270/Smart-Meter-Benefits-Cost-Savings-For-Households-February-2019-1.Pdf

3. 2021. Smart Grids - Prospects And Challenges. [Online] Available At: Https://Www.Energycharter.Org/Fileadmin/Documentsmedia/Forums/2-2_-_smart_grids_mr_wilczek.Pdf

4. Iot Analytics. 2022. Smart Meter Market 2019: Global Penetration Reached 14% – North America, Europe Ahead. [Online] Available At: Https://Iot-Analytics.Com/Smart-Meter-Market-2019-Global-Penetration-Reached-14-Percent

5. Navigant Research. 2019. AMI Gold Standards Report: An Assessment of the Smart Electric Metering Landscape. [online] Available at: http://nj.gov/bpu/pdf/boardorders/2019/20191220/12-20-19-2H.pdf

6.Tech Target. 2022. What is LPWAN (low-power wide-area network)? - Definition from Whatls.com. [online] Available at: https://www.techtarget.com/iotagenda/definition/LPWAN-low-power-wide-area-network

7. Agung Enriko, I Ketut, et al. "Design and Implementation of LoRaWAN-Based Smart Meter System for Rural Electrification." IEEE Xplore, 1 July 2021, https://ieeexplore.ieee.org/document/9538704/figures#figure

8. Statista. 2019. LPWAN connections by technology 2017-2023 I Statista. [online] Available at: https://www.statista.com/statistics/880822/lpwan-ic-market-share-by-technology

9. Bellias, M., 2016. 3 ways IoT will change smart meters for utilities - IBM IoT blog. [online] IBM Business Operations Blog. Available at: https://www.ibm.com/blogs/internet-of-things/smart-meter-grid

10. Global Market Insights Inc. 2021. Smart Water Metering Market Size & Share, 2028 ForecastReport. [online] Available at: https://www.gminsights.com/industry-analysis/smart-water-metering-market?utm_source=ireach.com&utm_medium=referral&utm_campaign=Paid_ireach

11. Ahrens, M. and Evarts, B., 2018. NATURAL GAS AND PROPANE FIRES, EXPLOSIONS AND LEAKS ESTIMATES AND INCIDENT DESCRIPTIONS. [online] Nfpa.org. Available at: https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/Hazardous-materials/osNaturalGasPropaneFires.ashx

12. IEA. 2022. Executive summary – Electricity Market Report - January 2022 – Analysis - IEA. [online] Available at: https://www.iea.org/reports/electricity-market-report-january-2022/executive-summary

13. Rian, S., 2019. Smart Water Metering & LoRaWAN. [online] Rian.tv. Available at: https://www.rian.tv/post/2019/03/26/smart-water-metering-lorawan

14. i-SCOOP. n.d. Smart metering and the role and market of smart meters. [online] Available at: https://www.i-scoop.eu/internet-of-things-iot/smart-metering-smart-meters

15. Terblanche, I., 2022. How IoT revolutionises metering for utilities in developing nations. [online] Smart Energy. Available at: https://www.smart-energy.com/industry-sectors/smart-meters/how-iot-revolutionises-metering-for-utilities-in-developing-nations

16. Hidayati, Amriane, and Muhammad Imam Nashiruddin. "LPWA-Based IoT Technology Selection for Smart Metering Deployment in Urban and Sub Urban Areas: A State Electricity Company Perspective." Buletin Pos Dan Telekomunikasi, vol. 18, no. 2, 27 Dec. 2020, pp. 75–94, online.bpostel.com/index.php/bpostel/article/view/180201/443

17. Goulas, A., Goodwin, D., Shannon, C., Jeffrey, P. and M. Smith, H., 2022. Public Perceptions of Household IoT Smart Water "Event" Meters in the UK—Implications for Urban Water Governance. [online] Frontiers In Sustainable Cities. Available at: https://www.frontiersin.org/articles/10.3389/frsc.2022.758078/full

18. LoRaWAN. (2021). WHY UTILITIES ARE CHOOSING SMART LoRaWAN® CONNECTIVIT. [online] Available at:https://lora-alliance.org/wp-content/uploads/2021/01/White-Paper_WHY-UTILITIES-ARE-CHOOSING-SMART-LoRaWAN%C2%AE-CONNECTIVITY.pdf.

19. Alvisi, S., Casellato, F., Franchini, M., Govoni, M., Luciani, C., Poltronieri, F., Riberto, G., Stefanelli, C. and Tortonesi, M. (2019). Wireless Middleware Solutions for Smart Water Metering. Sensors, [online] 19(8), p.1853. doi:10.3390/s19081853

20. Oracle.com. (2022). [online] Available at: https://www.oracle.com/us/ciocentral/smart-metering-water-utilities-396199.pdf

21. Sullings, R. (2018). LPWAN & Smart Water Metering. [online] rian.tv. Available at: https://www.rian.tv/post/2018/06/29/lpwan-smart-water-metering

22. LoRa and LoRaWAN: The Technologies, Ecosystems, Use Cases and Market. I-SCOOP, www.i-scoop.eu/internet-of-things-iot/lpwan/iot-network-lora-lorawan/

23. Kshirsagar, Dr Pravin R. "SMART ELECTRIC METER USING LORA." Www.academia.edu, www.academia.edu/42733462/SMART_ELECTRIC_METER_USING_LORA

24. "LoRaWAN IoT Technology for Energy Smart Metering Case Study Lebanon." Key Engineering Materials, vol. 886, May 2021, pp. 30–41, https://hal.archives-ouvertes.fr/hal-03216721/document

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