POLICIES IN SMART ENERGY AND THEIR LINK WITH STANDARDS

Presented by Pankaj Batra, Member (Planning), CEA.

WHAT IS SMART ENERGY

Smart energy or smart grid – why is it useful to the common man

- Optimum utilization of power system assets so as to minimize the cost to consumers.
- Improves reliability of power supply to consumers.

  - Solves grid problems by itself.
  - Informs the System Operator in advance of an impending grid instability/disturbance.
  - Optimally utilizes wind and solar energy resources, even with its unpredictable nature.

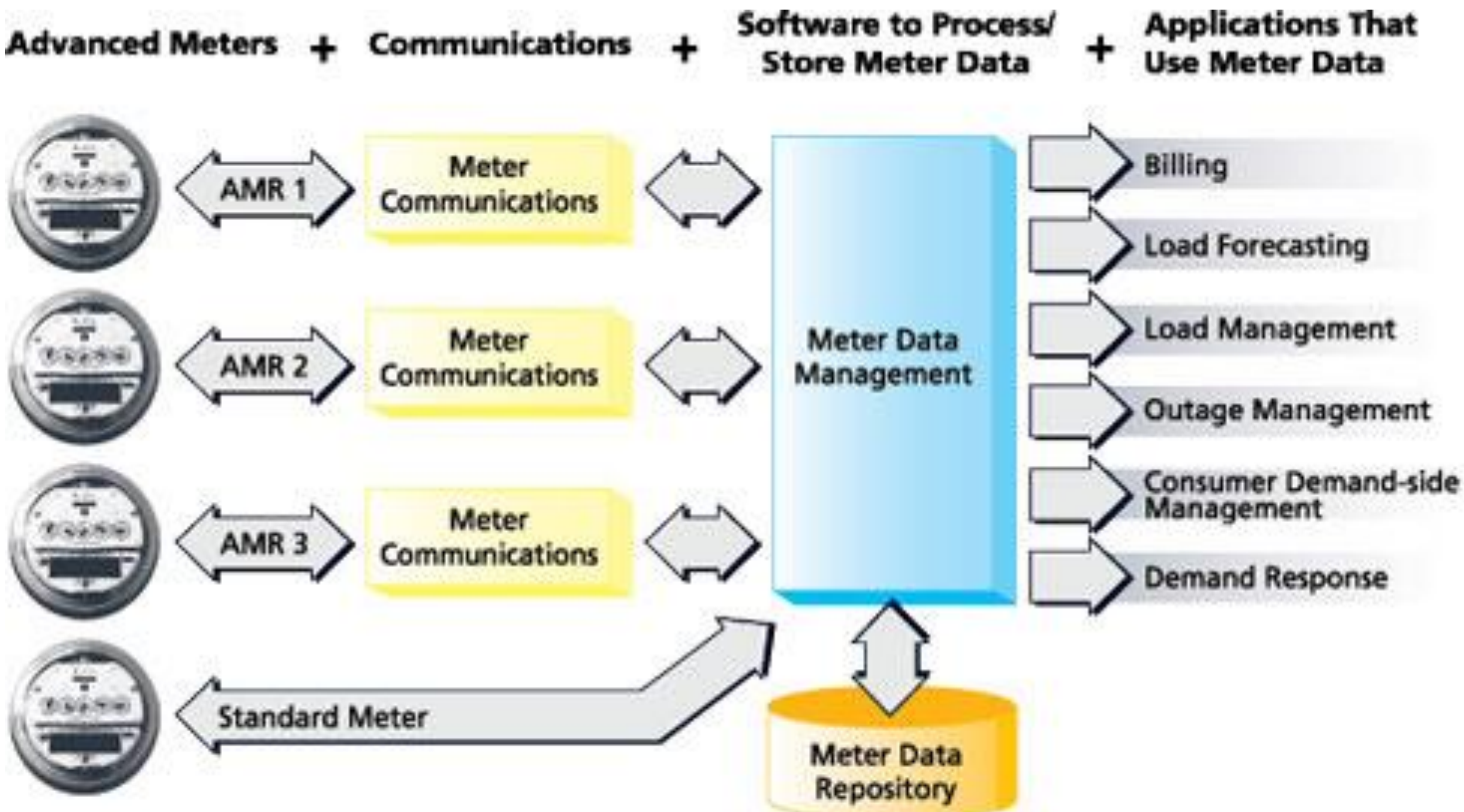
Definition of Smart Grids by EU Regulators

- European Regulators have adopted a definition of smart grids which is ***technology-neutral*** and ***focused on what smart grids can deliver.***
- *'A smart grid is an electricity network that can cost-efficiently integrate the behaviour and actions of all users connected to it – generators, consumers and those that do both – in order to ensure economically efficient, sustainable power systems with low losses and high levels of quality and security of supply and safety.'*

Distribution SCADA

Smart Meter

AMI



Advanced Meters
+
Communications
+
Software to Process/ Store Meter Data
+
Applications That Use Meter Data
AMR 1
Meter Communications
AMR 2
Meter Communications
AMR 3
Meter Communications
Standard Meter
Meter Data Management
Meter Data Repository
Billing
Load Forecasting
Load Management
Outage Management
Consumer Demand-side Management
Demand Response

Microgrid in an Indian village

Benefits to the Distribution Utility

- Savings in Aggregate Technical & Commercial (AT&C) losses
- No necessity to take the grid to far flung areas
- Handling of variability of intermittent type of Renewable Energy Sources.
- Reduction of downtime due to outages in distribution system.
- Reduced burning of distribution transformers.
- Optimum utilization of transmission and distribution assets.
- Savings in sub-transmission and distribution system upgrades.
- Reduction in electricity bills of consumers.

Benefits to the customer in the Indian context

- Access to electricity for all consumers
- Reduction in electricity bills of consumers.
- Improved reliability of service.
- Improved quality of supply.

Objective of the Business model for the State Distribution Utility

- Mutual benefit for the Distribution Utility and the consumer.
- Private entities can set up microgrids in far flung areas – no need of large investment by the State DISCOM
- For upfront money, technology company can provide the same.
- Useful to have the technology company to also do the billing and collection along with the maintenance of the Distribution SCADA and AMI.

Business model for the Distribution Utility for Distribution SCADA and AMI

- **Costs** :
- Installation of Distribution SCADA (includes Outage Management function/Energy Audit function)
- Installation of Advanced Metering Infrastructure (AMI) (i.e Smart Meters, Communication, Hardware and Software).
- **Benefits** :
- Savings in AT&C losses
- Reduction of downtime due to outages in distribution system, therefore more revenue.
- Optimum utilization of transmission and distribution assets.

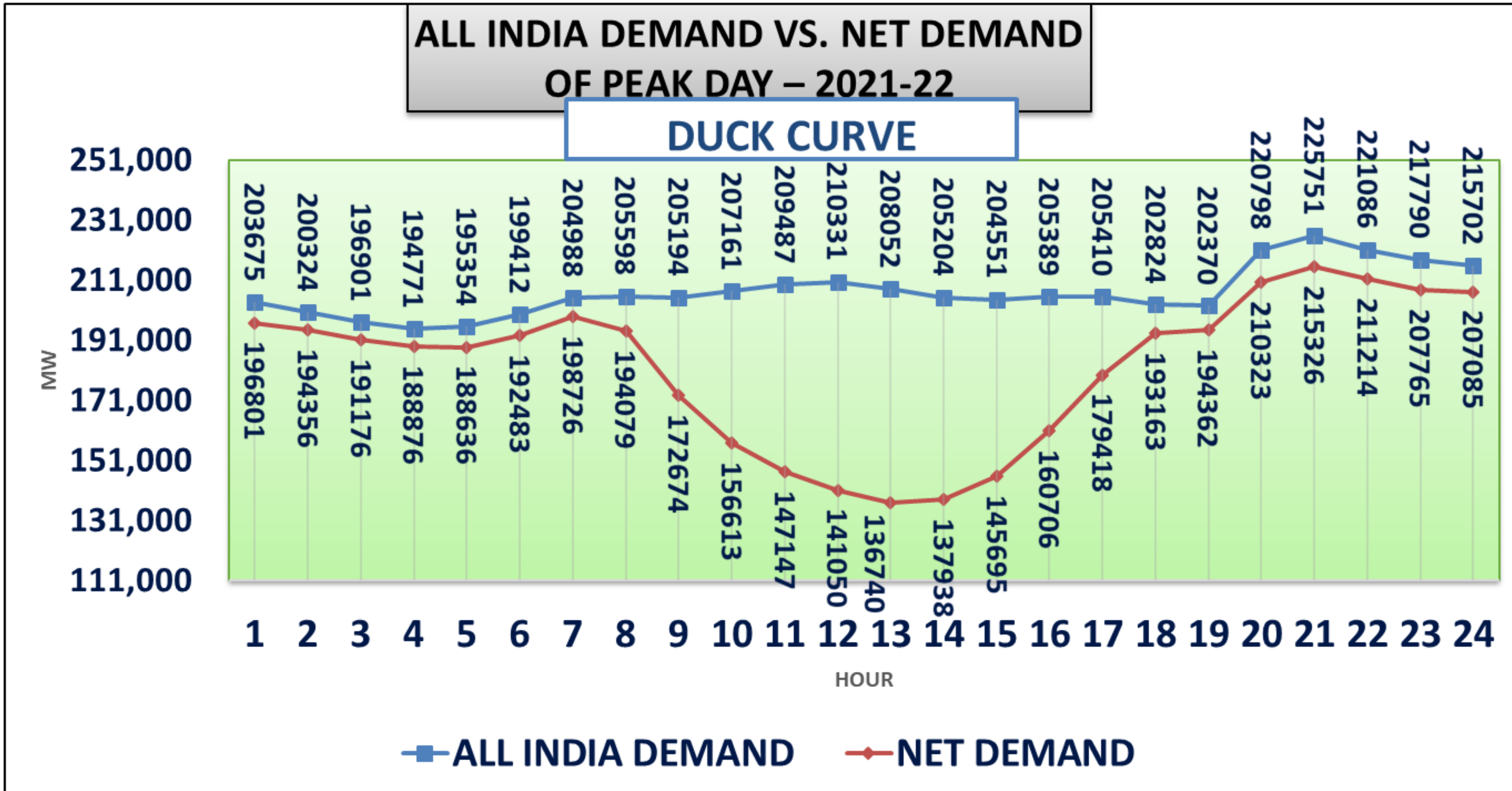
Savings in AT&C losses – Test case Uttar Pradesh (UP) – a State in India

- 93,052 million units consumption for 2015-16.
- AT&C losses – 27%
- Saving of 1% losses means saving of 930 million units in a year.
- Average cost of purchase – About Rs. 4 per unit.
- Savings in Rupees – Rs. 372 crores.
- Cost of one Distribution SCADA – Rs. 5 crores
- Cost of Distribution SCADA for 4 Distribution Utilities – RS. 20 crores

Savings in AT&C losses – Test case UP

- Number of consumers registered – About 1 crore
- Cost of AMI – Say about Rs. 3000 per unit
- Total cost of AMI meters – Rs. 3000 crores
- Cost recovery for 1% savings in AT&C losses for 9 years - Rs. 3300 crores.
- If 2% savings, cost recovery in 4 ½ years, if 3% savings cost recovery in 3 years, if 6 % savings, cost recovery in 1 ½ years.
- **One Business Model** : Technology company bears this initial cost, and recovers this through demonstrated savings on a monthly basis; then continued savings for the Distribution company.

TYPICAL ALL INDIA DEMAND & NET LOAD CURVE (2021-22)



Uses of LVDC

- With the advent of electronics, devices we use have changed to operate with direct current (DC): multimedia and mobile equipment, LED lighting, IT equipment, electric vehicles.
- Also the latest washing machines, air conditioners, refrigerators, fans, or heating/cooling systems have also adopted DC motors, allowing speed control and improved energy efficiency.

Generation through LVDC

- Solar PV generates DC
- Wind is generated through LVDC and inverted through Inverter to AC.

Need for standards

- Safety
- Competition
- Plug and play – good from consumer's viewpoint
- Therefore standardization

EXAMPLE OF STANDARDS FOR MICROGRIDS

Formulation of technical standards for connectivity of microgrids to the grid

- Regulations for construction.
- Provision of data and voice communication facilities to State Load Despatch Centre (SLDC) by the Microgrid Operator (MO).
- Abide by the instructions of the SLDC.
- Protection Coordination.
- Take part in System Protection Schemes.

Formulation of technical standards for connectivity of microgrids to the grid

- Connection Agreement.
- Site Responsibility Schedule.
- Visible isolating device.
- Synchronizing facility.
- Single line diagram to be kept with MO.
- Abide by Safety standards.

Formulation of technical standards for connectivity of microgrids to the grid

- Abide by Limits of harmonic injection.
- Abide by Limits of dc injection.
- VAR drawal/injection limits.
- Renewable generatorsLVRT/HVRT compliant.
- Earthing standards.

Thank You