

# How M2M aims to reduce Transmission & Distribution Losses

Author: Mayank Chauhan (mchauhan@masplantiz.com)

## The Situation Today

Electric power transmission and distribution losses have by far remained the biggest challenge for the power sector. The distribution losses are very high in India. The grid losses are a mammoth 27%. [1] Different reports and government agencies put this number to be 30%, 40% or sometimes even higher. On the contrary, China has T & D losses in the range 3-7% [2] which is miniscule as compared to India.

The high level of losses is not only a bane to the society, but also a big deterrent for the potential investors even after the liberalization era has set in. There is an immediate need to bring in methods to monitor and control these losses.

## Remote Monitoring: The need

The need to monitor T & D efficiencies emerges from the fact that just 50% reduction in transmission losses can result in a faster "Power for All" dream by 2012 as planned for by the government.

Remote monitoring of T&D assets like substation, transformers etc can help in a number of ways:

- It helps to optimize the transmission equipment thereby leading to reduced installation and setup cost for infrastructure. This results in overall less and deferred capital expenditure.
- A serious issue is unplanned outages and power failures which can be addressed by doing preventive maintenance of the assets in T&D.
- Overloading of grids or transformers results in damage. These repair costs can be avoided by preventing and monitoring the problem areas. Similarly, under-utilization of transformers can be addressed if data is available for all such assets.

## What does market has to offer?

There are numerous solutions that are available in the market that address the power sector. SCADA systems have been historically used in the past for real time monitoring. It has big names like GE, IBM, and Siemens among others that provide such proprietary solutions. The solutions are good, but a high cost always remains a deterrent to the already distribution loss facing power sector. The need is to adapt new technologies that not only comes at a more competitive cost but are also promising in achieving the same objective with a wider horizon.

The market is abuzz with the concept of "Smart Grid". A smart grid is a concept whereby the bulk of assets that had been lying there for years, needing exhaustive maintenance and upkeep will start talking to the networks and in turn to the business people to make them aware what is their status and capacity to contribute to the business. This in turn would help make better business decisions.

Machine-to-Machine (M2M) monitoring is one such technology that is being used in remote asset

management, for both remote monitoring and control. The technology promises to bring in operational and service efficiencies into the system at a very competitive cost. It utilizes standard open source technologies and hence has minimal R&D cost thereby even being attractive to the early adopters.

## Why M2M?

The advent of M2M is not new. All the components that are present in a M2M system have existed for decades. The continuously falling cost of the hardware, applications and communication have now made them more viable than any other system that currently exists.

The data from the business critical assets is combined with telemetry and information technology to automate the availability of data to all stakeholders in a business process. As a result the business becomes more effective leading to increased utilisation of assets and information flow across all segments. M2M can contribute to reduce T & D losses in numerous ways.

Intelligence can be built into the M2M applications. This coupled with business analytics can help to alert you to fault conditions that could lead to equipment failure or demand a servicing of a substation asset. This in turn is a significant benefit in terms of preventing unscheduled outages.

## How can M2M help?

### *Remote Transformer Monitoring*

A M2M system can be used for remote monitoring of transformers. The failures of transformers are a major problem. For distribution transformers alone the failure rate is 25% as compared to the 1-2% for international norms [3]. This results in T&D losses as well as revenue losses. These losses become even more enormous when power transformers fail.

The failures for the transformers can be prevented by appropriate monitoring. Although there are a number of technologies available for online monitoring of oil filled transformers, however, the way this data has been made available for the business decisions, using the data for diagnostics and predictive maintenance and tying down the condition of asset to critical business assumptions has not been done.

The need is to bring down the overall cost of implementing a monitoring and diagnostics tool, but more importantly making sure that this information finds way to each and every stakeholder involved in transformer management in an organisation.

An M2M enabled transformer monitoring solution can pickup inputs from already available monitoring components. It minimizes the need to add or replace new hardware for monitoring. It not only monitors but also analyzes and interprets the data collected from a transformer and related sensors to determine the transformer's real-time condition and to diagnose possible problems.

Traditional systems have existed where by a lot of parameters for transformers are monitored. However, summed up these become expensive and sometimes

overwhelming. The need is to identify the main culprits for failure and nail them without making the overall system unaffordable.

#### *Power Substation monitoring*

Monitoring of power substations and the dis-connector stations can be a step further to prevent the entire grid breakdown when a single component goes wrong. There are a number of assets that make up a power substation or a captive power plant. Again, any downtime of any component, be it a transformer, load control switches or a circuit breaker results in huge T & D losses.

The use of traditional SCADA systems has remained a norm for power substation monitoring. However, the huge cost of implementing such systems made it impossible to implement it at every substation or asset level. Even to date, most of the grid network is manually controlled. Moreover the information was available to a limited band of people again making it difficult for seamless flow of information.

Knowing that these assets are functioning well and when they would need maintenance can help to optimize capital assets and in parallel minimize operational and maintained costs that are incurred. The overall transmission traffic can be better managed by balancing the over utilized and underutilized assets which would ultimately result in lesser T & D losses and consumer savings.

The reasons for the asset non-performance can be studied over time and diagnostics improved and new diagnostics build up in the system to suggest taking corrective action.

The Telegestore project installed by Enel S.p.A of Italy is the first and most well known example of the implementation of Smart Grid. It is reported to deliver an annual saving of €500 million by preventing losses as well as efficient distribution of power. [4]

The control component of M2M takes a step further in terms of fast actions on need basis. Rather some actions can be initiated by the system itself so as to minimize human intervention.

#### *Automatic Metering*

M2M also address the problem of low metering efficiency by bringing in AMR. M2M can help to establish an advanced metering infrastructure such that the inconsistent billing practices can be tamed. This data can be used to selectively have less service hours for delinquent customers while providing uninterrupted services to customers that are regular in their bills.

PPL Electric Utilities, Allentown, Pennsylvania, U.S has implemented AMR over a period of a two year implementation cycle to automate its metering assets. The target was to better manage its customers, increase the existing customer base and achieve significant improvement of the 1-3% of theft related damages in US. In India, where the theft related damages are in excess of 20% [5], AMR promises to deliver very fast.

#### *The differentiator*

One of the most valuable future advantages that M2M brings on the table is that since it is based on standard protocols like the TCP/IP, HTTP, UDP etc, it has the potential to bring business working on a single connecting platform thus ensuring true integration of an enterprise. It promises the business critical information to be universally accessible by all tiers within an organisation.

True integration means integrating the financial systems, the SCM systems, the customer systems and maintenance systems leading to better reporting, better data integrity and ensuring that business decisions are made with all needed information and in time.

#### **Conclusion**

Remote monitoring and control in T & D promises to be a significant contributor in identifying the problem areas, giving the organisations the requisite data and tools to take in time corrective action for minimal downtime and minimal maintenance of the grids. It promises to join machines and equipments to the network so that people, applications as well as equipments and machines come together for more efficient performance.

The ultimate goal is to increase the performance and competitiveness of any organisation through increased efficiency and better service. Although some of the M2M solutions are internal to a company and focus is on improving processes, an ever-growing number also aim to serve the customer base of the company.

#### **References**

- [1] CEA, Power ministry data ([http://cea.nic.in/god/special\\_reports/AT&C-%20LOSSES\\_PFC\\_2003-04%20to%202006-07.pdf](http://cea.nic.in/god/special_reports/AT&C-%20LOSSES_PFC_2003-04%20to%202006-07.pdf))
- [2] CEA, Power ministry (<http://www.thehindubusinessline.com/2005/12/03/stories/2005120303300900.htm>)
- [3] International Copper Promotion Council ( India) (<http://www.copperindia.org/cu/wcms/en/home/programs/transformers/index.html>)
- [4] National Energy Technology Laboratory (2007-08) (pdf). [NETL Modern Grid Initiative — Powering Our 21st-Century Economy](#). United States Department of Energy Office of Electricity Delivery and Energy Reliability. p. 17. Retrieved on 2008-12-06.
- [5] 2005 Planning Commission, India data. Information from [Cut T&D losses, boost efficiency](#)

GE, IBM, and Siemens are registered trademarks of their respective companies.