

# ENERGY STORAGE SYSTEMS

## UNIT-I

### INTRODUCTION

#### **Applications of Energy Storage System**

##### **1. Grid Stability and Reliability:**

Energy storage systems help balance supply and demand, smooth fluctuations from renewable energy sources and improve overall grid stability.

##### **2. Integration of Renewable Energy:**

By storing excess energy from source like solar, wind, storage systems enable greater utilization of these resources and reduce reliance on fossil fuels.

##### **3. Time Shifting:**

Energy storage allows users to store energy when its cheap and use when its more expensive, optimizing energy costs.

##### **4. Backup Power:**

In case of grid outages, energy storage systems can provide a backup power supply for homes, businesses, and critical infrastructure.

##### **5. Electric Vehicle Charging:**

Energy storage systems can be used to charge electric vehicles especially at public charging stations, by storing energy during off-peak hours and discharging it when needed.

##### **6. Microgrids:**

Energy storage is essential for the development and operation of microgrids, enabling localized energy generation and consumption, enhancing resilience, and reducing reliance on the main grid.

##### **7. Industrial and Commercial Applications:**

Energy storage can optimize energy consumption in industrial and commercial settings, reducing energy costs and improving efficiency.

##### **8. Smart Grids:**

Energy storage systems are component of smart grids, facilitating the integration of distributed generation, demand response, and other advanced grid technologies.

##### **9. Transportation:**

Battery storage is crucial for electric and hybrid vehicles, enable ultra-low emissions transportation.

## **10. Power Accessories:**

Advances in power converters, fast chargers, and wireless charger for energy storage systems are also actively being developed.