

DEVELOPMENT of SMART GRIDS in INDIA

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Smart Grid Definition

- “an automated, widely distributed energy delivery network characterized by a two-way flow of electricity and information, capable of monitoring and responding to changes in everything from power plants to customer preferences to individual appliances.”
- “a smart grid is the electricity delivery system (from point of generation to point of consumption) integrated with communications and information technology”
- “No single definition - It is an evolving paradigm”

Smart Grid Features

- Smart grid can be better defined by its features
 - fully automated power delivery network that monitors and controls electricity flows
 - two-way flows of electricity and information between the power plant and the appliance, and all points in between
 - lowered carbon footprint and reduced emissions, increased access to renewable energy resources (like solar and wind)
 - Use of digital technology to save energy, reduce cost and increase reliability
 - improved power quality for needs of 21st century economy
 - reduced disruptions, improved efficiency and better asset utilization

Broader Aspects and Drivers of Smart Grids

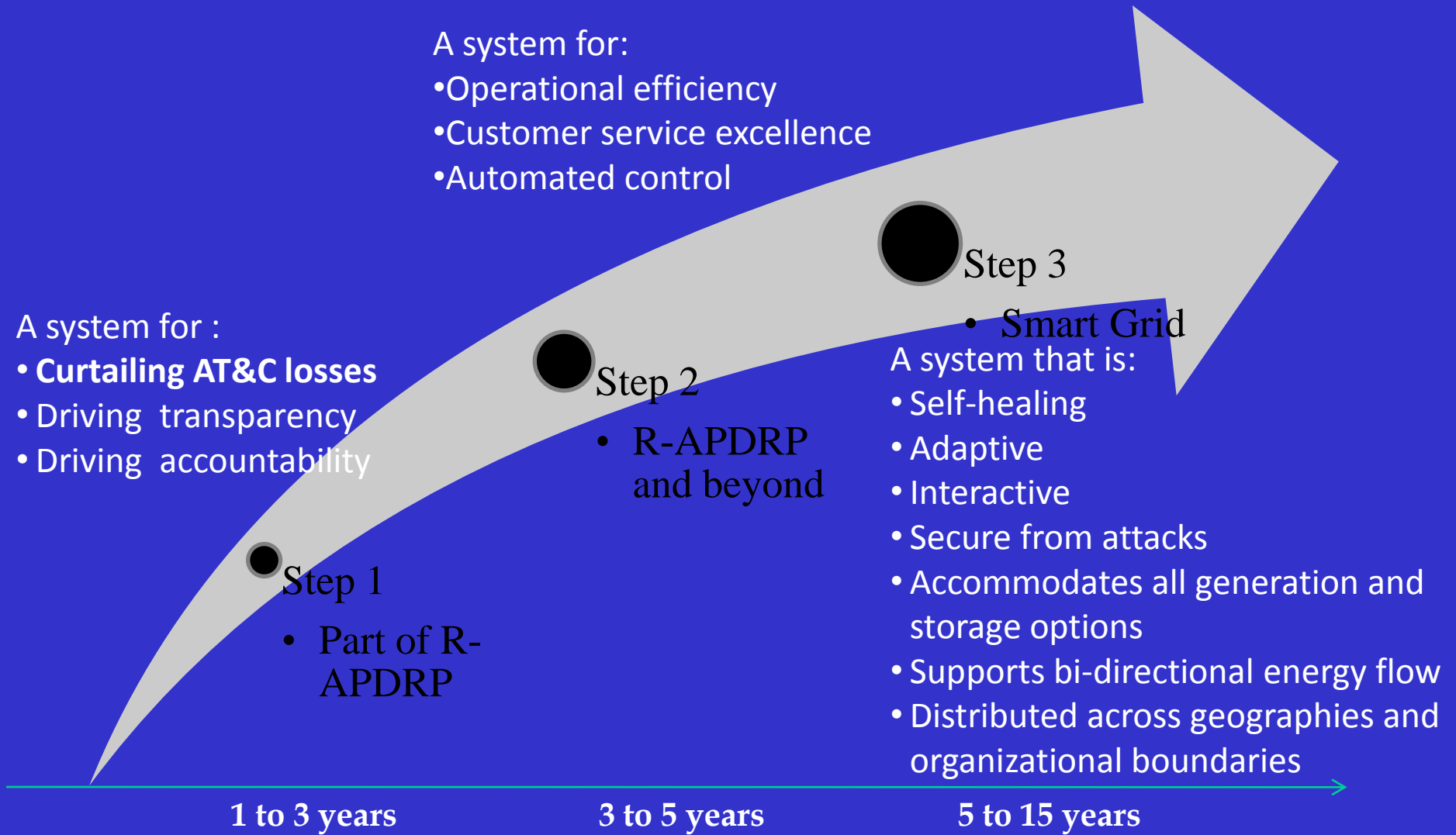
- Generation
 - Make it more distributed
 - Increase use of Renewables
- Transmission
 - Improve transfer capacity of existing infrastructures reliably
 - Reliability against uncertain events (avoid blackouts)
- Distribution (Includes consumption)
 - *Area of most effort*
 - One aspect is “smart metering”
 - Demand Response aka Load Control
 - Loss reduction

Vision for Smart Grids in India

- End of Load Shedding
 - Peak load shifting through a combination of direct control and differential pricing (demand response/dynamic DSM)
- Reliable Power
 - Robust systems with self-healing capabilities; first step is improved monitoring
- Cheaper power
 - Dramatic improvement in AT&C losses – knowing where every kWh is going in real-time
 - Shifting the peak away from costly power
 - Better utilization of assets
- More sustainable power
 - Integration of green and renewable resources at a massive scale – enough to increase energy independence

This will not happen overnight...Smart Grids are a process, not a product

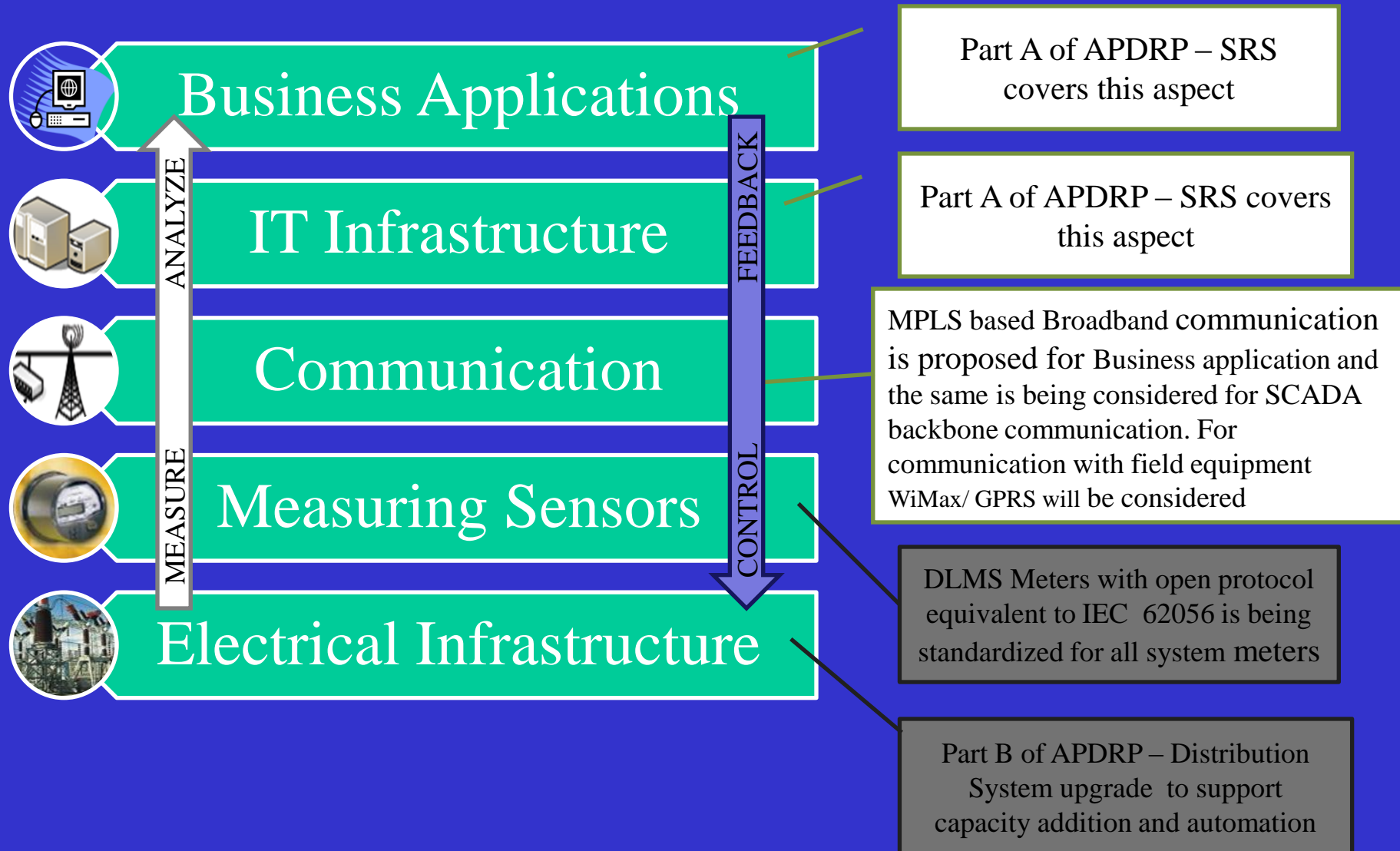
Gradual evolution of Smart Grid in Indian Power Distribution



Initiatives under R-APDRP

- R-APDRP is an AT&C loss reduction programme on sustainable basis through systematic measures
- Part-A: IT enabled platform with different levels of communication to and from the major components of the distribution network for energy accounting and consumer service centres
- Part-B: Strengthening and up-gradation of distribution network for increasing reliability, automation and remote control
- IT enabled platform under Part-A will support an intelligent network since it provides for varying levels of communication embedded with the network

Mapping the vision for Smart Grid vis-à-vis R-APDRP



Progress of R-APDRP at a glance

- Part-A projects worth Rs 5305.23 Cr sanctioned for almost all the eligible towns in the country
- Part-B projects for 644 Towns (59% of 1100 towns) worth Rs 10859.33 Cr sanctioned in thirteen States. Balance projects are expected to be sanctioned by March 2011.
- Rs. 2606.15 Cr released for disbursement to States.
- All states appointed IT Consultants except Arunachal Pr.
- All states signed Quadripartite Agreement except Arunachal Pr, Manipur, Chandigarh & Puducherry.
- All States issued RfP for appointment of IT Implementing Agency.
- 16 States have appointed IT Implementing Agency

R-APDRP Began the Process

- Increased ICT-based functionality
 - Accounting → Auditing → Monitoring → Control
- R-APDRP brings us to auditing, and takes steps towards monitoring
- Now, monitoring can be real-time
- Control is ICT *enabled*, but requires investments in the power system as well
 - No amount of knowing about a problem is sufficient – must have the means to do something about it as well

Other Aspects of Smart Grids

- Microgrids
 - Islands of mini-grids that can allow greater self-generation, e.g., village clusters using biomass
- Smart appliances
 - Response to pricing and control signalling
 - Consider refrigerators (cooling is some 30,000 MW of our load)
 - Why should the “defrost cycle” (a heater) ever turn on at 6 PM (or other peak periods)?
 - Incremental cost of making a modern fridge smarter is only ~100-200 rupees – *with standardization*

The critical step for Success: Choosing the right DESIGN

- Design is the intersection of Business Models, Regulatory/Policy environments, and Technology
- Functionality is the key driver – there are multiple technology options available
 - Performance-based standards allow more innovation and faster development than pure technical standards
- Key requirement is integrated solutions at the right price-points
 - All the *ingredients* of a smart grid already exist today
- MoP and stakeholders should evolve transparent, flexible, and innovative *processes* and *mechanisms* for moving forward

Broader Opportunities in Smart Grids

- Smart Grids are an ongoing global shift in the power sector
- There are future extensions that are not widespread commercially available but can become so with the right innovation and effort
 - E.g., sensor networks, home automation, home/appliance monitoring, etc.
- India is not just a major market but can become the *global supplier of solutions*

India Smart Grid Forum

- Launched by Hon'ble Union Minister of Power on 26.05.2010
- A non-profit voluntary consortium of public and private stakeholders, research institutions and selected utilities.
- The prime objective to accelerate development of Smart Grid technologies in the Indian Power Sector.
- The role of Forum is advisory in nature and it is publicly promoted but privately managed.
- The forum will seek the best practices in the world and develop a road map for development of Smart Grid in India.

India Smart Grid Forum

- Forum will operate in a hierarchical or layered structure with different working groups focussing on different aspects of Smart Grid.
- Members of core committee and working groups will be decided by elections and few nominations from Government agencies.
- Funding of the Forum will be from the annual membership fee from all members (except those specifically exempted) based on their categories.
- Initial funding of the Forum has been proposed through Ministry of Power, the Patron of the Forum .

India Smart Grid Forum – Working Groups

- WG1 Advanced transmission
 - Ending (cascading) failures
 - Improving power transfer capacity
- WG2 Advanced distribution
 - Outage prevention, detection, and restoration
- WG3 Communications
 - Open, secure, and modular communications options
- WG4 Metering including Interoperability standards
 - AMI architectures and business cases
- WG5 Consumption & load control
 - Plug & Play interoperability
 - Consumer choice
 - Incentives
- WG6 Policy and regulations
 - Specialized Tariffs
 - Experimentation and scaling
- WG7 Architecture & design incl. interoperability
 - Performance and/or Technology standards

Smart Grid Task Force

- An inter ministerial group under the Chairmanship of Sh Sam Pitroda, to serve as Government's focal point for activities related to "Smart Grid".
- The main functions of the Smart Grid Task Force is to ensure awareness, coordination and integration of the diverse activities related to smart Grid technologies, practices and services etc.
- Members of the Task force are from concerned Ministries (Home, Defence, Communications & IT, Non Renewable Energy, Environment and Forest, Finance etc) and organisations (Planning Commission, Department of Science and Technology, CERC, CEA, CPRI, BEE, NTPC, PGCIL, BIS, PFC, REC etc.)

Smart Grid Task Force – Working Groups

- Working Group 1: The group will focus on trials / pilots on new technologies / ideas. The group will deliberate on **methodology for selecting pilots, pilot locations, outcomes, processes, matrices** and evaluation. Chair and Co-Chair for the group will be **CPRI and POWERGRID**.
- Working Group 2: The group will focus on **loss reduction and theft control including data gathering and analytics**. Chair and Co-Chair for the group will be **NTPC and PFC**.
- Working Group 3: The group will focus on **access of power to rural areas and reliability & quality of power to urban areas**. Chair and Co-Chair for the group will be **CEA and REC**.
- Working Group 4: The group will focus on **distributed generation and renewable**. Chair and Co-Chair for the group will be **REC and MNRE**.
- Working Group 5: The group will focus on **physical security, standards and spectrum**. Chair and Co-Chair for the group will be **POWERGRID, BIS and MCIT**.

Smart Grid Pilots

- Small size pilots to validate the technology in Indian conditions.
- Pilots must yield credible results and satisfy various validity criteria to be evaluated in several metrics ranging from financially viable operation to consumer satisfaction.
- Ideal pilot project to be backed by consortium of DISCOM (leader), technology providers and research / educational institution.

THANK YOU