

PRESENT SMART GRID TECHNOLOGIES AND CHALLENGES DURING RECONSTRUCTION OF POWER SYSTEM

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ABSTRACT: India is fierce to meet the fast economy by meeting the electric power demands. The power System engineers are facing the several challenges while reconstructing the power system industry. By introducing the smart grids in various levels in the Indian power systems has suggested that advanced automation mechanisms need to be adapted. Smart grid technologies Proposes lists of advantages by considering a more efficiently operated electricity system and reduced operational costs. However the main focus of this report is that smart grid technologies enables the high level of renewable energy to be used in an electrical system. By introducing the smart grids in the grid operations we can make it smarter and efficient. This work presents the smart grid technology visions in India and present and future challenges, and also this report reflects the issues logged for development of the smart grid technology for the future necessary demands in India.

INTRODUCTION

A smart grid is a developed grid system that maintains the electricity demand in an upheld, reliable and in an economic manner and also these is the electric supply networks uses the digital communication systems to react and detect to local variations in usage.

The economic condition of the society, development of the nation, environment condition and green house effects by excess of carbon dioxide is largely depends on the "Global energy deficiency". And the high cost of the fuel, bad whether condition and outdated network infrastructure has leads to inefficient and unstable electric system.so that the Global concern has taken some steps to control the things that affects the electric system.

- Replacing the fossil fuels by RES (Renewable energy sources.).
- By keeping the global temperature as far below 2 degree Celsius as possible, so that we can reduce the Greenhouse gas emission.
- Keeping global warming at minimum levels.
- Replacing the nuclear energy by RES to prevent the worlds excessive hazardous.
- Introducing the Micro grid and hybrid grids are cost effective and efficient.

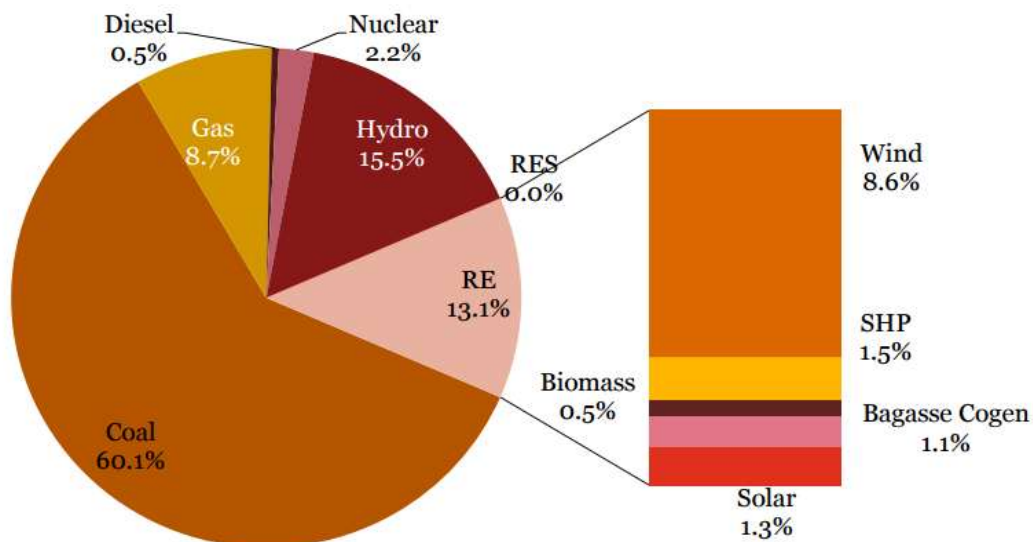
RENEWABLE ENERGY SOURCE IN INDIA

"The renewable energy sources are the resources which are replaced by naturally and can be used again". Some examples for renewable energy resources are wind energy, water energy, solar energy and biomass energy etc. in above all wind energy is the highest power generation source in India.

In India the current contribution of RES is about 77GW from the installed capacity of 271.722GW as per the survey of March2015. India has the fifth largest power generation capacity in the world with the power generation capacity of 271.722GW.the government of India has targets to achieve the total renewable capacity almost 175GW by the end of 2022. This includes 10GW from biomass, 100GW from solar energy, and 60GW from wind energy and 5GW from small hydro powers.

PRESENT POWER SCENERIO OF INDIA

Total installed capacity of 271.722GW and RE capacity of 77GW as per the survey of March 2015.



INDIAN POWER GRID MARKETING AND REFORMS

To increase the efficiency of power generation and transmission and distribution is the major challenge for India's power sector. It is recorded that nearly 30% of the loss occur in transmission and distribution of the energy, this is due to theft and leakages. This problem leads to increasing the demand of the electric power supply in a growing economy over that 12% shortage in the peak hours and 10% shortage in a day. By adopting the significant transmission and distribution technology will give the more availability of the precious power.

According to the survey of industries sources world will spend US\$378 billion in smart grid technologies by 2030, in that India is the third largest smart grid investment market and it is going to invest to install 130 million smart grids by 2021.

In this modern world the growth of the nation is mainly depends on the availability of electric energy. Countries individually and collectively have taken many steps to develop and utilize the energy. In India also has taken many important steps to develop and utilizes the electric energy.

Some of the significant achievements of the POWER GRID in India

- In 1980, the government of India received the report from the Rajadhyaksha committee on power sector reforms by suggesting that extensive reforms are needed in Indian power sector. In 1981 Indian government has taken major step by forming a National power grid, which helps for the integrated operation of central and regional transmission system.
- In 1991, the transmission assets of nuclear power Corporation limited were transferred to POWERGRID.
- In 1994, the government of India entrusted POWERGRID and it undertaken the responsibility of controlling the power grid.
- In 1998 Power grid was noticed as a Mini Ratna company by government of India. And in 2008 it was noticed as a Navratna company.
- In 2009 POWERGRID established National Load Despatch Centre (NLDC) at New Delhi.
- In 2012, POWERGRID adopted the vision and its new mission and In 2013 POWERGRID issued its Maiden Foreign Currency Bond of US\$ 500 million.
- In 2014, POWERGRID celebrated silver jubilee by completing 25 years. And in 2015 National Transmission Asset Management Centre (NTAMC), developed with State of the Art Technology was dedicated to the nation.

SMARTGRID TECHNOLOGY

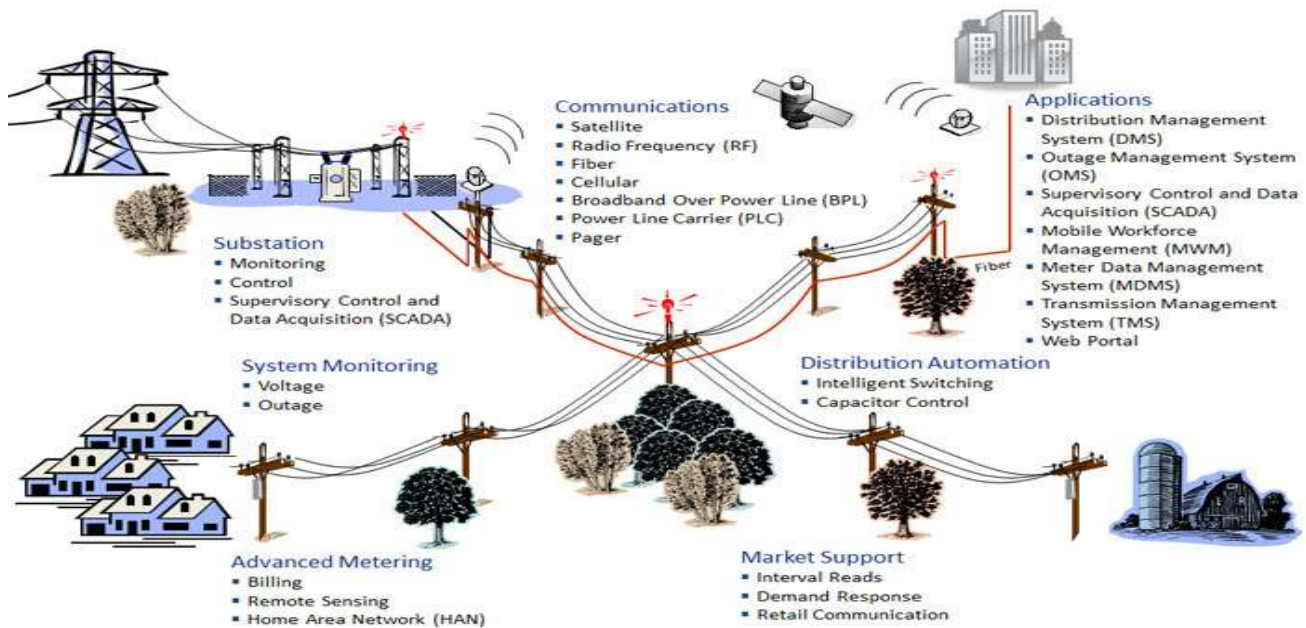
A smart grid is an electrical grid which comprises of different functional and energy measures including smart meters, smart appliances, renewable energy resources, and energy efficiency resources.

$$\text{Smart Grid} = \text{IT} + \text{Electric Grid}$$

“Smart grid” is a group of technologies that people are using to bring utility electricity delivery systems into the 21st century, with the use of computer-based remote control and automation. These systems include two way digital communications technologies and computer processing that has been used for decades in other industries. They are beginning to be used on

electricity networks, from the power plants and wind farms all the way to the consumers of electricity in homes and businesses. They offer many benefits to utilities and consumers -- mostly seen in big improvements in energy efficiency and reliability on the electricity grid and in energy users' homes and offices.

VISION:



India is struggling to meet its electricity demands, both in terms of Energy and Peak Load. Smart Grids can help better manage the shortage of power and optimize the power grid status in the country. Demand Side Management (DSM) is an essential tool for effective and optimized use of electricity, particularly in the developing countries like India where the demand is in excess of the available generation.

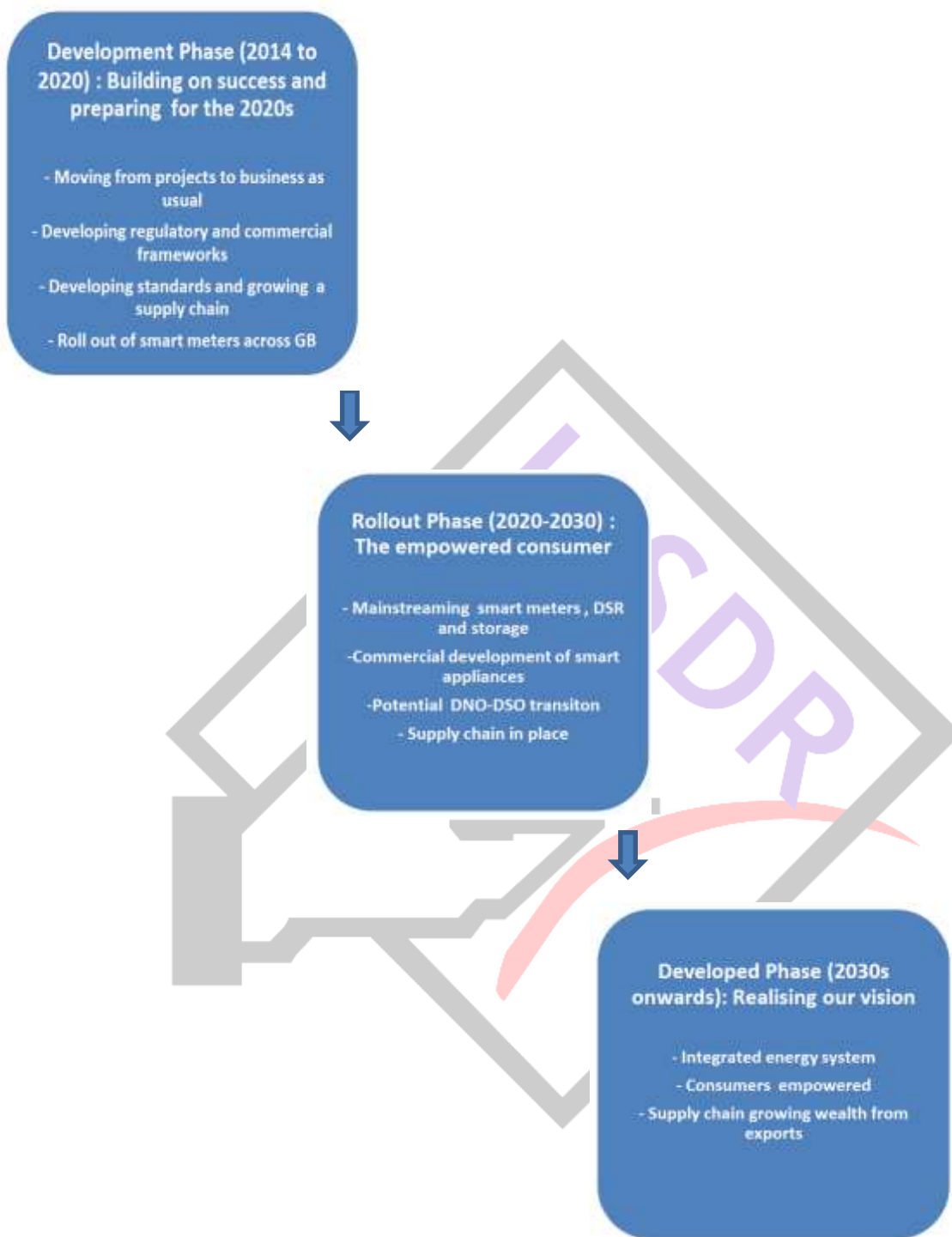
The non-technical losses can be overcome by electricity grid intelligence, which focuses on advanced control and communication protocols integrated with the utility providing a complete package for the requirement of "Smart Grid". India as a developing country, the scenario of the power system changes in exponential basis. Moreover the system is expected to be more reliable and flexible with its advancement in data communication and data analysis facility. The following figure illustrates about the advancement and its immediate results during its implementation in future. The conclusive approach for the Indian Smart Grid would be visualized.

CHALLENGES:

The implementation of Smart grid is not going to be an easy task in Indian sector as it has a number of issues as described:

- **Power theft:** Power theft being major issue of power loss 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. Replacing conventional energy meters with digital tamper proof meters and the use of prepaid card is yet another solution to overcome theft of energy.
- **Poor 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 Consumer awareness:** Consumers are having minimum knowledge of how electricity is being transmitted to their house. 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.



Grid connection planning

For the connection of grid, the relevant electro technical parameters for every turbine are first determined. Then the particular grid operator is contacted. Followed by the technical and financial analysis of various grid connection alternatives. In order to ensure smooth interaction between wind farm, wind farm operator and grid operator, the communications technology is also planned.

CONCLUSIONS

After usage of savvy network Indian power system will have keen components like load control, expense of preventive upkeep is lower than expense of repair, cooperation of consumer, green power, control top request by accessibility based duties, automation to decrease labor costs, monitoring of administration solicitation status by consumer, distributed computing, Web Based Information, also, GIS mapping of benefits. Adaptability of matrix can be enhanced. Also efficiency, reliability and wellbeing of existing power matrix can be enhanced by including Java Embedded systems, Java Virtual Machine, GPS, and Smart Phone (mobile registering) into it. Smart framework advantages not just end client yet utility as well. After usage of shrewd network pilot ventures under R-APDRP plan Indian force systems future is definitely bright.

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