



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

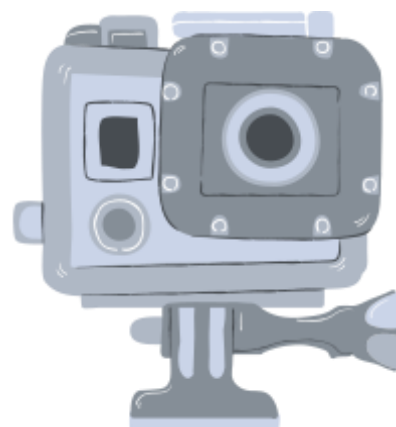
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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

UNIT I

Challenges in a Smart Grid

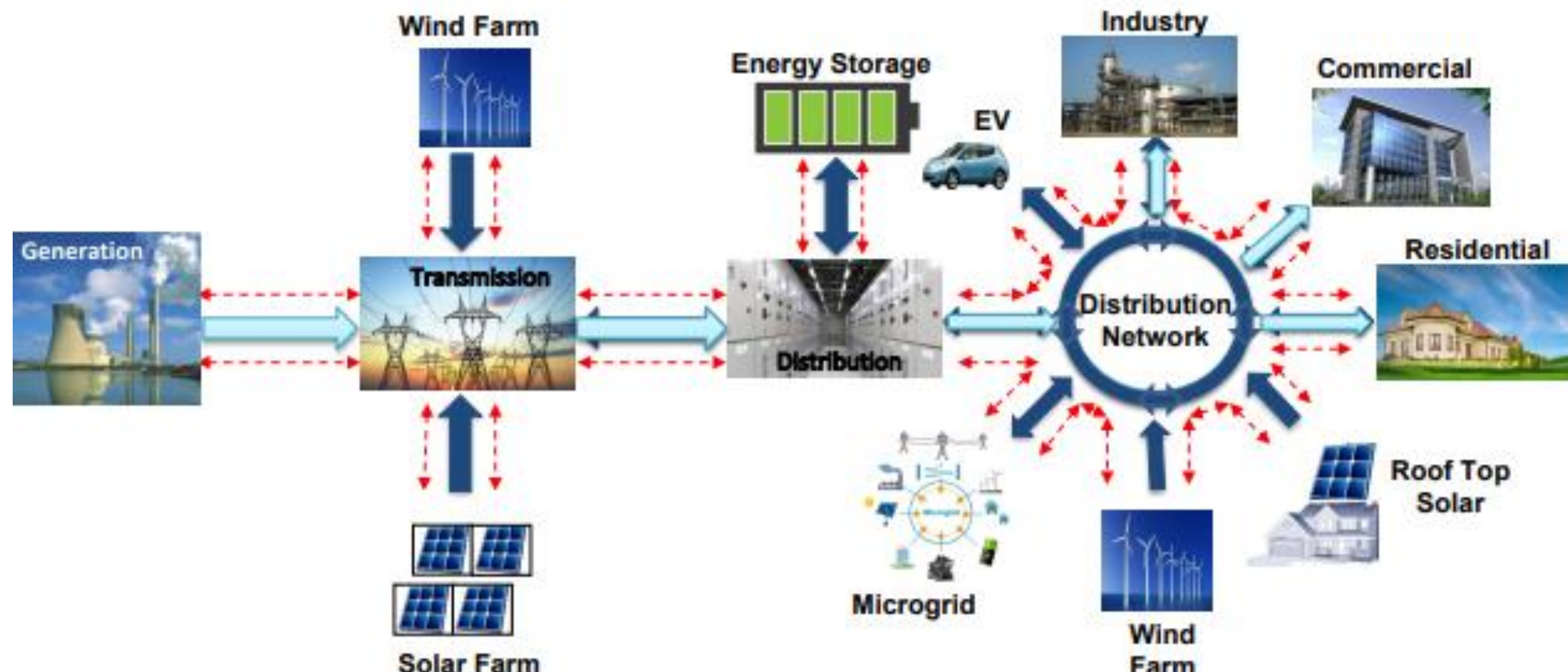
19EEE308 – SMART GRIDS
III year / VI Semester





Smart Grid Network

Transformed Power System Network - Utilities are poised to move from the traditional power system to a highly flexible, secured and green power system by using integrated two way communications and advanced control technology.



Power Flow in Smart Grid
 Power Flow in conventional Power System

Intelligent ICT Network

(Fig. Source: Internet)



Renewable Generation: Few Technical Challenges

- ✓ *Intermittent* generation, dependent on weather, season, time of day – Need accurate forecasting & Power balancing .
- ✓ Voltage and frequency control; Many of these sources do not have *reactive power* generation.
- ✓ Sudden generation loss can lead to system instability. Also *inertia less* generation, e.g. solar.
- ✓ Power Quality issues-Harmonics, flicker, under voltage ride through capability (IEEE & IEC std.)
- ✓ Power management and Maximum power point tracking. Requires proper converters and controls.



Transmission Grid: Challenges and Few Measures

Challenges	Measures
Right-of-Way	<ul style="list-style-type: none">• UHVAC, 1200 kV, 765kV, +- 800kV HVDC• HTLS Lines, Multi Circuit Tower, Compact Tower• FACTS Controllers, VSC based HVDC
Land Acquisition	<ul style="list-style-type: none">• GIS substation• Automation of Substation, Digital Substation
Renewable Integration	<ul style="list-style-type: none">• Transmission to lead generation• Strong Interconnection for large Balancing Area• Renewable Energy Management Centres for Renewable forecasting & Scheduling• Balancing reserves, Power Market, Ancillary Services, Energy Storage
Grid Management	<ul style="list-style-type: none">• Smart Grid- Real time monitoring System with Self-healing• Synchrophasor based WAMPACS• Advanced Metering Infrastructure (AMI), Demand Side Management, Consumer Participation

Need to plan 'Regional Electricity Highway



Few Major Challenges in the Smart Grid

- **Reliable and Fast Communication, Big Data, Cyber Security.**
- **WAMS integration with EMS, SCADA/DMS implementation in the existing networks.**
- **Suitable Converter Topology and Controls for RES Integration.**
- **Optimal Siting, Sizing and Controls of Energy Storage Systems.**
- **Dealing with Intermittent Generation- Flexible Generation (High ramp rate), CHP and Thermal storage.**
- **Adaptive Protection in Active Distribution Network, Microgrid protection (DC more challenging)**
- **Regulatory Changes.**
- **Customers' Acceptance to RES Deployment and Demand Side Participation- Social survey**



Summary



Activity



**KEEP
LEARNING..
Thank u**

SEE YOU IN NEXT CLASS