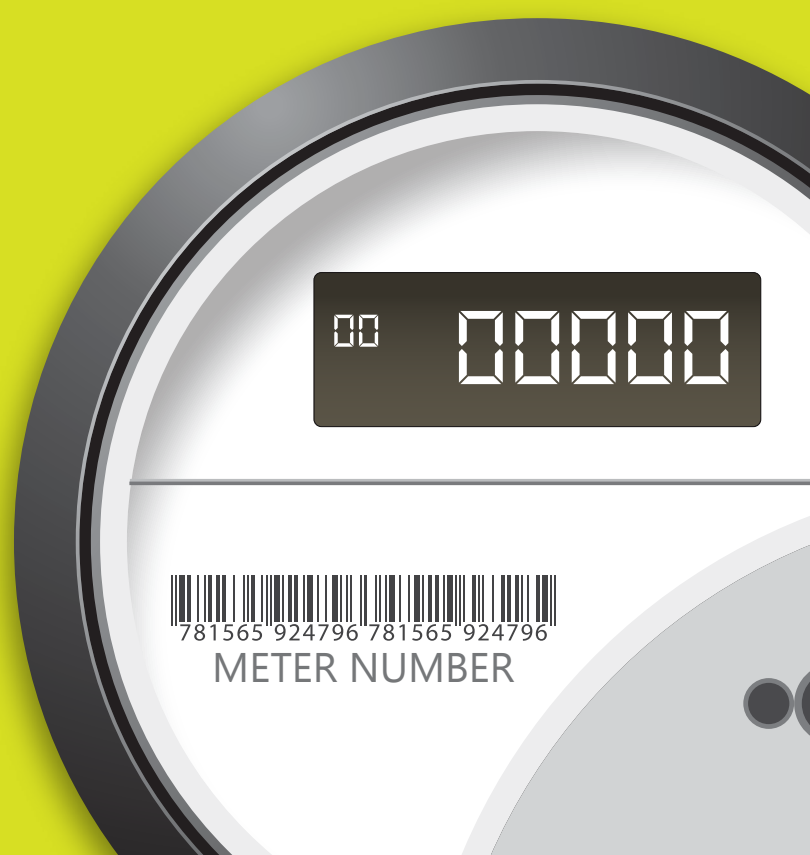


Automatic **Meter** Reading

Making Utilities Smarter & Efficient



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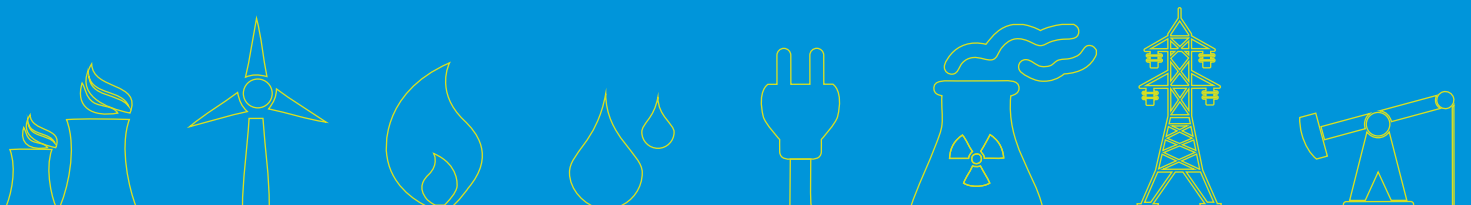
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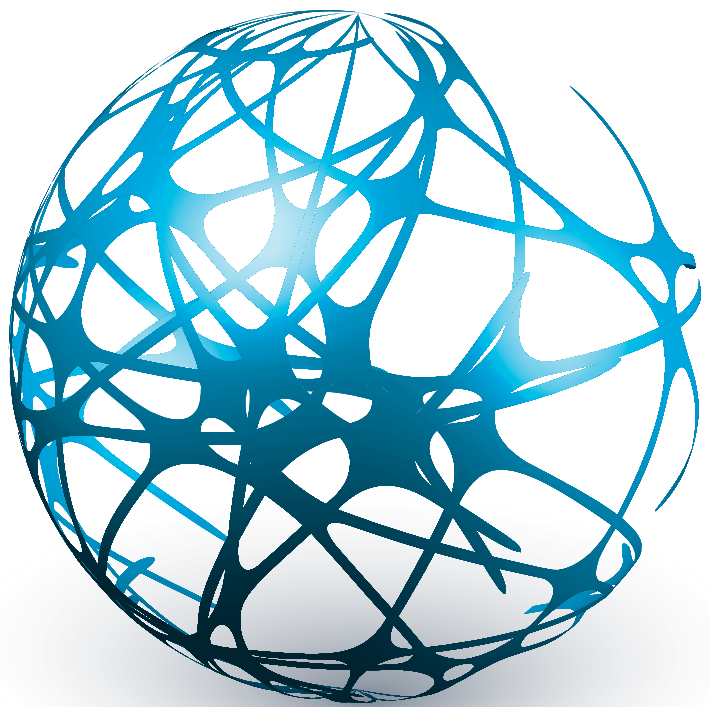
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Introduction

Machine-to-Machine (M2M) Technology is a cornerstone in enabling automation in various industries and in evolving them to understand their true potential for unlocking great business value. One such revolution that is quietly yet rapidly changing the paradigm for Energy and Utilities industry brought in by M2M is Automatic Meter Reading or AMR technology. In the foreseeable future, AMR is set to bring in a sea change in the way companies/utilities provide services to their customers and manage operations.

This whitepaper looks at the global trends in Smart Metering, challenges in its adoption, opportunities that it beholds, AMR the go-to solution, road toward AMR adoption in the Indian market, and how KPIT's AMR solution is instrumental in deriving substantial value for the Utility companies.





Global Trends

Imagine a scenario where meter readings are being automatically transmitted to a centrally located system, without manual intervention. This data is then used to observe real-time energy consumption, predictive analysis of future consumption and suggest ways to ensure energy conservation. Yes, this and much more is the virtue that Smart Metering technology brings along.

Several nations across the world have opened their doors to this technology. Smart Metering is leveling-off in the US and is gaining momentum in the UK. By 2020, almost 26 million British homes will have their old-style electricity and gas meters replaced by new smart meters. Other regions like Asia Pacific are still contemplating its business benefits and awaiting government mandates and intervention. Countries like Germany, Greece, Australia, and Argentina have deployed several AMR projects.

In India, Utilities are still on a wait and watch mode for this technology, however, as the government's plan for 100 smart cities materializes, AMR would become one of the most sought after technologies for utilities.

AMR applied to electricity meters, water meters and household gas meters, used for residential, commercial or industrial purposes, should not be mistaken for a mere face-lift for the innocuous looking devices, it is making them more efficient by delivering enormous operational and cost benefits.

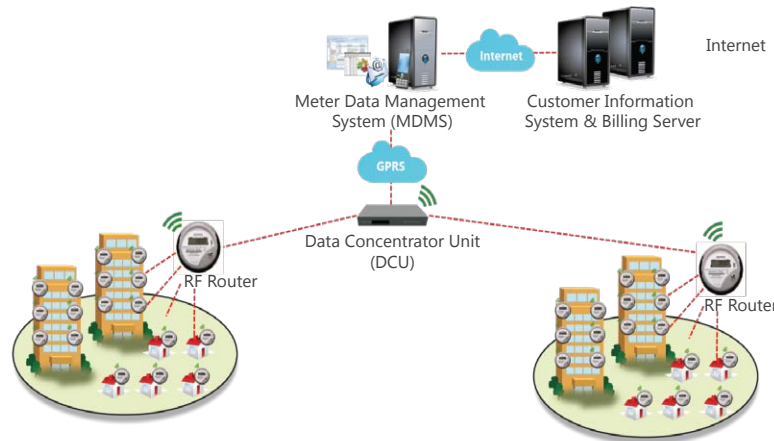
The traditional electromechanical meters that we see today would be soon replaced with the chic Smart Meters. A report by MarketsandMarkets estimates the Smart Meters market to grow from an expected \$11.1 billion in 2014 to \$18.2 billion by 2019, at a CAGR of 10.2% from 2014 to 2019. So the window of opportunity that we are talking about is huge, albeit gradual.



Automatic Meter Reading (AMR): The solution

Trends in the industry have demonstrated that Energy and Utility companies are moving towards Smart meters and therefore Automatic Meter Reading (AMR) solution instead of manual or touch-read devices.

AMR is also the first step towards ensuring a stable smart-grid. AMR with its predictive analysis could help in reducing the unexpected load on the grid, making it more resilient to failures.



Converts conventional meter into smart meter. Works on low power radio frequency(LPRF) and GPRS technology".
Change this to "Smart Meters transmit data to the Data Concentrator which in turn sends the meter data to the billing servers

A few reasons why Energy & Utility (E&U) companies should consider moving to AMR:

Walk-by and drive-by meter collection is a passé:

Manually taking the readings in the neighborhood of the service area is costly. Employee insurance cost, vehicle cost, maintenance, fuel cost, could add to a huge cash out-go and profit burn for energy and utility companies. With AMR, meter readings would be available remotely on a real time basis, giving utilities a transparency into their billing systems. It would also eliminate customer billing disputes.

Customer centric approach:

Customer service takes the front-seat in E&U industry. With accurate customer information available on real-time basis, companies can provide better offers tailored to customers' need. With AMR, consumers can monitor, manage and thus, reduce their overall energy consumption. It would even make it easier for consumers to change tariffs and switch between suppliers.

Demand and supply scenario:

AMR would establish better real time demand-supply equilibrium. While earlier energy and utilities companies were supply driven, this is changing to being consumer demand driven. Companies can now better manage their energy inventory to avoid supply outages.

Data analysis:

With AMR, a variety of data would be available (hourly, weekly, monthly, quarterly or annually). Historic comparison, irregular use reports and error prognostics and diagnostics would be possible. This data could be made available to consumers for them to achieve energy efficiency.

Easy commissioning and de-commissioning of services:

With remote management, services can be easily commissioned or switched-off. AMR can also help cities to respond to natural disasters like hurricanes or tornadoes. For example, AMR network helped an Alabama based power company to quickly restore electricity services to residents after a series of devastating tornadoes in 2011.

Pre-paid meters:

Pre-paid meters provide the option of pay-as-you-go for customers' energy usage. Think of it as a pre-paid tariff card for mobile phone. Customers can credit their electricity account with an amount of their choice and once this available credit exhausts, energy supply would be cut-off.

The rate of adoption however is growing at a slow pace due to challenges of execution and preparedness. Utility companies are unsure about how to maximize their AMR technology investments. Hence, as a component of their conservative IT budgets it is under the lens as it would entail huge investment.



Challenges in AMR adoption:

A few clear challenges for proliferation of the AMR technology are:

Upfront investment:

AMR demands new infrastructure, new meter installation cost and the investment towards establishing the backbone network for communication. Also the amount of data that would be generated would be enormous and hence calls for an investment in Meter Data Management (MDM) infrastructure. MDM system stores the data to make it further available to billing system on need basis.

Identifying a clear mandate:

Though AMR promises to bring better productivity and efficiency, the utility industry hasn't been able to identify and establish a clear mandate and vision for AMR deployment. While for some it is for improving the customer service, for others it means outage management.

Employee skilling costs:

With new infrastructure and technology in place, it is crucial to upskill the employee-base with the necessary training on the new technology. Aligning employees to the technical skills needed would ensure early return on investment.

Customer data privacy:

Some consumers are unyielding to the idea of sharing their personal usage information with the provider. This dispute over control of metering data would also set the pace for its uptake. E.g. The US government has started Green Button Initiative where they collect smart meter data of all the individuals from electricity distribution companies. Individuals can thereafter give authorization to various companies who can take the data and provide analysis of the data and can also suggest ways of reduction to individuals. Another controversy around this is if this data would be located centrally with the provider or be distributed at the customer's end.

Prone to hacking:

One big issue is the safety of the data collected by these smart meters. At the national level, implication of an anti-social element hacking into a nation's entire power grid via its AMR network could be catastrophic. To tackle this issue these smart meters have to be made safe-by-design.

With challenges come opportunities and with a technology like AMR, the potential is huge.

Opportunities associated with AMR:

Targeting customers more effectively:

Enormous data on customer usage pattern would be helpful in segmenting high usage customers and targeting them for ideas on energy consumption. For e.g. running a washing machine at night when the network load is less rather than in the afternoon or morning. Low usage customers could be identified for upselling and cross-selling.

Energy savings:

Real-time energy usage feed, tracked and stored in a centralized data center will enable the government and/or the energy provider to predict energy demand trends and chalk out ways to reduce energy consumption and meet carbon footprint requirements.

Fueling competition:

With such customer information, it would be easier to offer better pricing package that could fuel competition in the industry. This would be only possible in a de-regulated environment.



Growth in AMR adoption across countries.

Smart Metering in Switzerland

The Challenge:

For most consumers in Switzerland, electric meters are typically installed in the basement, read once a year, and show only the total electricity consumption. The increasing demand for energy was a concern for Switzerland.

The 2009 European Union regulations emphasized on increasing security, reducing carbon output and improving competitiveness in the energy and suggested the leading national authorities to deploy smart meters. The aim for installing smart meters was to optimize daily processes and increase operational efficiency.

AMR as the chosen technology for achieving energy efficiency:

The plan kicked-off with a pilot of 1000 AMR points to ensure higher flexibility and operational safety. This pilot project was rolled out in one of the Zurich districts Dietikon in spring 2010 and was subsequently rolled out in the entire city in a phased manner.

Key benefits:

- Remote parameterization
- Programming of customer profiles
- Quick fault finding by the network operator due to the status reporting feature
- Shorter implementation time that ensured low cost of ownership
- Timely billing at shorter intervals
- Convenient and remote registration, commissioning and cancellation
- No on-site reading, saving around 25,000 work hours a year

Added-value applications, such as personal energy management tools ensured customer satisfaction. Now the Swiss end users can track their real time energy consumption and tariff data displayed on their home unit. This home unit solution and an informational password-protected Internet Smart portal contribute towards raising awareness among end customers about sustainable energy use.

Meter reading and billing are now executed on a monthly basis. The on-demand meter readings are conducted remotely. Today implementation of Smart Metering in the residential sector in Switzerland generates in total 2 to 5% savings.

Massachusetts Municipality invests in Smart Metering

The Challenge:

One of the oldest municipalities in Massachusetts was jostling with the operational challenge to enhance reliability, reduce operating costs, and improve customer service. Utilities were looking for a solution that could assist them in restoring power quickly during volatile weather events, combat increasing opex and support an environmentally-aware customer base that demanded reduction in their spend and greenhouse gas emissions.

ARM was the answer to the municipality's conundrum:

The decision of implementing AMR technology by the municipality was a forward thinking approach that not only resolved its existing issues, but set a stage for the adoption of new and innovative utility management technologies in the future. The installation plan included a system for over 20,000 electric and water meters.

Key benefits:

- Isolating and responding to outage issues and efficiently dispatching repair crews
- Automatic transmission of meter data that helped reduce operating and maintenance costs
- AMR helped in bringing 'time of use' billing
- Residents can monitor their home and business energy usage through an online portal that shows their load profile
- Reduction in energy and decrease in greenhouse gas emissions



Growth in AMR adoption across countries.

Texas moves from manual to AMR for water utilities

The Challenge:

The city had more than 38,000 manual water meters through which 3.5 billion gallons of water was metered annually. A few challenges faced by the legions of peripatetic meter readers included the biological and physical hazards (topography, distance, dogs, electric fences, guns etc.). This process was also laborious, had transcription errors, no historic records, could not detect customer leaks or curb water theft.

AMR the answer to all the problems:

The objective was to install AMR and a reliable RF frequency network that would provide the best Return-on-Investment for the lowest life cycle cost. The new smart meters that were installed read remotely under desired conditions, integrated continuous leak detection functionality, ensured retrievable consumption history and used vandal deterrent technology.

Benefits:

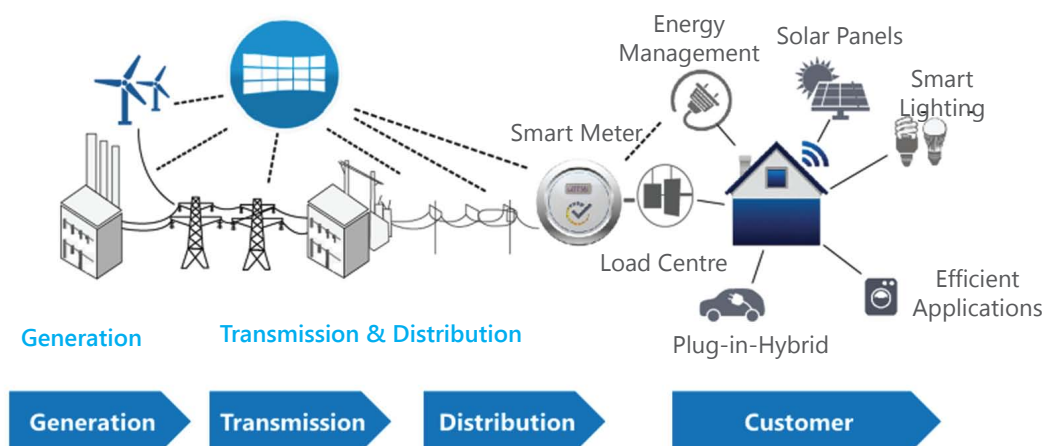
- Meter data communicated by RF and no manual meter reading was required
- This resulted in low labour and disputes
- Helped detect customer water leaks and identify water theft



Learnings from the case studies:

- Ensuring clear visibility on AMR policy and the implementation agenda is crucial at an early stage
- AMR roll-out should be in compliance with the legal and regulatory framework of the city or country
- Pilot exercises are necessary to demonstrate the technology, understanding customer reaction and for developing appropriate commercial and regulatory arrangements
- An impact assessment of AMR implementation is essential to make informed future decisions
- Consideration should be given to the ability of the proposed AMR model to accommodate future developments in technology and the market (e.g. smart grids).
- The technology implementer should be patient as the entire implementation process can take upto a few years and involves substantial investments. However the ROI is large and impactful.

Smart Energy Ecosystem





Paving way for **AMR** adoption in India

Learning from global peers, India is already making initial moves in this space. A couple of pilot projects that have been executed in India include:

- Deployment of around 1500 AMR machines at Puducherry that will eventually be rolled out to 87,000 households in the city.
- Installation of around 6,31,000 devices with AMR capability by MSEDCL (Maharashtra State Electricity Distribution Company Limited) in dense urban areas, and installation of close to 2.8 million devices in the rural areas.
- Deployment of close to 2000 Smart Meters by TNEB (Tamil Nadu Electricity Board).
- Project by Chamundeshwari Electricity Supply Corporation Limited (CESC) to install 21,824 smart meters for its consumers.

As India sees higher adoption of Smart Meters and therefore AMR, it is important that investments are made in line with global regulations for smart metering and AMR.

In most of the markets where smart metering project is implemented (Ontario, France for gas, Italy and Sweden), the meters are owned and maintained by the distribution system operator. In Colorado, the meters are owned and maintained by the vertically integrated utility. In Great Britain, suppliers own and maintain the meters. In France, electricity meters are owned by municipalities or their association.

The markets mentioned above had also specified the minimum functionality of the smart meters to be installed. For e.g. in Ontario, the minimum functionality of meters is set-out in a regulation. That includes collection of hourly metering data, communication protocols and data transfer to a centralized meter data management repository.

In Great Britain, specifications are established by the Government that mandated meter functions to be developed in collaboration with the industry. The functionality of gas and electricity smart meters included in home display for domestic customers, a wide area connection module to provide two way communications to a central data management body, and a home area network to connect smart meter to smart devices in customers' homes.

In Italy and France, the key functional requirements are defined by the regulators. In Sweden and Colorado, no minimum functionality of smart meters is set out in regulations.

In Great Britain, interoperability is the essential element of meter functionality.

In most of these markets, tariff is regulated by the government. The project cost recovery was initiated via customer billing over a period of time and no upfront cost was mandated. Two markets (Great Britain and Ontario) decided upon a central body to manage the data flows between meters and service providers, whilst in the other market (Sweden) a decentralised approach was adopted.

As the deployment models evolve, with India continuing to push for smart meters and automatic meter reading solutions, KPIT with its work combining engineering and IT is creating and piloting robust solutions that have been adapted for the Indian scenario. With extensive experience of delivering these solutions globally, KPIT also brings strong capabilities to offer system integration and on-ground support for the implementations.



KPIT strategically positioned in this space to provide maximum value

KPIT, is a technology company that offers a wide array of solutions, software and connectivity stacks in the area of Internet of Things (IOT). AMR is one such product that the company has developed and is offering mainly to the Utilities segment.

In accordance with the global industry standards and international best-practices, KPIT's AMR solution goes beyond meeting complex business requirements for the E&U sector. Company's considerable experience of being a technology enabler for the E&U industry and its extensive expertise in AMR combines to deliver advanced, powerful and efficient smart metering solution.

KPIT's AMR platform with enhanced features and advance capabilities ensures transformational results like improved productivity, enhanced efficiency and reduced energy costs.

Over the years, KPIT's AMR solution has enabled global utility companies to become smarter by being compliant with regulatory standards, improving customer satisfaction, optimizing load management, moving to future technologies, managing assets and bringing in operational excellence.

KPIT's comprehensive approach toward smart metering and understanding of global AMR trends and a series of pre-configured services have been instrumental in delivering a best-in-class solution that is tailored to each customer's need.

KPIT's AMR solution consist of

Radio Frequency (RF) Module

This module is retrofitted to the non-RF electric meters to enable RF data transmission to Gateway.

Gateway

This device works on Sub GHz. At one end it will talk to meters to collect data and at the other end it has RF repeater for range extension. This is to be fitted in the meter room near the group of electric meters.

Data Concentrator Unit (DCU)

This device consist of modules – RF Module, GSM/GPRS & memory

- RF Module: This module is required for communicating with the Gateway device using proprietary RF protocol
- GSM/GPRS Module: This module is required to communicate with the server
- Memory Module: Memory module will have a slot for SD card which will be used for storing data received from meters as intermediate storage.

Meter Data Management System (MDMS) on Server

This system stores the data received from DCU's. To make data further available to billing system on need basis

What makes KPIT's AMR solution unique?

KPIT's end-to-end solution for enabling AMR infrastructure enables Energy & Utility companies to:

- Integrate 'end-to-end' smart energy solution with hardware and software
- Configure meter as per utility needs
- Upgrade software remotely to deploy additional functionality as needed
- Configure user specific features using MDMS & billing server such as Prepaid meters and differential rate management
- Remotely diagnose robust field operations
- Improve overall efficiency, reliability & delivery of services
- Detect tampering / pilferage
- Ensure better revenue management through accurate billing
- Very vigorous and robust measurements to ensure that consumers' privacy and data are absolutely secure



Conclusion

Due to its multiple advantages over the traditional metering system, prudent Utilities are already factoring AMR solutions into their IT strategies. New and evolving business models, falling electronic prices and the plethora of advantages to both customers and E&U companies makes the systems very compelling.

