SMART METERS REPORT

Smart utilities target more than metering

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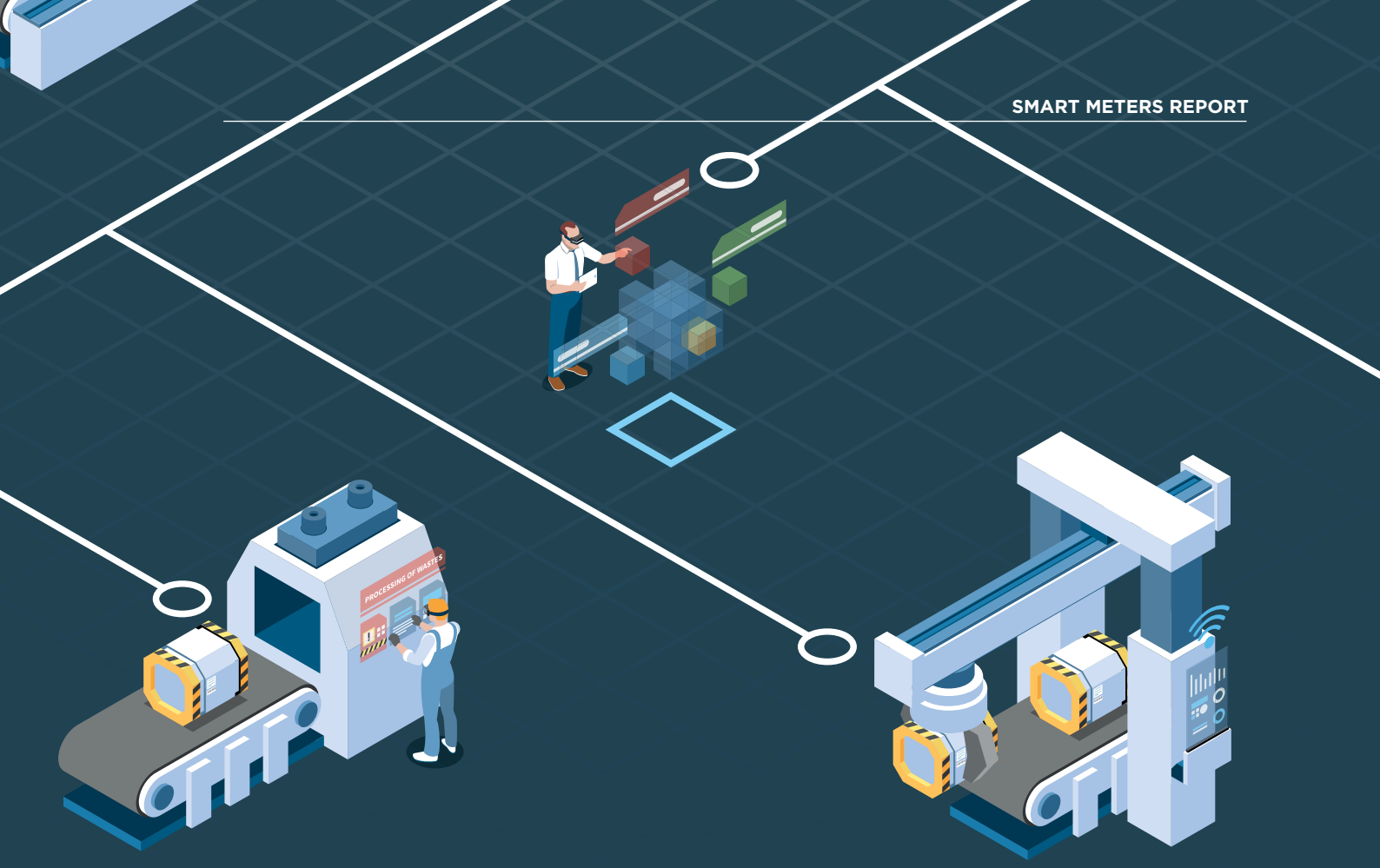


Smart utilities target more than metering

Meters used to be focused only on counting consumption. As such they were a cost for utilities but a smart meter can not only provide much richer consumption and generation information but also enable the business cases of partners. George Malim reports on smart meter developments and uptake and finds there are new opportunities for utilities to make money from their meters

Introduction

Utilities metering is among the earliest sectors to have harnessed the power of IoT. It's a natural fit because utilities companies incur substantial costs for reading traditional meters and they rely on accurate and timely information in order to bill accurately, prevent fraud, identify leakage in water and gas utilities, and ensure they have sufficient supply available to their delivery networks to meet customer demand. Much of this is simply metering, the accurate counting of what has been consumed, but smart metering goes further and opens up greater opportunities not only for utilities to run their own businesses more effectively but to provide additional value to their customers and to play themselves into new markets.

A smart meter has the potential to become a hub for appliances and other services within the home with the connectivity utilised by other systems, thereby generating new revenues for utility companies. At the same time the traditional one-way relationship of selling power at reasonably predictable levels of consumption to customers is changing. The arrival of power from renewable sources such as solar and wind generation, introduces a two-way relationship in which customers will sell as well as buy energy from utility providers. ▶

The meter provides a way to measure the results and refine performance

The new power generation

This places even greater importance on metering because those who generate energy will not find a quarterly estimate acceptable and will increasingly be using complex building management systems to optimise their own energy consumption. The meter provides a way to measure the results and refine performance. In addition, the unpredictable nature of power generated from renewables means utility providers need to balance demand with supply across the grid and meter data will be vital for this.

Finally, new forms of demand are being seen. Electric vehicles (EVs) have changed how energy for transport is consumed and this puts significant loads on power grids. Electricity utilities will increasingly use smart meter data to understand how much demand there is and its location.

This more complex market place, with higher expectations in terms of user demand, requires the more timely and granular data that smart meters can provide but the next step is to utilise the connectivity of smart meters and advanced metering infrastructure (AMI) to enable the business cases of other organisations. These business cases might include home or building management, monitoring and automation appliances and heating, ventilation and air conditioning (HVAC) systems but could also involve integration with appliance manufacturers to provide data back to manufacturers.

Meters are a long term bet. In European markets lifespans of 15-25 years are common so there are significant challenges involved in specifying smart meters with batteries, connectivity, and sensor and data handling capabilities that will enable them to operate for this entire period. Anything more than over-the-air software upgrades will be prohibitively costly and damaging to profitability.

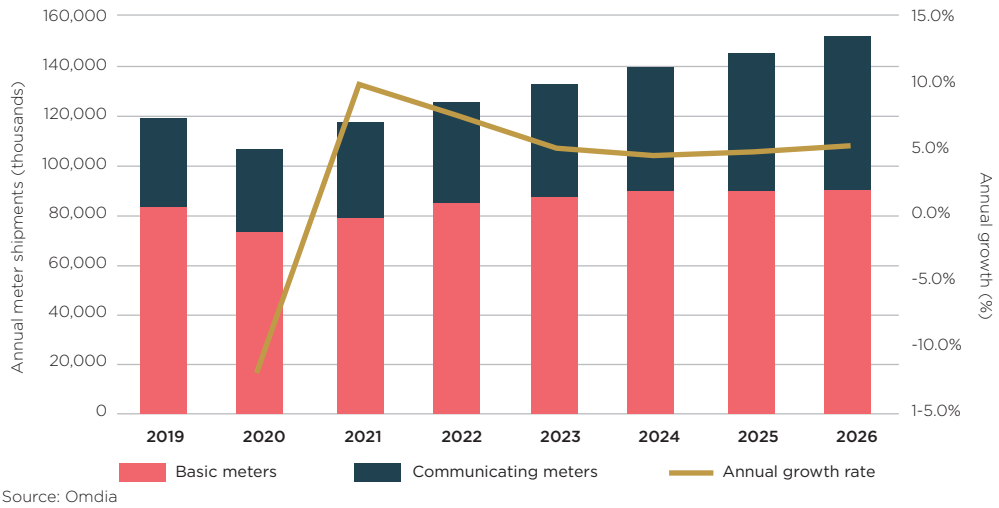
Utilities are therefore deploying smart meters at scale but they have been cautious, relying on tried and tested technologies and long lead times for specifying new meters and bringing them to market. Multi-million meter deployments deserve this measured approach but critical choices between connection technologies are being made and utilities are looking to drive efficiencies and economies of scale with meters designed for global or regional markets in an attempt to scale up more rapidly and eradicate some of the inefficient localisation of this traditional, nationally-focused market.

Electricity, gas and water

The **International Energy Agency** (IEA) has reported that global electricity demand grew by 4% in 2018 to more than 23,000 TWh. The electricity industry faces challenges in terms of serving the world's population and the emergence of new usage of electricity such electric vehicles (EVs). The IEA says EV sales are set to reach 44 million vehicles per year by 2030 and users recharging these vehicles will place large additional management burdens on power grids to ensure brown-outs do not occur. The management burden is further added to by increased generation via renewables, which requires greater integration, data and insights down to the level of micro-generation and individual consumption habits.

Gas consumption is also being more tightly controlled as companies look to more environmentally friendly alternatives. The **UN**'s recommendation of a 45% cut in carbon emissions by 2030 is stimulating organisations to re-assess gas usage and look for alternatives. In the meantime, knowledge about consumption is helping to control usage.

Finally, water is increasingly being recognised as a resource that needs to be protected. The IEA claims that more than 34% of pumped water is lost as non-revenue water because of tampering, theft, meter errors and faulty distribution networks. Smart metering can address some of these issues.



Source: Omdia

Figure 1: Projected annual shipments for basic and communicating water meters

Before the pandemic, the market momentum was already in place and bears out Berg Insight's view that impacts will be short-term

Market status

At the start of 2020, roll-outs of smart meters were underway at varying paces and with different goals across the globe. Many millions of devices were already deployed and some markets were already embarked upon second generation smart meter upgrade projects. IoT analyst firm **Berg Insight** had predicted that annual shipments of smart energy meters in Europe would reach a record level of 34.8 million units in 2021 while ABI Research has reported that penetration of smart electricity meters had reached nearly 70% of households in China by the end of 2019.

However, the pandemic has had an inevitable impact on the roll-out of smart meters to the extent that **ABI Research** projects a 25% year-on-year decrease in annual smart meter shipments in 2020, with revenue expected to have contracted by 31% – a decrease of US$3.3bn to reach a total of US$7.39bn. However, smart meter shipments and revenues are set to bounce back in 2021 with a 36% growth in annual shipments and revenues exceeding US$9.5bn, the firm says.

Berg Insight also projected pandemic-related impacts but expects the impact to be smaller. Temporarily postponed meter installations due to COVID-19 would have a slightly negative impact on shipment levels in 2020 and the total number of smart meters installed during the year is anticipated to be 10% lower compared to the previous year, it said.

Whilst rollouts of smart water meters will undoubtedly see some slowdown due to the pandemic, **Omdia** analysis in **Figure 1** shows that the market will be less affected in the short term than electricity meters sector. The global water meter market grew by more than 5% in 2019, shipping a total of 118 million units. Accounting for more than a quarter of the product mix, meters with remote communications will surpass 40% by 2026 despite changing market dynamics in a post-pandemic world.

Before the pandemic, the market momentum was already in place and bears out Berg Insight's view that impacts will be short-term. The firm has reported that annual smart electricity meter shipments amounted to 20.9 million units in 2019 and the corresponding figure for smart gas meters was 8.5 million units.

Cumulative investment in AMI will rise to $127.6 billion by 2025, up from $97.4 billion in 2020, according to a report from **Wood Mackenzie Power & Renewables**. Over that period, total smart meters deployed will rise from about 1 billion to nearly 1.3 billion.

Asia will dominate the market with roughly 40% of all new meters deployed by 2025, or more than 136 million units, driven by nationwide deployments in Japan and South Korea, as well as expected growth in ▶

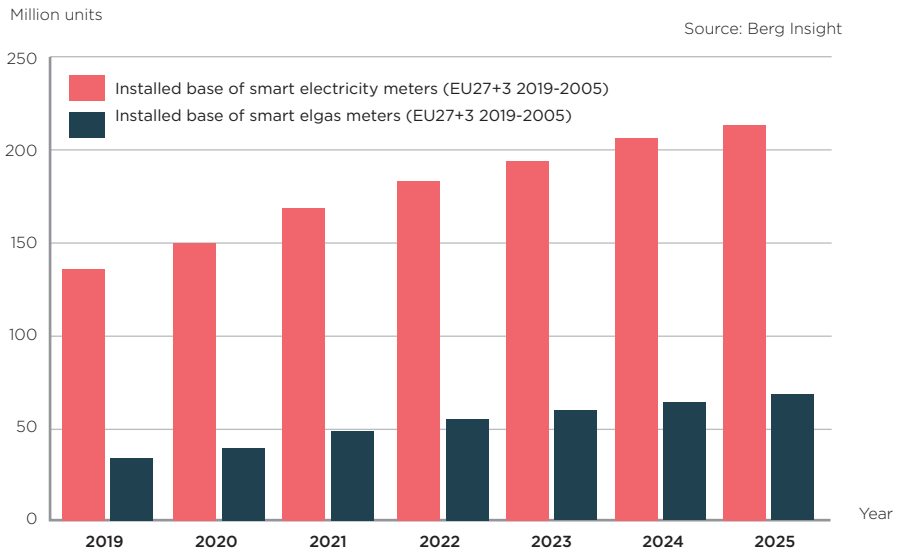


Figure 2: European installed base of smart electricity and gas meters 2020-2024

India, with about 300 million potential metering endpoints, is expected to be the second-largest market behind China

the still slow-moving market in India. By 2025, about 850 million smart meters will be installed across Asia, including 640 million in China, which largely completed its first-generation AMI rollout last year, along with 82 million in Japan and 22.5 million in South Korea, the firm reports.

India, with about 300 million potential metering endpoints, is expected to be the second-largest market behind China, though it hasn't yet met its own expectations for AMI deployments, with only about 7.7 million meters deployed as of 2019, said Francesco Menonna, an analyst at Wood Mackenzie Power & Renewables analyst.

European deployments continue momentum

Major first-wave rollouts in countries such as France and The Netherlands are expected to be completed on schedule while the delayed UK rollout is forecast to ramp up during the same time period and large-scale second-wave rollouts are beginning in Sweden and Finland. Berg Insight reports that upgrades to first-generation smart electricity metering systems are forecasted to account for 30-35% of annual European smart electricity meter shipments during the period 2020–2024.

AMI and new apps

Deployments of AMI demonstrate that utilities see the opportunity to position the meter as the hub through which other data flows, beyond simply measuring consumption of their own offerings. Uptake of apps such as **Google Nest** demonstrate consumer appetite for building control data but it's also clear that white goods and other household appliances could use the meter network. It provides a better alternative than these devices piggybacking on home Wi-Fi because this gives the appliance companies no control over the connection and necessitates upgrades or changes every time an end user changes their Wi-Fi provider or upgrades a router. By utilising the meter connectivity, the appliance company can be assured that the connectivity will remain available and only change on the long lifecycle of a meter.

The ability to communicate about more than simple consumption is a fundamental capability of AMI and this will applied to enable efficient charging of EVs. These power-hungry machines are seeing increased uptake across the world, with home charging points being installed. The challenge for utilities is to learn about usage habits and dimension their delivery capabilities accordingly. ▶

Europe remains the second-largest AMI market with 20% share, meaning 21.1 million meters were shipped

The number of connected EV charging points in Europe and North America is set to reach 4.4 million by 2024 according to Berg Insight. The firm reports that the number of connected EV charging points in Europe and North America reached an estimated 0.9 million units in 2019. Europe represents the largest share with around 0.6 million of these charging points, corresponding to a connectivity penetration rate of 46%. In North America, about 0.3 million of the total number of charging points were connected, equivalent to a connectivity penetration rate of 35%. Growing at a compound annual growth rate (CAGR) of 38%, the number of connected charging points in the two regions is expected to reach 4.4 million in 2024.

Service-oriented smart metering solutions have now become an area of interest among utilities throughout Europe, including standalone software subscriptions and end-to-end managed services. In the next few years, Berg Insight expects managed services to see strong growth in markets that comprise a large number of small- and mid-sized utilities. High upfront costs and lack of relevant technical expertise are two major barriers for adopting smart metering among utilities which have not yet done so.

Global roll-outs

The emergence of a global smart meter industry places significant challenges on providers who have to produce devices that comply not only with national utilities regulations but also communications regulations. These differences make it impossible to manufacture a single, global device but regional versions can be made that go some way to streamlining development complexity.

The fragmentation of the utilities industry along national lines still continues so the market has been addressed along national lines. However, the emergence of metering specialists is changing this and regional variations are expected. Nevertheless, markets are developing at different paces as roll-out pace is dependent on regulatory demands and the business case.

2018 was a record year for the global smart metering market with 107.1 million meters shipped, up from 101.2 million in 2017, reports analyst firm **Frost & Sullivan**. China accounted for 52% of global shipments in 2018, a significant decline from a few years previously, when it accounted for 70% of volumes. The short replacement cycle for Chinese meters, combined with the huge market – a 470 million unit installed base – means domestic demand will continue at 55-60 million units per year for the foreseeable future.

Europe remains the second-largest AMI market with 20% share, meaning 21.1 million meters were shipped. The roll-out in France is now nearing its peak, the UK and Netherlands markets are progressing, and the Spanish rollout is nearing completion. APAC accounts for 13% of the total or 14.3 million meters, with Japan the largest market, followed by South Korea. India, Malaysia, Indonesia, Taiwan and the Philippines are all key growth markets.

The North American market registered strong growth, with a 20% year-on-year increase. Global market shipments excluding China increased from 47.2 million in 2017 to 52.1 million in 2018 – a record.

Choose the right connectivity

For the reasons discussed, there is no single correct answer to the question of which network technology to use to connect smart meters. The array of technologies used extends from the private radio mesh networks of the utility companies to low power wide area (LPWA) technologies such as LoRaWAN and Sigfox and then on, into the cellular market with narrowband-IoT (NB-IoT) and LTE-M. 2G cellular also exists and is still being used in many markets. In fact, long term metering contracts are starting to extend 2G beyond its expected lifespan because it can't be retired until contracts are fulfilled. In some cases this will mean operators retire 3G to free up spectrum for 5G before 2G is retired.

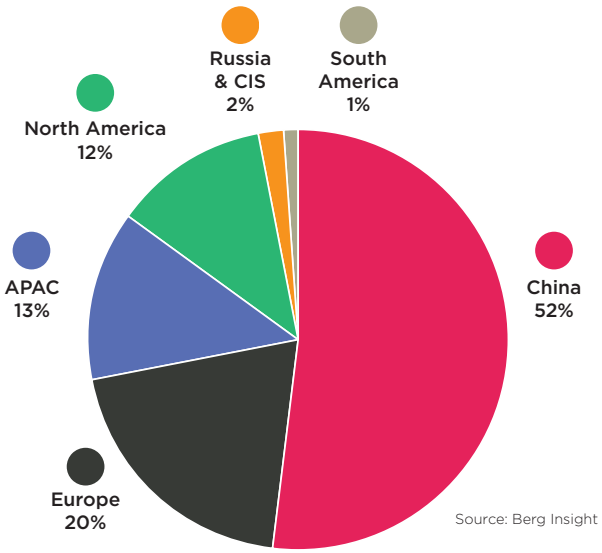


Figure 3: Regional key Advanced Meter Infrastructure market unit shipments 2018

The decision is increasingly based on the cost, security, coverage, power usage and potential throughput of the connectivity. Each of these can cause deployments to succeed or fail and therefore must be carefully balanced against each other to create an optimal solution.

From a coverage perspective, near total national coverage is needed which can reach meters in difficult locations such as underground in basements or plant rooms of large buildings. More than one solution may be required to achieve this nationally so different versions of meters may be needed. This is sub-optimal but a necessity to ensure total coverage.

Capacity is also becoming more of a priority as utilities recognise that they will need to communicate more data and their partners will also increase traffic over meter connections. There's a fine balance between provisioning a solution with enough capacity to meet future needs and not spending excessively on capacity that isn't required. Utilities are carefully assessing what the operational landscape will look like in a decade and, accordingly, are specifying connectivity that enables them to scale up flexibly in future.

Another constraint is battery life. With lifespans of two decades or more, utilities need meters that are power efficient. Truck roll to replace a battery represents a cost that breaks the profitability of a service so low power solutions that still enable the data utilities and their partners need to be transmitted are attractive. Don't forget none of these applications involve high definition video, for example, so the focus is on frequent communication of relatively small data.

Finally, utilities and metering service providers are looking to create globally standardised products where possible within regulatory constraints. Being able to accommodate multiple communications technologies is an important step in these efforts but issues such as chipsets and antennas constrain flexibility.

Conclusion

The new role of the smart meter as a hub in the home or building through which other systems also communicate data has invigorated the market. Meters are no longer an unavoidable cost of doing business in the utilities market, they're a potential source of revenue. That changes priorities from doing the minimum needed to gather consumption data and comply with regulations to enabling partners with reliable, secure connectivity and turning a cost into a profit centre.

The connectivity is at the centre of whether this can be done profitably so utilities are choosing carefully between the sometimes bewildering options on offer. The good news is that there are a wide variety of communications technologies available and many have already proved their value in large-scale smart meter deployments. There truly is a connectivity option for every deployment situation.