

Role of Smart Grids in the Indian Power Sector: Current Developments & Challenges



Power Situation in India

Installed Capacity of 248.5 GW as on 31st May 2014

Potential Demand by 2032 is estimated to be as high as 900 GW

Indian Power Sector is 4th largest in the world, but per-capita consumption of electricity in India is only about 1/4th of World Average.

As on May 2014 there is a deficit of 4.1 % in Power Availability against demand and 4.9 % shortfall in peak demand in the month of May 2014

High AT&C losses, traditional Outage Management & lower revenue réalisation leads to Under Investment in distribution sector and unreliable supply.

Share of Renewable Energy excluding Hydro is currently 12.75 %

Dependence on Electricity

Rapid Urbanization

31% of population in 2011;
40% of population by 2030

Higher Industrial growth

Residential consumption
growing at 14% over next
10 years

Realization of demand
suppressed due to load
shedding



India's Energy Sector Realities and Emerging Needs

National Priorities	Current Situation	Implications
Meeting Demand Shortage	<ul style="list-style-type: none"> • Chronic power shortages • Rapid demand growth • Inadequate energy access 	<ul style="list-style-type: none"> • Augmentation of generation capacity; efficiency improvement • Power evacuation and grid access
Clean Energy Deployment	<ul style="list-style-type: none"> • Renewable Energy capacity increasing ~ 3000+ MW added each year 	<ul style="list-style-type: none"> • Require smarter systems for power balancing to deal with variability & unpredictability
Operational Efficiency Improvement	<ul style="list-style-type: none"> • Poor operational efficiency • High system losses • R-APDRP has provided much needed support 	<ul style="list-style-type: none"> • Need for ability to control and monitor power flow till customer level
Enhancing Consumer Service Standards	<ul style="list-style-type: none"> • Poor system visibility • Lack of reliability 	<ul style="list-style-type: none"> • Real time system to enable better system visibility and consumer participation

Smart Grids can transform the existing grid into a more efficient, reliable, safe and enable address sector challenges.

Brief About R-APDRP

(Restructured Accelerated Power Development & Reforms Programme)

The R-APDRP is a Government of India initiative being executed by utilities. In one integrated project, Distribution Utilities in India are building IT Infrastructure, IT Applications and Automation Systems. R-APDRP is distributed in 3 Parts.

Scope Under Part A: Consumer Indexing using GIS, Asset Mapping of entire Distribution Network using GIS, AMR for all DTs & Feeders, IT Application for Business Processes like Metering, Billing & Collection etc., Energy Accounting & Auditing and SCADA for large towns (> 400 K Population & > 350 MU consumption)

Scope Under Part B: Electrical Network Strengthening & Up-Gradation.

Under Part C: Smart Grid Pilots are Launched.

Highlights of Smart Grid Road Map for India

During 12 th Plan (2012-17)	During 13 th Plan (2017-22)	During 14 th Plan (2022-27)
Full Smart Grid roll out in 14 pilot cities	Smart Grid roll out in all urban areas	Smart Grid roll out nationwide
Infrastructure for AMI roll out for all consumers with load > 20 KW or as prioritised by Utilities	AMI roll out for customers with 3-phase connections	AMI roll out for all consumers
Development of Micro Grids in 1000 villages/industrial parks/commercial hubs	Development of Micro Grids in 10,000 villages/industrial parks/commercial hubs	Development of Micro Grids in 20,000 villages/industrial parks/commercial hubs
Policy for Roof Top Solar PV tariff – Net Metering		
Renewable Integration of 30 GW	Renewable Integration of 80 GW	Renewable Integration of 130 GW

MOP Approved SG Pilots (14 Nos.)



Photo credits: Sh. V S K Murthy Balijepalli, ppt on SG implementation framework in India

Smart Grid Functionalities In India For 14 Pilots as “Proof of Concept”

National Priorities

Smart Grid Interventions proposed by the Utilities

Power Demand Shortage	Demand Side Management	Demand Response	
	Peak Load Management	Crew Management	
Clean Energy	Renewable Energy Integration	Demand Response	
Operational Efficiency Improvement	Theft Management & Tamper Detection	Asset Monitoring	Meter Data Management System
	Substation Automation	AMI	
Consumer Service Standards	Power Quality	Work Force Management	Outage Management
	Automatic Billing	Consumer portal	

Key Challenges/ Critical Areas

- Development of Standards & Regulations

For Smart Meters, work is already underway, under the Bureau of Indian Standards (BIS). Further, under the BIS sectional committee and various working groups, standards for AMI, cyber security and interoperability are being developed.

Central Electricity Authority (CEA) notified “Technical Standards for Connectivity of Distributed Generation resources in September, 2013” and CEA (Installation and Operation of Meters) Regulations 2006 are being amended to include generation from renewable energy sources.

- Communication Solutions

Multiple communication options like GPRS/CDMA, Zigbee, RF/Mesh, PLC etc. are available for last mile connectivity. However, they are yet to be tested in the 14 Smart Grid pilots.

Key Challenges/ Critical Areas

- Revision of Tariff Structure

With the integration of small-scale consumer owned renewable energy sources to the Grid wherein the consumer takes electricity from the Grid but can also act as a generator and supply electricity to the Grid, appropriate tariff revisions need to be carried out by the State Electricity Regulatory Commissions (SERCs). Some of the states like Tamil Nadu, Andhra Pradesh & Uttarakhand have already gone forward and announced solar rooftop/net-metering policies. Going forward, net-metering/feed-in-tariff (FiT) would have to be factored into the tariff revisions by various SERCs.

- Consumer Awareness

Appropriate/varying price signals can be used by utilities to help manage demand, but consumers will need to be made more aware in order to understand and be motivated to take part in utility Demand Side Management (DSM) programmes

Development potential & issues across various application areas

Application Area (Current Status)	Business Issues	Potential/Importance of Smart Grids
<p>Distribution</p> <ul style="list-style-type: none"> • Inefficient • Huge Theft • Poor customer service & reliability 	<ul style="list-style-type: none"> • Lack of measurements and controls • Antiquated technologies • Poor business orientation 	<ul style="list-style-type: none"> • High (can bring rapid technological upgradation) • Supports loss reduction and demand response
<p>Industrial Energy Efficiency</p> <ul style="list-style-type: none"> • Improving rapidly • Signalled by environmental market 	<ul style="list-style-type: none"> • Lack of awareness 	<ul style="list-style-type: none"> • High (Smart Grid enables better load management through Demand Side Management (DSM) and Demand Response (DR))

Development potential & issues across various application areas

Application Area (Current Status)	Business Issues	Potential/Importance of Smart Grids
<p>Renewable Energy</p> <ul style="list-style-type: none"> • Fast developing • Fills India's Energy void 	<ul style="list-style-type: none"> • Variability management & storage • Transmission networks and controls 	<ul style="list-style-type: none"> • Very High (Smart Grid can assist in grid integration, forecasting, balancing and storage)
<p>Energy Storage</p> <ul style="list-style-type: none"> • Nascent in India • Closely linked to Renewable Energy & Energy Efficiency 	<ul style="list-style-type: none"> • Expensive • Technological up gradation • Space requirements 	<ul style="list-style-type: none"> • High (Has applications in energy storage, enabling provision for balancing power & islanding during blackouts)

Brief About UHBVN

- North Haryana Power Distribution Company (UHBVN) is engaged in distribution and supply of electricity in 10 districts of Haryana (50 % of Geographical Area).
- Provides services to 2.5 million consumers with total connected load of 9577.12 MW (March 14)

Initiatives In Panipat, Haryana, India

The pilot will focus on addressing three key issues,

- 1) Reduction of aggregate technical and commercial (AT & C) losses,
- 2) Peak load management, and
- 3) Integration of renewable energy like wind and solar into the grid.

The pilot is expected to be completed within 24 months.

This project shall provide functionality of AMI, PLM, OMS with SCADA and Renewable Integration using Solar Roof Top.

Smart Grid In Haryana (UHBVN)

Benefits Envisaged:

- Reduced AT&C Losses
- Reduced Peak Load Consumption
- Reduced Cost of Billing

Location:

- Panipat City Subdivision, 90 KM North of New Delhi

Project Area Summary:

- Project Area : Panipat, covering 3 feeders.
- Functionality Proposed:
 - Advanced Metering Infrastructure (AMI)
 - Peak Load Management (PLM)
 - Outage Management System with SCADA (OMS)
 - Renewable integration through net metering

Project Area/Feeder Overview

11 KV Feeder Name	Remarks
Conduit	This feeder has Theft Prone areas and maximum number of theft cases have been identified here along with cases of unauthorized extension of load. The feeder also has HT connections.
Tehsil Camp	This feeder also has Theft prone areas, has connections of hotels and Shopping Mall (HT) and has space available on the roof top installation in Sub Station Building
City 1	Has Approx. 200 Domestic Supply connections having load around 10 KW or the area of local market.

Thanks
Any Queries ?