

21st Century Grids: India's journey towards smarter grids



India Smart Grid Forum

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Electric Grid is on the threshold of a paradigm shift!

After a century of focus on centralized power generation and creation of massive electric grids, today the focus is towards de-centralized generation

With more and more distributed generation resources being connected at the distribution end, traditional boundaries between generation, transmission and distribution is fast disappearing - evolving into one “Integrated Grid”

With consumers becoming “prosumers”, the grid that is built for one-way flow of electricity is now experiencing bi-directional flow of electrons

Debate on whether to invest in transmission or in storage – the choice between “Generation + Transmission + Distribution” AND “Distributed Generation + Storage + Distribution” is becoming real

Power purchase is moving from Volumetric Tariffs to Transactive Tariffs as Inflexible Demand has become Price Responsive Demand: Era of Smart Energy OR Transactive Energy

The “Merit Order Dispatch” has graduated towards an “Energy Efficient and Environmentally Responsible Dispatch” regime

Solar PV has already achieved grid parity in many parts of the globe which is about to unleash a rooftop PV revolution

Large fleets of Electric Vehicles that can be aggregated as virtual power plants which could support short term supply-demand balancing will make the grid even more dynamic and complex



Evolving Smart Grid will be a “Grid of Things”

- **Traditional grid**
 - ability to monitor and control power flows in real-time is limited to the HV network.
 - In the LV network, the power system operator has no visibility on who is consuming how much electricity when and where.
- **Smart grid**
 - with smart sensors and smart meters connected to computers in the control room, it is possible to **remotely monitor and control** the flow of electricity in real time to every customer or even to every smart appliances inside a customer’s premise.
- In offices and homes increasing share of consumption is by devices using direct current – laptops, LED/CFL bulbs, TVs and LCD/LED screens, phones etc; and increasing share of generation also is from distributed DC sources – solar PV. Soon there will be justification for **DC distribution systems or DC grids in buildings**

“The grid will soon emerge as the **“grid of things”** like how the internet is evolving as **“internet of everything”**”

--- Chris Jones,
President, Pacific
Gas & Electricity,
USA

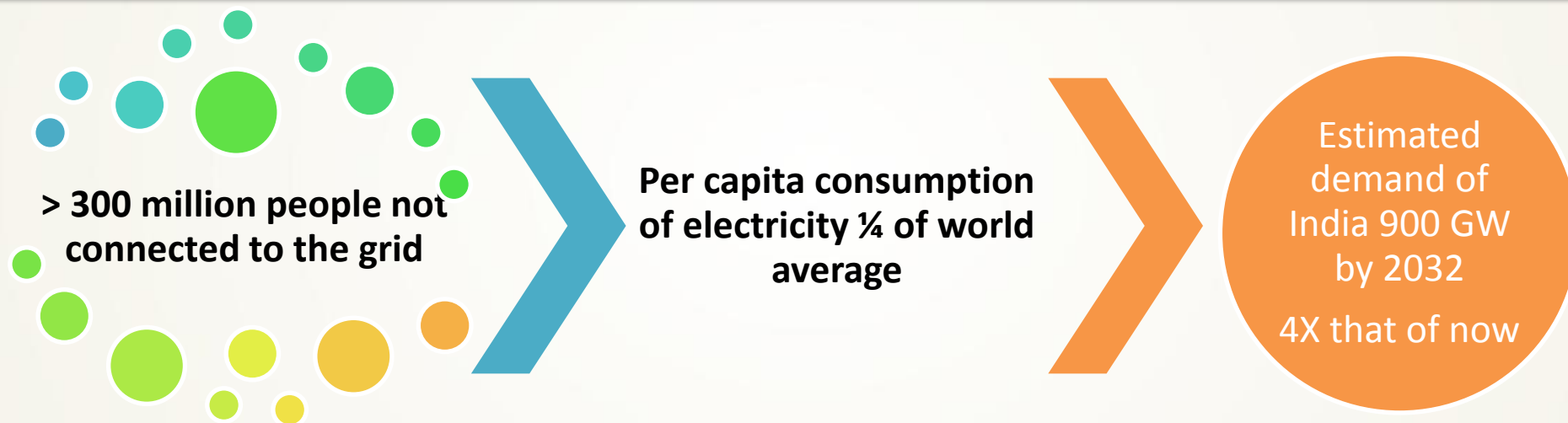
So the picture of the grid of the 21st century will be drastically different!





Electricity Challenge in India

India operates one of the largest synchronous grids in the world – covering an area of > 3 million sqkm, 260 GW capacity and >200 million customers



To address the above challenges, the Indian power system is expected to grow **8-10% p.a.** for next **several decades** - managing a rapidly growing power system of this size requires smarter systems

Developing countries like India need to invest in both strengthening the electrical network as well as adding communications, IT and automation systems to build a strong and smart grid



India in the forefront of this revolution

- Post Vedic Era, India had been a laggard in all technology revolutions
- But in this wave of technology revolution (Clean Energy and Smart Grids) India is not far behind – rather we are going to lead this from the forefront!
- While on one side we are struggling with mundane issues of “access and availability of power” and “huge T&D losses”, on the other hand we are moving fast on clean energy and smart grids development
 - 2008-09: R-APDRP – basic building blocks of Smart Grids
 - 2010: JNNSM with a target of 20 GW grid connected Solar Power by 2022
 - 2011: India Smart Grid Task Force and India Smart Grid Forum
 - 2012: Smart Grid Pilot Projects, Net Metering Policy in AP
 - 2013: Smart Grid Vision and Roadmap for India; Net Metering Policies in 3 states
 - 2014: Net Metering Policies in 14 states
 - 2015:
 - **New RE Program for 175 GW by 2022 - 100 GW from Solar of which 40GW from 20 million Rooftop PV systems**
 - **National Smart Grid Mission**
 - **Haryana Order for Mandatory Rooftop PV**
 - **Delhi, Rajasthan and Maharashtra Net Metering Policy**
 - **Model Smart Grid Regulations**
 - **National Mission on Electric Mobility**
 - **Smart Cities Mission - 100 Smart Cities and AMRUT**

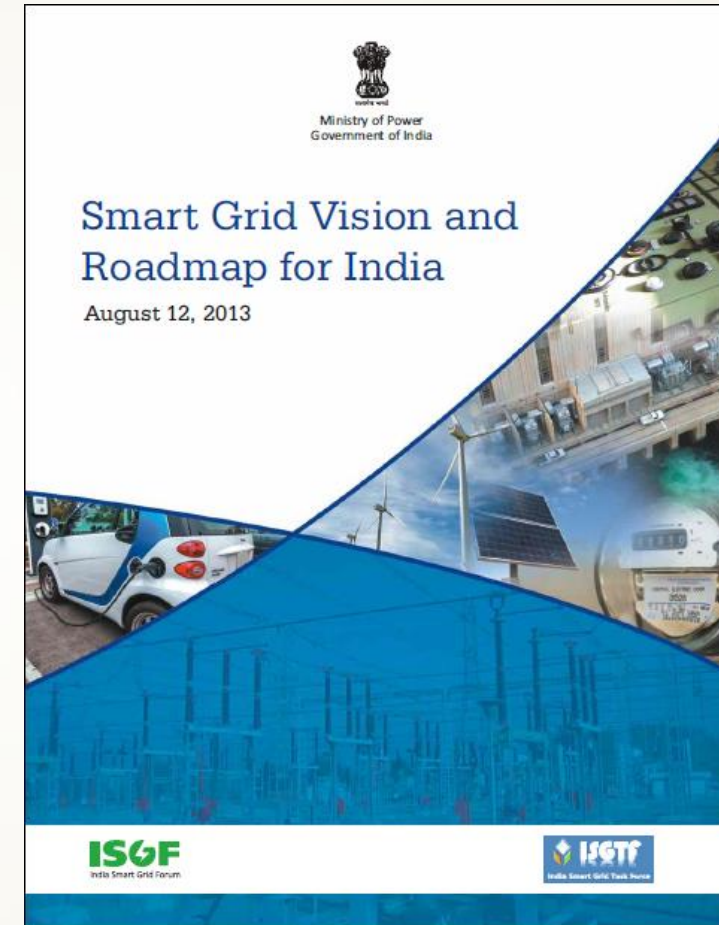


Smart Grid Vision and Roadmap

August 2013 - Ministry of Power (MoP) in consultation with India Smart Grid Forum and India Smart Grid Task Force has formulated a smart grid vision and roadmap for India, aligned to MoP's overarching objectives of **"Access, Availability and Affordability of Power for All"**

Smart Grid Vision for India

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





Enabling Environment

- India amongst handful of countries that has a **Smart Grid Vision and Roadmap** that envisages
 - **Smart Metering – 200 million smart meters in 10-12 years**
 - **Mandatory Demand Response and Rooftop PVs for certain categories of customers**
 - **Smart Microgrids: 1000 by 2017 + 10,000 by 2022 + 20, 000 by 2027**
 - **MW scale energy storage solutions, millions of EV**
 - **Loss reduction measures**
- Gol is committed to providing 24x7 electricity supply to all households in the next 5 years and has recently launched 3 focused programs with initial capital outlay of **US\$14 billion**
- The other ambitious programs are to build **100 Smart Cities** on a fast track mode and add **175 GW** of renewable energy by 2022!
- With all these ground-breaking initiatives, India has already emerged as the prime destination for Smart Grids and Smart Cities
- The evolving smart grids of the future are going to create huge business and employment opportunities and in this wave of technological revolution, India can leverage its demographic advantage to play a dominant role in this new world



National Smart Grid Mission (NSGM)

In order to achieve the goals envisaged in the Smart Grid Roadmap, a National Smart Grid Mission (NSGM) has been approved by GoI

- NSGM will have its **own resources** and **funding** mechanism and will bring national level support from other Ministries, Institutions, and the State Governments
- NSGM will coordinate with **state governments, utilities and other stakeholders** for rollout of smart grid projects and monitor project implementation
- NSGM will coordinate **development of standards**, technically feasible and economically sustainable business models relevant to the Indian context
- USD 150 million allotted for NSGM for next two years which will include certain technology demonstration projects
- We look forward to partner with International Development Agencies to roll out larger smart grid projects in different states in India
 - World Bank already committed USD 160 million for next two years

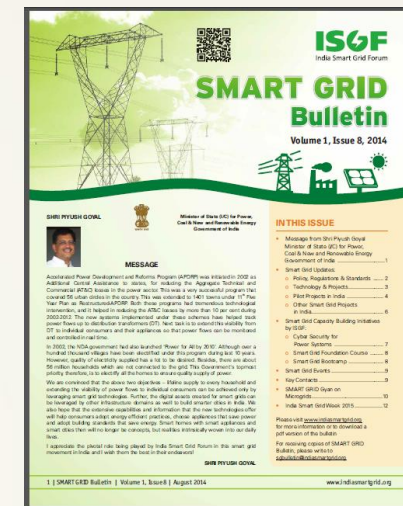


Need for International Collaboration

- Experiences from hundreds of smart grid projects executed in Europe, Americas, Japan, South Korea etc are shared at international events and workshops. ISGF depute our experts to these international events regularly.
- ISGF organized 2 smart grid workshops in partnership with USTDA (San Francisco and Bangalore)
- India Smart Grid week (ISGW) 2015 in Bangalore in March 2015 where worlds top most Experts presented (94 speakers from 16 countries) on various topics
- **Exposure to the fast paced changes taking place and training on new technologies and smarter systems are essential for managing the transition to 21st century grid**
- Up coming programs:
 1. **INDIA-EU Smart Grid Workshop: Jun 11 – 12, 2015 @Nice, France by ISGF and European Commission**
 2. **CIREN: Jun 15-18, 2015 @ Lyon, France (<http://www.cired2015.org/>)**
 3. **Smart, Secure and Sustainable Cities India: July 15-16 2015 @ London by ISGF and Partners**
 4. **Preparatory workshops for IPDS (by ISGF and member organizations)**
 - 4 regional and 1 national workshop (June to September 2015)
 5. **European Utility Week: Nov 3 -5, 2015 @Vienna, Austria (<http://www.european-utility-week.com/>)**
 6. **ISGW 2016: March 15 – 19, 2016 @Manekshaw Center, New Delhi, India (www.isgw.in)**

Initiatives by ISGF

- India Smart Grid Knowledge Portal launched in Jan 2013 (www.indiasmartgrid.org) – Most popular smart grid portal in the world today
- Smart Grid Bulletin - **Circulation: 2,500** printed copies to key decision makers in Indian power sector; > **45,000** electronic copies to power sector professionals around the world
- White Papers on important topics
- Regular webinars on technical topics
- Workshop on Cyber Security for Power Systems (3 Days) in collaboration with NCIIPC – now being moved to an E-learning platform
- Foundation Course on Smart Grids (5 Days)
- Smart Grid Bootcamp for Students (1 Day)
- Smart Grid Program for Regulators (5 Days)
- Latest Publications of ISGF:
 - Smart Grid Knowledge Paper (co-authored by BNEF and ISGF)
 - Who is Who Guide in Smart Grids and Smart Cities domains in India
 - ISGF Directory of Indian Power Sector
 - Smart Grid Projects – a global snapshot
 - ~~Compendium of Training Programs for Power Sector Personnel~~





Smart Utilities Group (SUG)

- Smart grid is a new concept and utilities around the world have just started gaining experience – it is wise not make the same mistakes but learn from each other's experiences
- Towards this objective, ISGF launched the **Smart Utility Group (SUG)** in March 2015
- A platform exclusively for utilities and free of any charges – purely knowledge sharing
- Secretariat at ISGF
- Mr. Praveer Sinha, CEO TPDDL was elected Chairman; Dr. Rahul Tongia as Advisor
- First meeting held in April 2015
- Presently working on formulation of policies and standards for EV Charging Infrastructure

OBJECTIVES OF SUG:

- Regular interaction with peers from progressive utilities
- Exchange, project ideas, new technology implementation plans etc
- Discuss challenges and seek guidance from other utilities who have overcome such challenges
- Key focus on learning from each other and avoid the mistakes others have already done
- Some utilities can hand-hold others in select domains on voluntary basis
- ISGF will provide technical support to utilities where they require assistance
- SUG will prepare white papers, technology selection guidelines, model RfPs, innovative business models and capture best practices and educational content to help facilitate these discussions.
- To build and maintain strong relationships with other industry groups, associations or societies with similar aims and objectives.
- To provide members education opportunities, including virtual and face-to-face informational sessions, forums, workshops and webinars. Also, to establish new and improved ways to deliver training, updates and employee skills





Thank you for your kind attention

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