A Review Paper on Advanced Metering Infrastructure

Prachi Sharma[1], Harvinder Singh[2]
[1]*ME Electrical, Department of electrical engineering, Chandigarh University*
[2]*Assistant Professor, Department of electrical engineering, Chandigarh University*

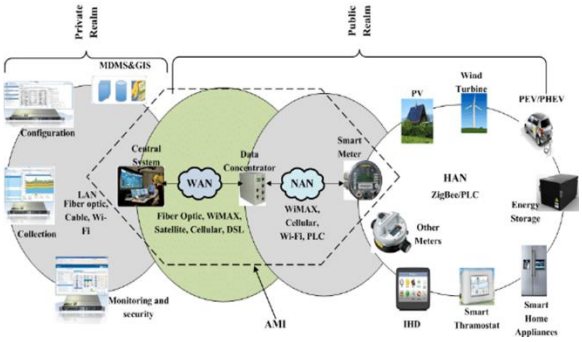
Abstract **- The current power grid may not grow electric request. Modern skill canister remain use to recover productivities then reasonable electrical use by staying away from the requirement for new age, transmission and appropriation plants. To address the issues of things to come and to fix the issue of the past shrewd lattice innovation saddles the most progressive advanced registering advances to screen and change the utilization. For generation of energy smart grid also aids to optimize. This innovation guarantees better utilization of assets and precise charging to clients dependent on genuine utilization instead of assessments. AMI, Double way correspondences, Unique meters/Unique sensor, safety, IT, web network and Natural Energy and Loading are the technology used in smart grid implementations demand. The paper additionally guidelines National situation of AMI is to meet keen matrix requests then its turn of events.**

Index Terms **- Automatic Metering Infrastructure, advanced meter, smart grid.**

I.INTRODUCTION

In present situation India will use electromechanical and in somewhere we also use digital energy meter instead of energy metering for billing purpose. For billing purpose energy metering system is very effectively and less time consuming. But in traditional billing system is very inaccurate and more time consuming which will be very costly many times. [1]
But in today, present time accuracy is electricity billing is very highly considered. So, smart meter reading which gives accurate billing and it also give accurate power consumption. But in electricity it also provides real time monitoring of utility.[2]

Fig1: advanced metering infrastructure[1]



II.BUILDING BLOCKS OF AMI

AMI is involved different equipment and programming parts, all of which assume a part in estimating energy utilization and sending data about energy, water and gas use to service organizations and clients. [3]
The general mechanical parts of AMI include: -
Smart meters: -Smart meter is same as digital meter and its working is also same but in smart meter, we will use two-way communication which also tell us when we take supply from the utility in smart meter it will share information directly to the utility, there is no need to any person to come and check the meter reading. [4] Its radiation is also very low and for connection to utility it will use radio frequency (Rf).
Correspondence Grid: -Modern correspondence networks which upholds two-way correspondence empowers data from keen meters to service organizations and the other way around. Organizations like Broadband over Powerline (BPL), Power Line Communications, Fibre Optic Communication, Fixed Radio Frequency or public organizations (e.g., landline, cell, paging) are utilized for such purposes. [5]
Rhythm Information Procurement Organization: -Programming applications on the Control Centre gear and the DCUs (Data Concentrator Units) used to get

data from meters through correspondence organize and send it to the MDMS. [6]

Meter Data Management System (MDMS): -Host framework which gets, investigates the metering data and stored it.

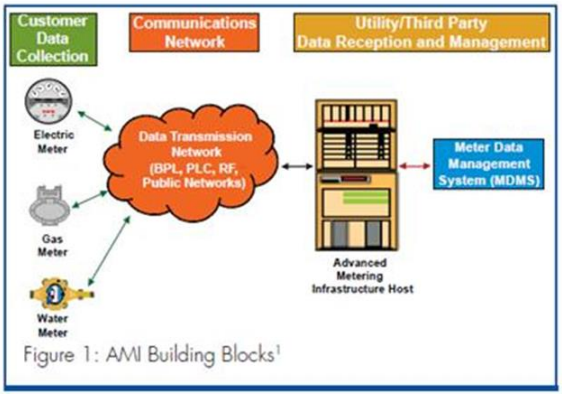


Fig2: - building blocks of AMI[2]

III.BENEFITS OF AMI

The advantages of AMI are multifield and can be by and large sorted are:

Operating Profits: -AMI (Automatic Metering Infostructure) aids the whole lattice by educating the precision of meter peruses, energy burglary recognition then reaction toward blackouts, though disposing of the requirement for on location meter perusing. [7]

Monetary Benefits: -AMI carries monetary benefits toward function, liquid plus smoke organizations through diminishing gear and support expenditures, empowering quicker reclamation of electric help during blackouts and smoothing out the charging cycle.

Client Benefits: -AMI benefits electric clients by identifying meter disappointments early, obliging quicker help rebuilding, then cultivating the precision then adaptability from charging. Additional, AMI (Advanced Metering Infrastructure) takes into consideration time sensitive rate choices that can help clients set aside cash and deal with their energy utilization. [8]

Security Benefits: -AMI innovation empowers improved observing of framework assets, which mitigates expected dangers on the matrix by digital psychological militant organizations.

IV.CHALLENGES OF ADVANCED METERING INFRASTRUCTURE

In spite of its broad advantages, conveying that the three major issues in AMI that include:

High Standardisation Costs: The complete gauge sending the AMI (Advanced metering infrastructure) necessitates uses happening completely equipment besides programming segments, with pulses, system framework then organization the board programming, alongside cost related through these establishment then upkeep of pulses and data innovation frameworks. [9]

Integration: AMI (Advanced Metering Infrastructure) is an unpredictable arrangement of advances that should be incorporated with benefits' data innovation frameworks, including Customer Information Systems (CIS), Geographical Information Systems (GIS), Mobile Workforce Management (MWM), SCADA/DMS, Distribution Automation System (DAS), and so on [10].

Normalization: Interoperability guidelines should be characterized, which set uniform prerequisites for AMI innovation, organization and general activities and are the keys to effectively interfacing and keeping an AMI-based framework.

V.ADVANCED METERING INFRASTRUCTURE IN THE INDIA CONTEXT

Modernizing India's network framework by putting resources into AMI vows to alleviate various strains put on the matrix because of developing interest for water assets and electric gas. Specifically, for India’s network framework AMI will have focus three points:

Framework Reliability: -AMI innovation develops the appropriation and in general dependability of power by empowering power merchants to recognize and naturally react to electric interest, which thus limits blackouts. [11]

Energy Costs: -Increased dependability and usefulness and diminished blackouts and smoothed out charging activities will drastically reduce expenses related with giving and keeping up the matrix, along these lines essentially bringing down power rates.

Power Theft: - In India common type of issue will be power theft. To increase system straightforwardness AMI frameworks that track energy use will help screen power practically in active time. [12]

VI.COSTS ASSOCIATED WITH AMI

Three different types of sources occurred in AMI and its cost associated: -

1. Source device at operator points.
2. Installations.
3. Communication grid.
4. Facts gathering, investigation, storage and system management.

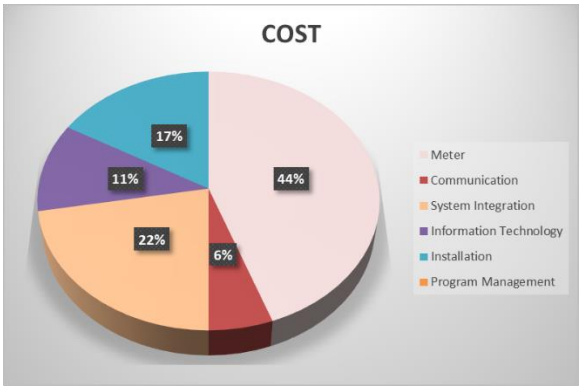


Fig3:Smart meter and its installation from the majority of cost in AMI implementation.[3]

Cost Estimation

S.NO.	ITEM	Unit cost (INR)	Quantity
1	Capital expense per meter	1350	1.5 million
2	Correspondence element	1500	1.5Million
3	DCU	55000	55000
4	Meter Box and Installation Charge	1500	1.5 million
5	DCU and COMMS Installation, Testing and Commissioning Charge	5000	5000
6	Computer hardware and software and networking equipment	50000000	Lump sum
7	Head End and Operating System Software and MDMS	40000000	Lump sum
8]	System Integration	55000000	Lump sum
9	Misc.	15000000	Lump sum

VI.CONCLUSION

Advanced Metering Infrastructure permits the administrators and service organizations to have the data on the situation with their organization for arranging and execution streamlining purposes. It likewise offers higher force quality and solidness.

Advanced Metering Infrastructure is a moderately innovative idea which needs improvement in the space of correspondence, information investigation and control plans. Notwithstanding, considering the worldwide energy market's circumstance and ecological worries that make administrations, organizations and customers to fuel AMI examination and use, the possibility of AMI looks encouraging.

REFRENCES

[1] Craig Glazer, "Smart Grid Regulatory Challenges and Opportunities," PJM

[2] U.S. Aid, "The Smart Grid Vision for India's Power Sector," (March 2010).

[3] United States Department of Energy, "Grid 2030: A National Vision for Electricity's Second

[4] United States Department of Energy, http://energy.gov/oe/technology-development/smart-grid

[5] Edison Electric Institute., "Smart Meters and Smart Meter Systems: A Metering Industry Perspective An EEI-AEIC-UTC White Paper ", Accessed on: 25 Sep 2015, Online, Available: http://www.eei.org/issuesandpolicy/grid-enhancements/documents/smartmeters.pdf.

[6] Edison Electric Institute., "Smart Meters and Smart Meter Systems: A Metering Industry Perspective An EEI-AEIC-UTC White Paper ", Accessed on: 25 Sep 2015, Online, Available: http://www.eei.org/issuesandpolicy/grid-enhancements/documents/smartmeters.pdf.

[7] International Energy Agency, Energy Technology Perspectives 2010. OECD Publishing, 2009.Availible: http://dx.doi.org/10.1787/ energy _tech-2010-en.

[8] The Advanced Security Acceleration Project (ASAP-SG), "Security profile for advanced metering infrastructure," AMI-SEC Task Force (UCAIug), Knoxville 2012, Online, Available: http://osgug.ucaiug.org/utilisec/amisec/Shared Documents/AMI Security Profile (ASAP-SG)/AMI Security Profile - v2_1.pdf, Accessed on: 28 Dec 2015.

[9] S. Justin, G. Rasche, A. Wright, and S. Dinnage, "NESCOR Guide to Penetration Testing for Electric Utilities," National Electric Sector Cybersecurity Organization Resource (NESCOR) 2013, Online Available: http://smart grid.epri.

com/doc/NESCORGuidetoPenetrationTestingfor ElectricUtilities-v3- Final.pdf.

[10] National Institute of Standards and Technology, Standards Identified for Inclusion in the Smart Grid Interoperability Standards Framework, Release 1.0, Sept. 2009, [Online], Available: http://www.nist.gov/smartgrid/standards.html

[11] Palak P. Parikh, Mitalkumar, G. Kanabar, S. Sidhu "Opportunities and Challenges of Wireless Communication Technologies for Smart Grid Applications". V.S.K. Murthy Balijepalli, A. Khaparde, R.P. Gupta "Smart Grid Initiatives and Power Market in India". [Online]. Available: Bangalore Electricity Supply Company (BESCOM) http://www.bescom.org/, Nov. 2009.

[12] Momoh JA. Smart grid design for efficient and flexible power networks operation and control. In: Power Systems Conference and Exposition, PSCE '09. IEEE/PES; 2009. p. 1–8

[13] The History of Electrification: The Birth of our Power Grid, Edison Tech Center. <http://edisontechcenter.org/HistElectPowTrans. html> [accessed November, 2013].

[14] SAIC Smart Grid Team for The Energy Policy Initiatives Center. San Diego smart grid study final report. University of San Diego School of Law; 2006.

[15] National Energy Technology Laboratory for the U.S. Department of Energy. Advanced metering infrastructure, NETL modern grid strategy; 2008.

[16] Electric Power Research Institute (EPRI). Advanced metering infrastructure (AMI); 2007.

[17] Silicon Laboratories, Inc. Smart metering brings intelligence and connectivity to utilities, green energy and natural resource management. Rev.1.0. <http://www.silabs.com/Support%20 Documents/TechnicalDocs/Designing-Low-Power-Metering-Applications.pdf> [accessed August, 2013].

[18] Depuru SSSR, Wang L, Devabhaktuni V. Smart meters for power grid: challenges, issues, advantages and status. Renewable and sustainable energy reviews; 2011. p. 2736–42.

[19] US Department of Energy. Communications requirements of smart grid technologies; October 5, 2010.

[20] Agilent Technologies. Introducing LTE-Advanced; 2011 <http://cp.literature.agilent.com /litweb/pdf/5990-6706EN.pdf> [accessed May 2014].

[21] Navigant Research. LTE Networks for Smart Grid Applications; 2013