



# Study of Smart Grids , Vision, Mission and Road Map in India

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**Abstract :** The present electric grids use the technology of 1970's. But with the advancement in various concepts of power generation, problems associated with power outages and thefts, and also due to increase in demand, we

require a modernized grid to avail all the needs of customers even in the situations of hype, which can be called a "smart grid". The smart grid performs various functions such that it increases grid stability, reliability, efficiency and ultimately reduces line losses.

The Indian power system is the 4th largest in the world with an installed capacity of 235 GW and with the recent synchronization of the southern grid with rest of the regional grids, we perhaps have the largest synchronous grid in the world today. Largely dominated by government owned utilities, the private sector role is about 27% in generation, <1% in transmission and about 5% in distribution. The distribution sector continues to be riddled with very high T&D losses – about 26.5% nationally (>40% in many states!) and nearly 400 million plus people have no access to power. Large parts of the country experiences power cuts for several hours every day and consumers are forced to keep storage (invertors)/ standby generation facilities. Power quality being poor, consumers require voltage stabilizers, UPS, Inverters etc. Our power system doubled in the last decade, yet our percapita consumption of electricity is about one-fourth of world average. The estimated demand by 2032 is about 900 GW, which means the power system should need to almost quadruple the existing capacity in next 18-20 years. To manage a large grid of this size and growing at this pace require smarter systems.

Also the smart grids are designed to allow the two-way processing of electricity from consumers that have distributed generation. Various technologies like sensing and measurement, usage of advanced components are to be used for successful functioning of the grid. In this paper, smart grid, its functions, technologies used in smart grids are discussed.



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### **Indian Scenario :**

India considers the Smart Grid as integrating the electrical and information, communication technologies in the complete power system value chain enabling every point for generation and every point as controllable consumption (of consumers). Ministry of Power (MoP) decided to develop Smart Grid in India in stages by taking up pilot Smart Grid projects. MoP set up the India Smart Grid Task Force (ISGTF) and India Smart Grid Forum (ISGF) to help prepare a roadmap for smart grid rollout. In August, the MoP adopted the roadmap. 14 smart grid pilots are been approved for immediate execution. Pilots will be evaluated for techno commercial benefits, technology evaluation and then scaled out into full projects.

The following are various functionalities being opted as part of the smart grid pilots in India.

- AMI for Residential, Commercial and Industrial
- Peak Load Management
- Outage Management
- Power Quality
- Renewable Integration
- Micro Grids
- Distributed Generation

### **Smart Grid Implementation Challenges in India**

<sup>1</sup>India is pursuing one of world's largest grid connected renewable energy programs and integration of such intermittent renewable resources also requires smarter systems. The National Electric Mobility Mission with a target of 6 million EVs by 2020 was recently launched by the Ministry of Heavy Industries and successful rollout of EVs will require smarter systems.

Reduction of T&D losses continues to be top priority of both Government and utilities and smart grid technologies will increase visibility and control of power flows in real time heralding a transition to smart cities and a low carbon economy. The Power Industry calls for a complete switch into the next generation through automation. Despite monetary issues, power utilities need to begin with basic automation systems eventually upgrading to the advanced systems. By

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<sup>1</sup> <http://www.indiasmartgrid.org/>



analyzing the growing power demand and market competence, this is the only way-forward for the domestic power industry. The implementation of Smart Grid is not going to be an easy task as the Indian power sector poses a number of issues such as minimizing T&D losses, power theft, inadequate grid infrastructure, low metering efficiency and lack of awareness.

- **Power theft:** Power theft has been one of the major issues in India. A few ways to help prevent the power theft are the use of overhead lines that are insulated and the LT overhead wires used for distribution of power could be replaced with insulated cables in order to minimize the theft of energy through hooking. The conventional energy meters could be replaced with digital tamper proof meters and the use of prepaid card is yet another solution to eradicate theft of energy.
- **Inadequate Grid Infrastructure:** For India to continue along its path of aggressive economic growth, it needs to build a modern, intelligent grid. It is only with a reliable, financially secure Smart Grid that India can provide a stable environment for investments in electric infrastructure - a prerequisite to fixing the fundamental problems with the grid.
- **Low metering efficiency:** The commercial losses are mainly due to low metering efficiency, theft & pilferage. This may be eliminated by improving metering efficiency, proper energy accounting & auditing and improved billing & collection efficiency. Fixing of accountability of the personnel / feeder managers may help considerably in reduction of AT&C loss.
- **Lack of awareness:** The understanding of consumers on how power is delivered to their homes is very minimal. Before implementing Smart Grid concepts, they should be educated about the Smart Grids, the benefits of Smart Grid and Smart Grid's contribution to low carbon economy. Consumers should be made aware about their energy consumption pattern at home, office etc. Utilities need to focus on the overall capabilities of Smart Grids rather than mere implementation of smart meters. Policy makers and regulators must be very clear about the future prospects of Smart Grids.

### **Smart Grid Mission, Vision In India :**



<sup>2</sup>The Smart Grid Vision and Roadmap for India was approved by Ministry of Power in August 2013 and it was released by the Power Minister on 10th Sept 2013 in a conference of all state power ministers in Delhi.

The Smart Grid Vision for India is to „Transform the Indian power sector into a secure, adaptive, sustainable and digitally enabled ecosystem that provides reliable and quality energy for all with active participation of stakeholders“

A National Smart Grid Mission will be launched soon that will have the overall responsibility to bring all stakeholders for successful implementation of the policies and programs envisaged under this Roadmap.

<sup>3</sup>Some key highlights of the roadmap are as follows:

1. Appropriate policies and programs to provide access for electricity for all
  - Uninterrupted life line supply (8 hours/day minimum) by 2015
  - Electrification of 100% households by 2017
  - 24×7 quality supply on demand to all citizens by 2027
2. Availability of an indigenous low cost smart meter by 2014
3. AMI roll out for all customers in a phased manner based on size of connection (and geography and utility business case)
  - Starting with consumers with load >20 KW by 2017, 3-phase connections by 2022 and all consumers by 2027
  - Development of innovative and sustainable financing/business models for smart meter roll outs
4. Development of state/utility specific strategic roadmap(s) by 2014 for Smart Grid deployments, Required business process reengineering, change management and capacity building programs to be initiated by 2014
5. Policies supporting improved tariffs such as dynamic tariffs, variable tariffs, etc. including mandatory demand response programs
6. Policies created by 2014 for implementing energy efficiency in public infrastructure and EV charging facilities starting by 2015 and Demand Response ready appliances by 2017

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<sup>2</sup> <http://www.desismartgrid.com/2014/03/indias-outlook-smart-grids/>

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7. Enabling programs and projects in distribution utilities to reduce AT&C losses , Below 15% by 2017, below 12% by 2022, and below 10% by 2027
8. Enabling programs and projects in transmission utilities to reduce transmission losses to below 3.5% by 2017 and below 2.5% by 2022
9. Conversion of existing EHV sub stations in all urban areas to Gas Insulated Substations (GIS) in a phased manner through innovative financing models
10. Mandated roof top solar for large establishments with connected load >20kW
11. Microgrids in 1000 villages/industrial parks/commercial hubs by 2017 and 10,000 villages/industrial parks/commercial hubs by 2022 – microgrids could island from main grid during peak hours if needed
12. Finalization of frameworks for cyber security assessment, audit and certification of utilities by 2013
13. Development of 1st set of Indian Smart Grid Standards by 2014, Active involvement of Indian experts in international SG development bodies
14. Tariff mechanisms, new energy products, energy options and programs to encourage participation of customers in the energy markets that make them “prosumers” – producers and consumers – by 2017

**Conclusion :** <sup>4</sup>Thus, smart grids are more a process than a product and the roadmap is the guiding document that gives a clear direction to state governments, regulators, utilities and industry. The 14 pilot projects are expected to set the ball rolling in order for India to leapfrog towards a smarter grid. The states utilities and regulators would now have to take up a more proactive role in bringing out state specific smart grid roadmaps and making the vision of power for all a reality! It is also proposed to launch a National Smart Grid Mission (NSGM).

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