

School of Electrical, Electronics and Communication Engineering

Course Code : BEEE4001

Course Name: Smart Grid and Energy Mngement

UNIT 1

Introduction to Smart Grid

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Program Name: B.Tech

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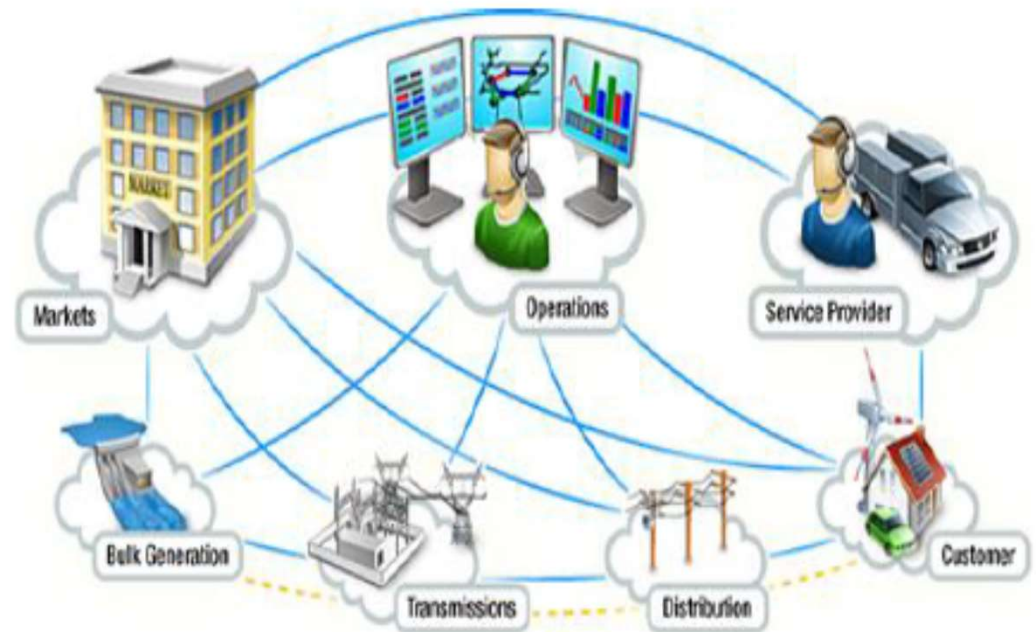
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Smarter

- Generation
- Transmission
- Distribution
- Customer participation
- Operations
- Markets
- Service Providers

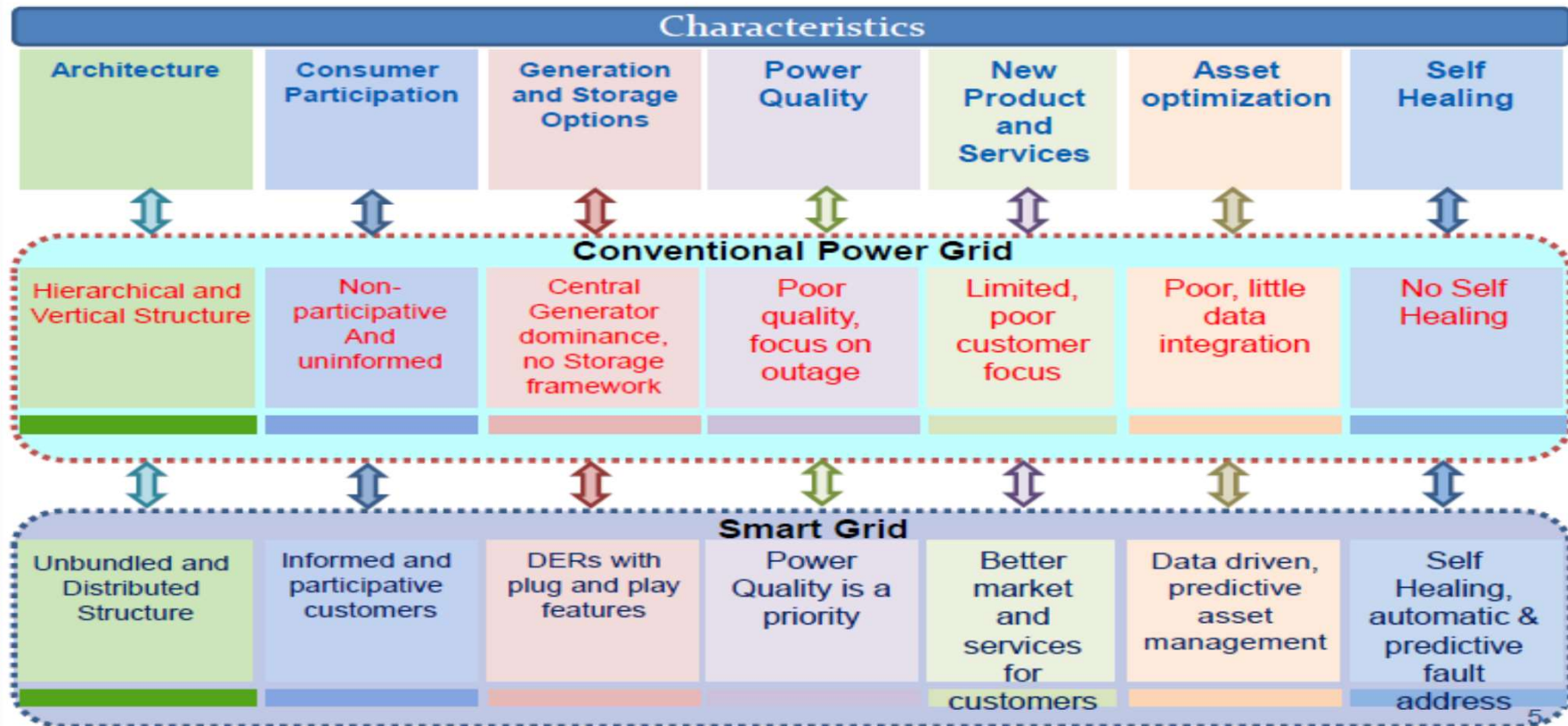
Overall objective:

Smart/best/optimal utilization of all the available resources.



Source: <http://smartgrid.ieee.org>

Conventional Grid Vs. Smart Grid



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Smart Grid Enablers

Clean and Flexible Generation-Share of Renewable Energy Sources to increase

Flexible Transmission - FACTS & HVDC

Energy Storage Systems

System Wide Secure Communication Network

Automation – SCADA/EMS, Synhrophasor based WAMPACS, ADMS, Home/Building/Industrial Automation

Active Distribution Network

Sensors- Smart Meters, PMUs

Smart Analytics-Wide area monitoring and control, DSM

Market and Regulatory Framework

Few New Concepts

PROSUMER: Producer + Consumer

VIRTUAL SYNCHRONOUS GENERATOR: To artificially add inertia through converter controls.

ADMS (ADVANCE DISTRIBUTION MANAGEMENT SYSTEM): to coordinate DMS and MEMS (Micro-grid Energy Management System)

Distributed Energy Resources (DERs)

Distributed Generations using Renewable Technologies

- **Photovoltaics (India aims at > 100 GW by 2022)**
- Solar thermal
- Small wind systems (upto 50 kW)
- **Large wind systems** (ranging upto 1-2 MW)
- Biomass etc.

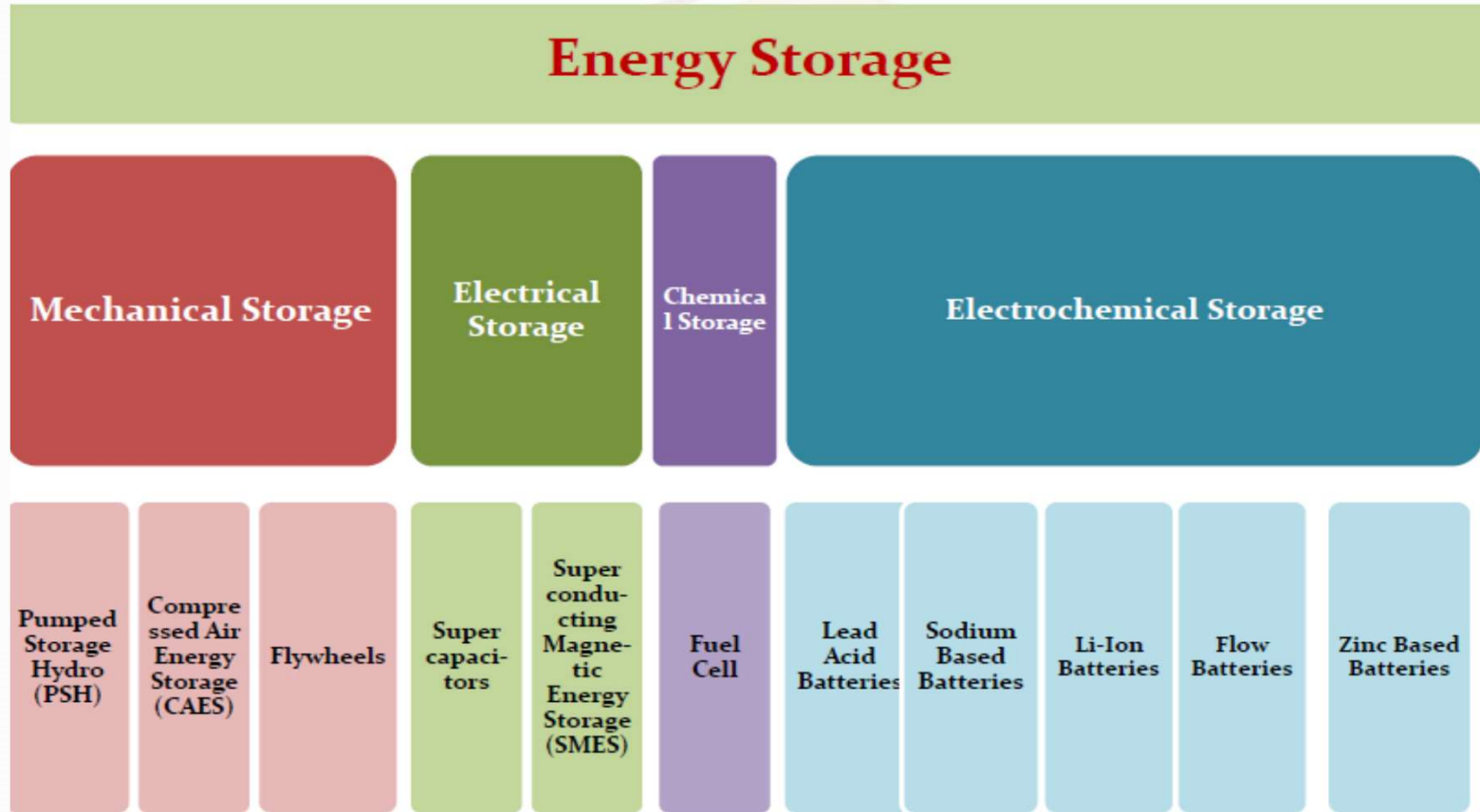
Storage Technologies

- Mechanical
- Electrical
- Chemical
- Electrochemical

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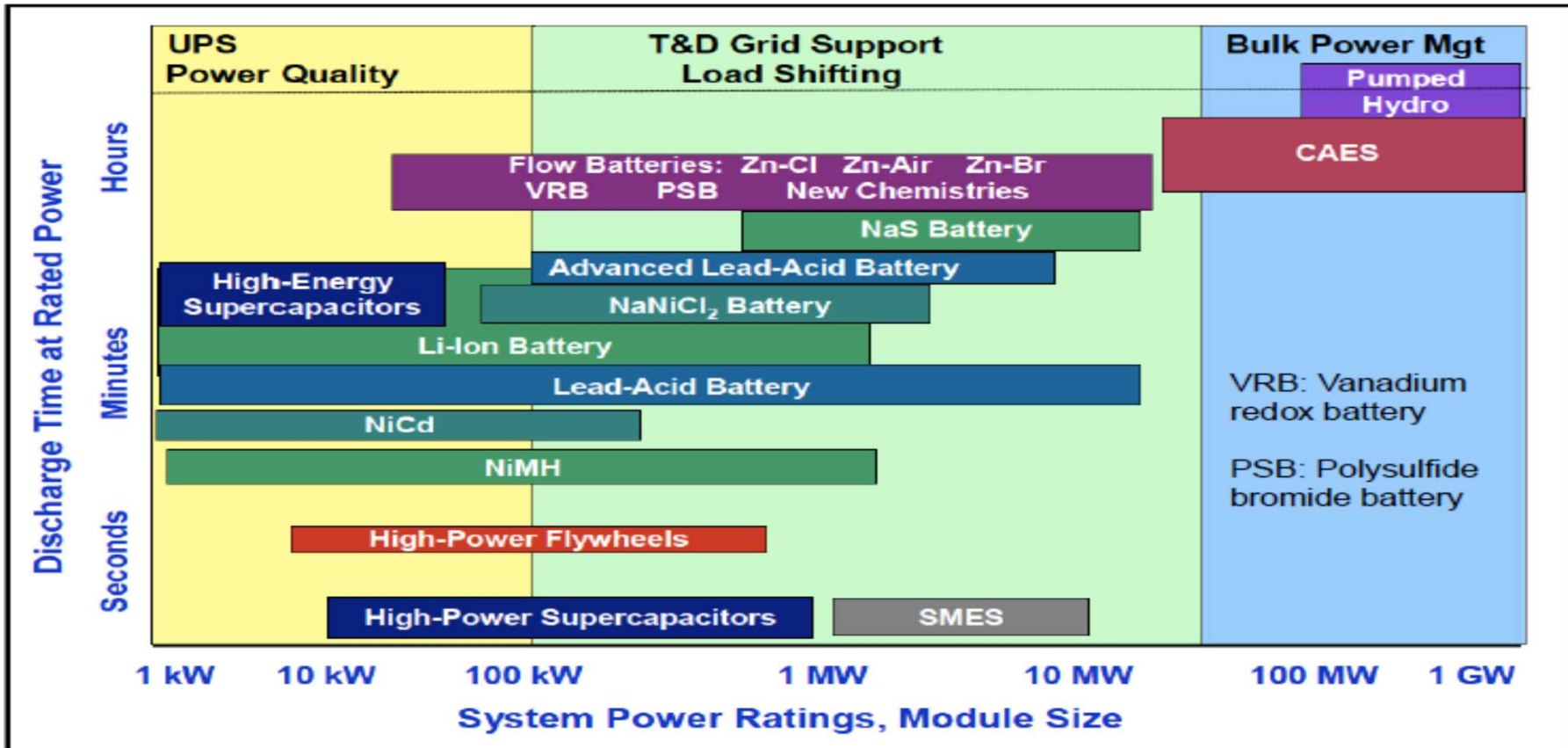
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Storage Technology Options (source: IESA)



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References

1. DOE document at <http://www.oe.energy.gov/smartgrid>
2. EPRI document at <http://intelligrid.epri.com>
3. *Smart Grid and LDC Divisions of POWERGRID, Gurgaon*
4. *IITK Smart City and UI-ASSIST Team*
5. A. S boyer, SCADA:supervisory Control and Data Acquisition, The Instrumentation system and Automation Society,4 th Edition 2009.
6. Vehbi C. Güngör, Dilan Sahin, TaskinKocak, SalihErgüt, ConcettinaBuccella, Carlo Cecati, and Gerhard P. Hancke: Smart Grid Technologies- Communication Technologies and Standards IEEE Transactions on Industrial Informatics, Vol. 7, No. 4, November 2011.
7. Xi Fang, SatyajayantMisra, GuoliangXue, and Dejun Yang: Smart Grid – The New and Improved Power Grid- A Survey, IEEE Transaction on Smart Grids.
4. Stuart Borlase: Smart Grid-Infrastructure, Technology and Solutions, CRC Press.
5. B.G. Liptac Instrument Engineering Handbook,Volume 3:process Software and Digital Networks,CRC Press, 4 th Edition 2011.

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