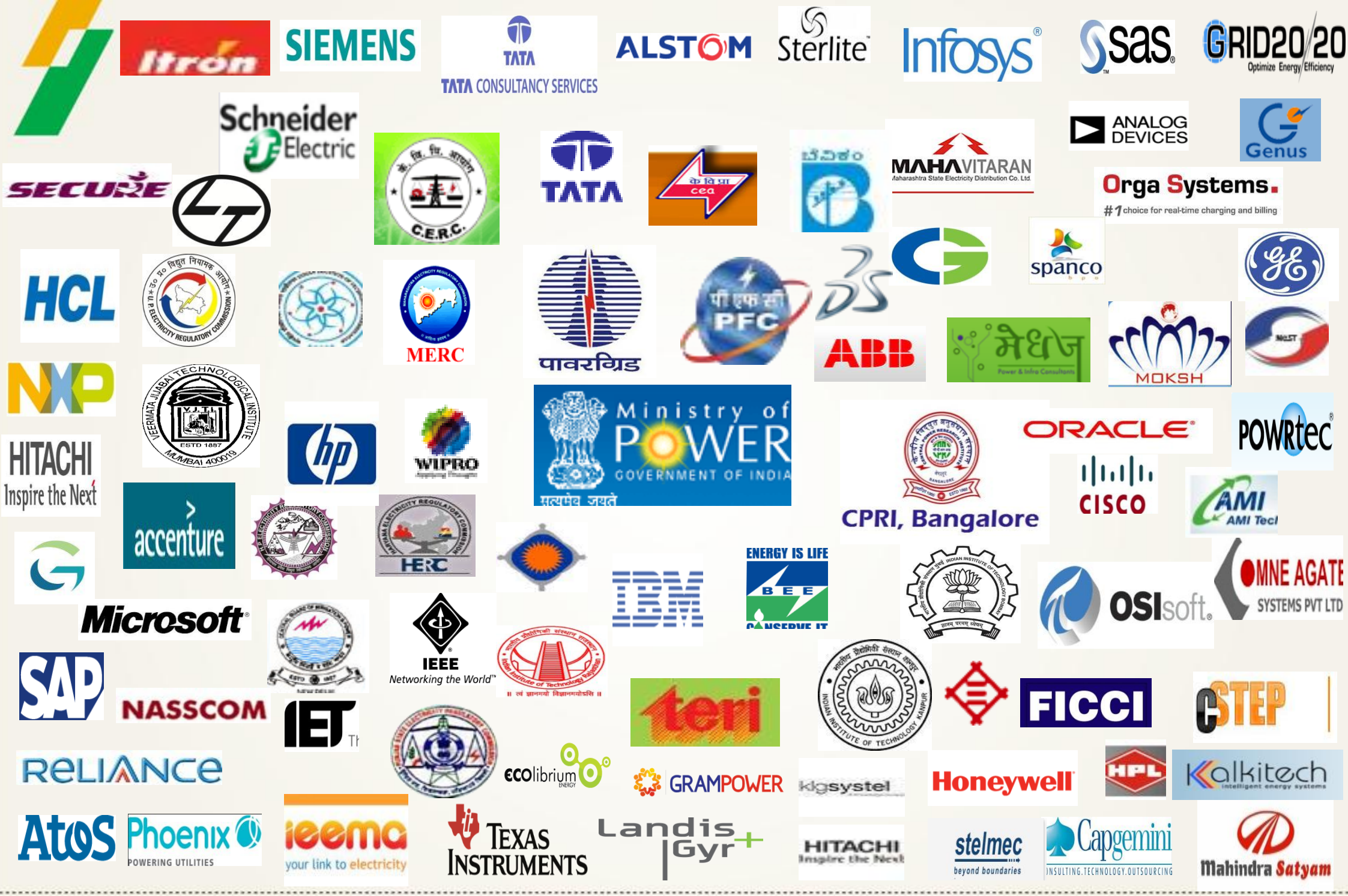
India Smart Grid Forum

ISGF Presentation at the Eilat Eliot
28th November 2012



Note: This list of logos of ISGF Members is partial and indicative only

Brief on Indian Power Sector

- **Indian power system is the 4th largest in the world – installed capacity: 210GW. Almost doubled in last 10 yrs; and will continue to grow at 8-10%/year for several decades – both capacity and consumers; >500k villages electrified, around 70k villages remaining**
- **Largely dominated by government owned utilities (central and states – 29 states and 7 union territories) – most of them have own generation, transmission and distribution utilities**
- **Central Electricity Regulatory Commission (CERC) and State Regulatory Commissions (SERCs) in most states – some small states few have gone for Joint SERCs.**
- **Transmission Grid in India is one of the largest in the world:**
  - *765kV/400kV lines: ~1,03,000 ckms; 220kV lines: ~132,000 ckms*
  - *HVDC Bipole (±500kV): 7,500 ckms – 3 nos; HVDC Back-to-back: 7 nos (3000MW)*
  - *Now building 1200 kV AC and 800kV HVDC networks*
  - *Most modern control centers – 5 regional control centers , 1 national control center, 1 back-up national control center*
- **Distribution sector:**
  - *Very high T&D losses – about 30% (>50% in several states!)*
  - *400 million+ people have no access to power*
  - *Large parts of the country experiences power cuts for several hours every day – customers keep storage (invertors)/ auto generation facilities*
  - *Power quality being poor, consumers require voltage stabilizers, UPS etc*

Brief on R-APDRP (Restructured – Accelerated Power Development and Reforms Program)

The on-going R-APDRP is one of the largest IT initiatives by utilities anywhere in the world - in one integrated project, Distribution Utilities in India are building IT Infrastructure, IT Applications and Automation Systems

Scope under Part-A:

- Consumer Indexing using GIS
- Asset Mapping (entire distribution network – HT and LT lines, transformers, poles, meters) using GIS
- Automatic Meter Reading for all Distribution Transformers and Feeders
- IT applications for, meter reading, billing & collection, MIS, IT enabled consumer service centers ; Energy Accounting & Auditing
- SCADA / DMS system (only in the project area having population > 400k population and annual input energy >350 million kWh (MU)

Under Part-B of the program utilities are undertaking electrical network strengthening and up-gradation.

And under **Part-C** of the program **14 Smart Grid pilots** are being launched

Smart Grids for India –Stakeholder Expectations

Customers:

- Expand access to electricity – "Power for All"
- Improve reliability of supply to all customers – no power cuts, no more DG sets and inverters!
- Improve quality of supply – no more voltage stabilizers!
- User friendly and transparent interface with utilities

Utilities:

- Reduction of T&D losses in all utilities to 15% or below
- Peak load management – multiple options
- Reduction in power purchase cost
- Better asset management
- Increased grid visibility
- Self healing grid
- Renewable integration

Government & Regulators:

- Satisfied customers
- Financially sound utilities
- Tariff neutral system upgrade and modernization
- Reduction in emission intensity

A Smart Grid Roadmap prepared by ISGF is currently under discussion with various stakeholders

India Smart Grid Forum & Task Force

- ***India Smart Grid Forum (ISGF)*** is a public-private partnership initiative of the Ministry of Power (MoP), Government of India for accelerated development and deployment of smart grid technologies in the Indian power sector

- ISGF was launched along with ***India Smart Grid Task Force (ISGTF)***, an inter-ministerial government task force chaired by Mr.Sam Pitroda, Advisor to the Prime Minister of India

ISGF – Objectives

- Voluntary public-private consortium of Govt agencies, utilities, technology and service providers, regulators, research & academia and other stake holders
  - Ministry of Power, Govt. of India is the Patron, and retains Chairmanship
  - Registered as a Society under the Indian Societies Act as a not-for profit organization
  - Enrolled members and conducted elections to choose the management team n Oct 2011
  - As of 31st October2012 ISGF has 105 members (several requests pending)
- Prime objective is to accelerate development of Smart Grid technologies in the Indian Power Sector
  - ISGF recommendations will be advisory in nature
- ISGF will seek the best practices in the world and help develop a roadmap for development of Smart Grid solutions for Indian needs and conditions

ISGF - Structure

Funding of ISGF will be from membership fees

- Seed funding of the ISGF by Ministry of Power (~USD 100K)

Governance of ISGF will be overseen by a Board of Governors (BoG)

Category of Members:

- **Founding Members**: MoP, PFC, CEA, CERC, CPRI, BEE – enjoy voting rights
- **Regular Members**: enjoy voting rights, representation in all Working Groups (WGs)
  - **Utilities**: Rs 10 Lakhs life time fee OR Rs 3 Lakhs Joining Fee + Annual Fee ; 50% discount for utilities from special category states – NE, Sikhim, Uttarakhand, HP, J&K and UTs
  - **Industry:** Rs 5 lakhs Joining Fee + Annual Fee
- **Associate Members**: Non-Profit/Educational & Research entities – no fee; no voting rights; by invitation for a period of 2 years; representation in all WGs
- **Limited Members**: Rs 1.5 lakhs/Year - for smaller entities with revenues under INR 5 crore; no voting rights; representation in all WGs
- **Individual Members:** Rs 50,000/Year – for eminent persons by invitation; enjoy voting right and representation in all WGs
- **International Members:** Entities having no presence in India; more as Observers; USD 11000/year. No voting rights

ISGF – Office Bearers

Office Bearers:

1. Chairman: Sanjeev Kumar, Director-Distribution, Ministry of Power
2. President & CEO: Reji Kumar Pillai
3. Secretary & Convenor: elected person resigned recently; Board appointed Rupendra Bhatnagar as interim Secretary till next elections
4. Treasurer: V.K.Shah, Executive Director, Power Finance Corporation

Board of Governors:

a) Industry (4 seats)

1. Deven Patel, Tata Consultancy Services
2. Rupendra Bhatnagar, SAP India
3. Vikram Manchanda, Microsoft India
4. Sunil Singhvi, Secure Meters

B. Utilities (2 seats)

1. U.S.Mane, Maharashtra State Electricity Distribution Company Ltd
2. To be elected

C. Research/Academia (1 seat)

1. Prof.S.A.Khaparde, IIT-B

Term is 2 years (from November 2011)

ISGF Working Groups - Chairpersons

WG1: Advanced Transmission	• Shekhar Kelapure, GE Energy
WG2: Advanced Distribution	• Ram Pillai, Tata Power
WG3: Communications	• Ajoy Rajani, Reliance Infra
WG4: Metering	• V. Arunachalam, CPRI
WG5: Load Control	• Vikram Gandotra, Siemens
WG6: Regulatory & Policy	• Pankaj Batra, CERC
WG7: Architecture & Design	• Deepak Konnur, IBM
WG8: Pilots and Business Models	• Raghu Cavale, Infosys
WG9: Renewables and Microgrids	• Prakash Nayak, IET
WG10: Cyber Security	• Abraham Samson, L&T

National Smart Grid Mission (NSGM)
(Draft under discussion)

"Quality Power on Demand for All by 2027"

Smart Grid Vision for India

Transform the Indian power sector into a secure, adaptive, sustainable and digitally enabled ecosystem by 2027 that provides reliable and quality energy for all with active participation of stakeholders

National Smart Grid Mission (NSGM)

Objectives:

In order to achieve this vision, stakeholders will undertake:

- **Smart Customer:**
  1. Appropriate policies and programmes to provide access for electricity for all with life line supply (to be defined) by 2015, electrification of 100% households by 2020 and 24x7 quality supply on demand to all citizens by 2027
  2. Smart meter roll out for all customers by 2022
  3. Tariff mechanisms, new energy products, energy options and programmes to encourage participation of customers in the energy markets that make them “prosumers”
  4. Formulation of effective customer outreach and communication programmes for active involvement of consumers in the smart grid implementation

National Smart Grid Mission (NSGM)

- **Smart Utilities:**
  1. Enabling programmes and projects in distribution utilities to reduce AT&C losses to below 15% by 2017, below 12% by 2022, and below 10% by 2027; and in transmission utilities to reduce transmission losses to below 3% by 2017 and below 2% by 2022
  2. Development of reliable, secure and resilient grid supported by a strong communication infrastructure that enables greater visibility and control of efficient power flow between all sources of production and consumption by 2027
  3. Development of utility specific strategic roadmap for implementation of smart grid technologies across the utility by 2013. Required business process reengineering, change management and capacity building programmes to be initiated by 2014
  4. Integrated technology trials through a set of smart grid pilot projects by 2015; and rollout of smart grids in all urban areas (to be defined) by 2020 and nationwide by 2027
  5. Create an effective information exchange platform that can be shared by all market participants, including prosumers, in real time which will lead to the development of energy markets

National Smart Grid Mission (NSGM)

- **Smart Generation & Transmission:**
  1. Optimally balancing different sources of generation through efficient scheduling and dispatch of distributed energy resources (including captive plants in the near term) with the goal of long term energy sustainability
  2. Implement power system enhancements to facilitate integration of 30 GW renewable capacity by 2017, 70 GW by 2022, and 120 GW by 2027 *< being reviewed in consultation with MNRE and MoP>*
  3. Development of Microgrids, storage options, virtual power plants (VPP), vehicle to grid (V2G), solar to grid (PV2G), and building to grid (B2G) technologies in order to manage peak demand, optimal use of installed capacity and reduce load shedding and black-outs

National Smart Grid Mission (NSGM)

- **Smart Policies:**
  1. Formulation of policies and programmes by 2013, for mandatory demand response (DR) infrastructure for all customers with load above 1 MW by 2013, above 500 kW by 2015, above 100 kW by 2017 and above 20 kW by 2020
  2. Policies for grid-interconnection of captive/consumer generation facilities (including renewables) where ever technically feasible; policies for roof-top solar; and policies for peaking power stations
  3. Policies for DR ready appliances and public infrastructure including EV charging facilities by 2014
  4. Investment in research and development, training and capacity building programmes for creation of adequate resource pools for developing and implementing smart grid technologies in India as well as export of smart grid know-how, products and services
  5. Development of appropriate standards for smart grid development in India; and active involvement of Indian experts in international bodies engaged in smart grid standards development

NSGM Roadmap - Targets

12th Plan (2012 – 2017)	13th Plan (2017 – 2022)	14th Plan (2022 – 2027)
1. Access to "Electricity for All" 2. Reduction of transmission losses (>66 kV) to below 3% 3. Reduction of AT&C losses in all Distribution Utilities to below 15% 4. Reduction in Power Cuts; Life line supply to all by 2015; grid connection of all consumer end generation facilities where feasible 5. Renewable integration of 30 GW; and EV trials 6. Improvement in Power Quality and Reliability 7. ToU (Time of Use) Tariff 8. Energy Efficiency Programs 9. Standards Development for Smart Grids including EVs 10. Strengthening of EHV System 11. Efficient Power Exchanges 12. Research & Development, Training & Capacity Building 13. Customer Outreach & Participation 14. Sustainability Initiatives 15. SG Pilots, SG roll out in major cities	1. Reduction of transmission losses (>66 kV) to below 2% 2. Reduction of AT&C losses to below 12% in all Utilities 3. Improvement in Power Quality 4. End of Power Cuts; Peaking power plants; Electrification of all households by 2020 5. Nationwide smart meter roll out 6. Renewable integration of 70 GW; 5% EV penetration 7. Standards Development for Smart Infrastructure (SEZ, Buildings, Roads/Bridges, Parking lots, Malls) and Smart Cities 8. UHV and EHV Strengthening 9. Research & Developments; Training & Capacity Building 10. Export of SG products, solutions and services to overseas 11. Customer Outreach & Participation 12. Sustainability Initiatives & Public Safety	1. Reduction of AT&C losses to below 10% in all Utilities 2. Financially viable utilities 3. Stable 24x7 power supply to all categories of consumers all across the country 4. Renewable integration of 120 GW; 10% EV penetration 5. Smart Cities and Smarter Infrastructures 6. Export of SG products, solutions and services to overseas 7. Research & Development ; Training & Capacity Building 8. Active Participation of "Prosumers" 9. Sustainability Initiatives & Public Safety

12th Five Year Plan: Programs and Estimates

Roadmap: 12th Five Year Plan (2012-17)

Targets/Goals	Solutions/Projects	Cost (Rs Cr)	Remarks
1. Access to "Electricity for All"	• Successful completion of RGGVY and ensuring its sustainability through innovative schemes	Not under NSGM	Covered under RGGVY
	• Microgrids – isolated and connected with main grids:		
	Rural Microgrids (<100 kW): 1000 no @Rs 2 Cr per installation average	-	(Rs 2000 Cr under RGGVY)
	Medium size Microgrids (500kW to 2 MW): 500 no (Extra Rs 5,000 Cr for Renewable generation) Benefit: Up to 2500 MW peak load shaving	5,000	Under NSGM
	Large Microgrids which include Distribution Management System (>5 MW): 100 no Benefit: Up to 10,000 MW peak load shaving	6,000	Under NSGM

Roadmap: 12th Five Year Plan (2012-17)

Targets/Goals	Solutions/Projects	Cost (Rs Cr)	Remarks
2. Reduction of transmission losses (>66 kV) to below 3%	• Reconductoring of old lines (this may also increase the capacity of the line)	-	To be funded under Transmission Development Schemes
	•Dynamic line ratings (optimal capacity utilization of transmission lines through real-time monitoring). Rs 100 Cr/year to be allocated in proportion to size of transmission system	500	Under NSGM
	•Wide Area Monitoring (PMU in all Substations >110 kV) - 3500 points including grid connected renewables: @ Rs 10 Lakhs/PMU WAM will also improve system reliability and security and could help ascend to Wide Area Control regime in future	350	Under NSGM

Roadmap: 12th Five Year Plan (2012-17)

Targets/ Goals	Solutions/Projects	Cost (Rs Cr)	Remarks
3. Reduction of AT&C losses in all Distribution Utilities to below 15%	Successful completion of R-ADPDRP (1401 towns); and its extension to smaller towns: Per 2011 Census there are 7935 towns of which 1401 have been covered under R-APDRP. Balance 6534 towns are to be covered under 12th and 13th Five Year Plans. 3250 have been proposed for 12th Plan		To be covered under R-APDRP Extension
	Condition Monitoring and Energy Auditing & Accounting in real time - each points of consumption (meter and a network assets) mapped to bulk supply point. This includes full DT Metering , IP Metering and pre-payment Smart meters for temporary connections: About a third of total DTs may be covered in 12th Plan: 1.5 million @ Rs 30,000/- (There were 4,615,025 DTs as on March 2010. It is assumed that there are >5 million DTs in operation in 2012; proposed addition of DTs in 12th plan is 850,000 of which 425000 are >100 kVA which may be installed along with monitoring mechanisms)	4,500	Under NSGM

Roadmap: 12th Five Year Plan (2012-17)

Targets/ Goals	Solutions/Projects	Cost (Rs Cr)	Remarks
3. Reduction of AT&C losses in all Distribution Utilities to below 15%	Network Planning Tools: 63 Discoms @ Rs 1 Cr/Discom	63	Under NSGM
	Integration of R-APDRP systems with ERP systems, in particular Finance and HR @ Rs 10 Cr/Discom	630	Under NSGM
	"Smart" DT control - for remote load control at DT level - load shedding, preventive DT health management. There are 5 lakh DTs rated > 630 kVA which require real-time monitoring and control system. 1.5 Lakh DTs may be covered in 12th Plan @ of Rs 2 lakh/DT	3,000	Under NSGM
	National Power MIS Centre at MoP : Aggregation of Power System Data (operational & asset) at national level for better planning and monitoring Benefits: Online data capture and Analytics from R-APDRP Systems from all Utilities	200	Under NSGM

Roadmap: 12th Five Year Plan (2012-17)

Targets/ Goals	Solutions/Projects	Cost (Rs Cr)	Remarks
4. Reduction in Power Cuts	Demand Response for peak load management in all Utilities - target: 5% of peak load. (5% x 120 GW x 300 hrs/year x 5 years x Rs 4500/MWH = Rs 4,050 Cr). Utilities likely to save more than double this amount	-	(Not under NSGM). Incentive to be given to participating consumers by utilities from savings
	AMI for all customers with loads >20 kW. 50% of total 4 million consumers may be covered 12th Plan (@ Rs 20,000) and balance by 2020.	4,000	Under NSGM. Being high net worth consumers the cost can be passed on to them
	SCADA/DMS for additional Towns: 572 (@ Rs 25 Cr/town). There are 642 Districts and 70 towns have been covered under R-APDRP; SCADA/DMS may be implemented in balance 572 District HQs	-	To be covered under R-APDRP Extension programme
	Systems for Grid Connectivity for Captive Plants: >500kW Peaking Power Plants – Feasibility and regulations for peaking plants	500	Lump sum provision
	Automatic reclosers (2000 no/year for 5 years @ Rs 7 lakhs for 11kV and 10 lakhs for 33kV)	-	To be covered under R-APDRP Extension programme

Roadmap: 12th Five Year Plan (2012-17)

Targets / Goals	Solutions/Projects	Cost (Rs Cr)	Remarks
5. Improvement in Power Quality and Reliability	Transmission Substation Automation: modernization of all 132(110)/33 kV, 66/11 kV and above (new breakers, numerical relays, bay controllers and transformer monitors; OR new GIS where ever feasible by unlocking the value of the land); and on-line condition monitoring of transmission assets and early warning systems	-	Rs 5,000 Cr. May be covered under Transmission Development Programmes (1000 substations @ 5 Cr/SS)
	Distribution Substation Automation: modernization of all 66(33)/11(22) kV S/Stns (new breakers, numerical relays, bay controllers and transformer monitors)	-	Rs 6,000 Cr. Under R-APDRP Extension Part-B (5000 substations @ 1.2 Cr/SS)
	Fiber connectivity for all substations 33kV and above – fiber network connecting 250K Panchayats to be leveraged	2000	Under NSGM. (connection from Panchayats to substations: Lump sum Rs 2000 Cr provisioned in first phase which could cover over 100,000 substations)
	Improvement in HT:LT ratio, Volt-Var Compensation systems and other KPIs	-	To be covered under R-APDRP Extension

Roadmap: 12th Five Year Plan (2012-17)

Targets/Goals	Solutions/Projects	Cost (Rs Cr)	Remarks
6. ToU (Time of Use) Tariff	Appropriate regulation for implementation of Dynamic ToU Tariff for all consumers	-	
7. Renewables Integration & Electric Vehicles	Development of systems for load forecasting and generation forecasting, storage option and other technologies. 2% EV penetration nation wide and 5% in urban areas by 2020. Rs 200 Cr/year for 5 years	1000	Under NSGM. To be distributed to Discoms and Transcos in proportion to % of renewables.
8. Energy Efficiency Programs	Mandatory building management system (BMS) for commercial buildings and industrial units with loads > 100 kW and its integration with utility DMS. Integration cost @ Rs 2 Cr x 63 Discoms	126	Cost of BMS to be borne by Building owners.
	Mandatory Energy Audit for all customers above 20 kW and benchmarking with industry best; mandatory LEDs for public lighting by 2015 and mandatory LEDs in urban areas by 2020	-	Cost to be borne by customers
9. Standards Development for Smart Grids	Standards for smart grid systems, smart appliances, public infrastructure, electric vehicles, etc. (Rs 1 Cr/Year)	5	Under NSGM

Roadmap: 12th Five Year Plan (2012-17)

Targets/Goals	Solutions/Projects	Cost (Rs Cr)	Remarks
10. Strengthening of EHV System	•Stable backbone of 765 kV system in operation •Enhancement of inter-regional power transfer capacity •Expansion of HVDC system •FACTS, SVC etc	-	Under Transmission Development Programmes
11. Efficient Power Exchanges	Remote Metering Systems for all feeders at transmission level enabling same-day settlement at power exchanges @ Rs 10 Cr/RLDC	50	Under NSGM
12. Training and Capacity building in Utilities and in the Industry to build, operate and maintain SG systems and applications	•Smart Grid focused courses in Engineering Colleges, Polytechnics and ITIs: One Engineering College (Rs 40 lakhs/year) in each Utility area (63 nos); and One Polytechnic/ITI (Rs 25 lakhs/year) under each Distribution Circle area (400 nos). Total: 626 Cr for 5 yrs •Training and Skill Development for Utility Personnel: in collaboration with CPRI, CBIP, NSDC and institutions from overseas. Cost: Rs 50 lakhs per Circle per Year = 0.5x400x5= 1000 Cr	1626	Under NSGM

Roadmap: 12th Five Year Plan (2012-17)

Targets/Goals	Solutions/Projects	Cost (Rs Cr)	Remarks
13. Customer Participation	•Consultation and involvement of customers in SG initiatives, outreach programmes , Customer portal •Customer participation in Grid Management through various programs (Microgrids, roof top PV, DR schemes etc)	126	Under NSGM @ Rs 2 Cr per Discom
14. Research & Development	•Fundamental and Applied Research, Technology Absorption and Diffusion; and Tecchnopreneurship •Power System Test Data be made available to all stake holders	50 -	Under NSGM @ Rs 10 Cr/year
15. Sustainability Initiatives	End of life processing facilities for SF6 and CFLs	10	Under NSGM
	Life-cycle analysis of electrical equipment		
	Promotion of CHP projects		

Roadmap: 12th Five Year Plan (2012-17)

Targets/Goals	Solutions/Projects	Cost (Rs Cr)	Remarks
17. SG Pilots	•First Phase of Pilots (14): 2012-2013	500	Under NSGM
	•Smart Grid Test Bed & Knowledge Center	150	
	•Low Cost Smart Meter – Specs finalization and testing: 2012-13	25	
	•Verification of technology trials in terms of scalability, sustainability and results vis-à-vis initial and formulation of specs for larger SG Projects by 2014	-	
	•Roll out of SG Projects in all Metros and State Capitals/Largest 100 Cities: Most components covered under different programs. Incremental cost @ Rs 10 Cr/City	1000	
18. Cost-Benefit Analysis	Societal impacts of Smart Grid and allied enhancements, Identification of benefits, generic model pan India	5	Under NSGM
Total for the 12th Five Year Plan (in Rupees Cr)		**31,416**	

Roadmap: 13th Five Year Plan (2017-22)

Targets/Goals	Solutions/Projects
1. Reduction of transmission losses (>66 kV) to below 2% 2. Reduction of AT&C losses to below 12% in all Utilities 3. Improvement in Power Quality 4. End of Power Cuts; Peaking power plants; Electrification of all households by 2020 5. Nationwide smart meter roll out 6. Renewable integration of 70 GW; 5% EV penetration 7. Standards Development for Smart Infrastructure (SEZ, Buildings, Roads/Bridges, Parking lots, Malls) and Smart Cities 8. UHV and EHV Strengthening 9. Research & Developments; Training & Capacity Building 10. Export of SG products, solutions and services to overseas 11. Customer Outreach & Participation 12. Sustainability Initiatives & Public Safety	1. a) R-ADPDRP Solutions to be rolled out utility-wide, b) transmission losses below 2% in all state Transcos through upgradation and modernization of lines and substations 2. a) Modernization of all substations 33 kV and above (GIS where ever feasible), b) improvements in HT:LT ratio, VVC and other KPIs, c) all power transformers (11 kV & above) and all DTs are monitored, d) SCADA/DMS for all towns with annual energy consumption > 50 MU (or >25 K population), e) Inter-connection of isolated micro-grids with National Grid where ever feasible 3. a) DR mandatory for all loads >20 kW, b) Substation Automation, c) AMI for all customers with loads >10 kW, d) Outage Management Systems and Mobile Crew Management Systems , e) Smart Meters for all connections >3 kW, f) Utility wide SG Roll outs in select utilities – metros, state capitals and large urban areas 4. Systems for load forecasting and generation forecasting integrated with weather forecasting 5. a) Standards and Infra for EV charging stations and intelligent systems to manage EVs on the grid, b) smart buildings (loads >100 kW) integration with DMS, c) Mandatory standards for appliances (DR readiness), d) inter-operability & cyber security, e) Real-time price signals and choice of tariff plans for select categories of customers 6. a) 1200kV systems in operation, b) Expansion of 765 kV and HVDC systems 7. R&D Efforts augmented, assets harvested, patents obtained 8. Export targets to be fixed based on the progress made in 12th Plan 9. Training & Capacity building efforts augmented 10. Consumer participation efforts augmented 11. Sustainability initiatives augmented 12. Safety drives augmented

Roadmap: 14th Five Year Plan (2022-27)

Targets/Goals	Solutions/Projects
1. Reduction of AT&C losses to below 10% in all Utilities 2. Financially viable utilities 3. Stable 24x7 power supply to all categories of consumers all across the country 4. Renewable integration of 120 GW; 10% EV penetration 5. Smart Cities and Smarter Infrastructures 6. Export of SG products, solutions and services to overseas 7. Research & Development ; Training & Capacity Building 8. Active Participation of "Prosumers" 9. Sustainability Initiatives & Public Safety	1. a) AT&C losses not more than 10% in any Distribution Utilities, b) Utility-wide SG roll-out in all major utilities, c) IT network & CRM systems of electric utilities being leveraged by other infra service providers where ever synergies exist 2. a) Mandatory DR for all loads > 10kW, b) All 33kV s/stns are GIS and automated, c) SCADA/DMS for all towns with annual energy consumption > 25 MU (or >10 K population), d) AMI for all customers with loads >5 kW, e) Smart meters for all connections all across the country, f) Real-time price signals and choice of tariff plans for all categories of customers, g) Robotics for live-line maintenance, h) Trials of super-conductivity (HTSS) 3. 33% or more renewables in the power system 4. a) Smarter Cities – Utility Corridors that can leverage common field infrastructure for automation and control of electricity, water, gas and district cooling/heating networks; common control and command centers, automated mobile crew systems etc, b) EV infrastructure leveraged as Virtual Power Plants (VPPs) to support peak loads and provide Ancillary Services 5. Global leadership in SG products and services 6. R&D Efforts augmented, more assets, more patents 7. Training & Capacity building efforts augmented 8. Consumer participation efforts augmented 9. Sustainability initiatives augmented 10. Safety drives augmented

Roadmap: Beyond 2027

Targets/Goals	Solutions/Projects
Smart Utilities managing other pieces of vital infrastructure sectors such as Water and Gas distribution, Surface Transport etc	Electrify almost all economic activities including transport and much of agricultural processes; and de-carbonize the power sector through dramatic increase in renewables and nuclear and carbon capture and storage technologies

Thank you for your kind attention!

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Summary of Smart Grid Initiatives Worldwide

Country	SG Drivers and Roadmap	Duration	Cost
US	SG Drivers are: Emission reduction, Demand response, Economic benefits, Grid security. US DoE's (GRIDTECH Team) new vision targets 80% renewables and 100% consumer participation by 2035. No national level roadmap. New York State Smart Grid Consortium formulated SG Roadmap for New York: 15 years (2011-2025); $7.2b investment will result in $18.9b avoided cost to consumers.	Vary in each state/utility	$ 4.3b for pilots in 2009. New York State Roadmap: $7.2b
UK	Govt body, ENSG formulated a 40 year Routemap (2010-50). Drivers are: Cost effective transition to low carbon economy, Energy security, Affordability; and Economic competitiveness.	2010 – 2050	€10b for 2010-2020
Ireland	Comprehensive SG Roadmap, EV Roadmap, and Wind Energy Roadmap prepared by Sustainable Energy Authority of Ireland (SEAI). Drivers are: Carbon reduction, Electrification of transportation for reduction in imported fossil fuels , Energy security. Envisages >88% renewables by 2050.	2011 – 2050 Smart metering rollout by 2018	NA
France	No national level roadmap yet; a white paper by industry forum is under debate currently. Drivers are: Intelligent energy management, MV/LV grid operation management, Network modernization, Power quality improvement, Distributed storage, Prosumers, EV etc.	2010 – 2018 Smart metering rollout by 2018	NA
Germany	Govt is actively involved. DKE has formulated a SG Standards Development Roadmap 2010-2013. Drivers are: Standards development for engineering dominance, Carbon reduction, Energy efficiency, Flexibilization of load, DR, Energy security, Distributed generation, Storage, VPP, Electromobility, Avoidance of grid bottlenecks etc .	2010 – 2020	€40b

Summary of Smart Grid Initiatives Worldwide

Country	SG Drivers and Roadmap	Duration	Cost
South Korea	Govt is actively involved in SG developments – Smart Grid Promotion Act 2010 was passed in 2011. Drivers are: Innovating and exporting green technology, Microgrids that can achieve self sufficiency through small generation at consumer ends, EV proliferation, Energy efficiency and Reduction in consumption, Consumer participation etc.	Phase 1: 2010 – 2012 Phase 2: 2013 – 2020 Phase 3: 2020 – 2030	$24b
Japan	Govt involved in SG standards development. Issued a standards Roadmap in 2010. Drivers were: Development of Smart Communities, Emission reduction, Renewables, Export of SG equipment and knowhow. Priorities being under revision post Fukushima: public safety, restoration of public trust in the energy system, and customer empowerment and protection are key priorities in the post Fukushima era. Share of renewbles may be enhanced significantly.	2010 – 2030	NA
China	Govt (State Grid Corporation of China) is leading SG development. Envisions a Strong & Smart Grid covering 8 domains; 26 technical areas identified and 92 standards series under finalization. Equipment standards also under development. Drivers are: Energy efficiency, Export of equipment, Emission reduction, Renewables integration, EV proliferation etc.	2010 – 2020 300 million smart meters by 2015	$7.5b given in 2010 for pilots.