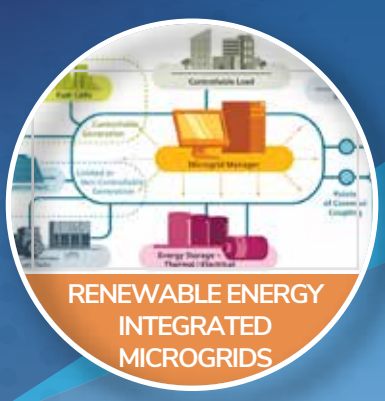
مدينة الملك عبد الله للطاقة الذرية والمتجددة K·A·CARE

Technology Overview

RENEWABLE TECHNOLOGIES FOR GRID MANAGEMENT

Renewable Energy Technologies when appropriately employed can effectively reduce electricity peak demand, ensure energy security while simultaneously maintaining grid stability and resilience



RENEWABLE ENERGY INTEGRATED MICROGRIDS

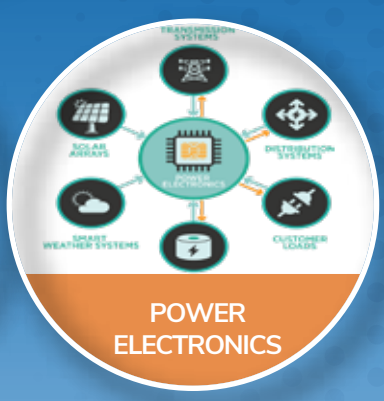
Renewable energy integrated microgrids are discrete energy systems consisting of distributed energy sources (including demand management, storage, and renewable energy generation), and loads capable of operating in parallel with, or independently from the main power grid.

DEMAND SIDE MANAGEMENT STRATEGIES

Energy demand management, also known as demand-side management (DSM) or demand-side response (DSR) is the modification of consumer demand for energy.

ENERGY STORAGE

Energy storage systems are key to managing variations in energy demand and more importantly so with deployment of variable generation resources such as solar and wind. Technology options for energy storage include electrochemical batteries; flow batteries; fuel cells; flywheels; hydroelectric storage; compressed air energy storage (CAES); supercapacitors; and gravity-based storage.



POWER ELECTRONICS

Power electronics devices are proven economical solutions for deferring transmission investment, increasing the capacity of existing grid infrastructure, and ensuring dynamic stability during system fluctuations, caused by non-dispatchable renewable generating resources.

BENEFITS

- Renewable Energy Integration through utility scale projects and distributed energy resources (DER)
- Diversification of Energy Supply and Energy Security
- Effective load/ demand management during periods of peak demand
- Investment deferral associated with generation, transmission and distribution network expansion
- Providing ancillary services such as frequency response, voltage control, or power factor correction and ensuring grid stability

WHAT IS DRIVING ADOPTION?

- Rural/ off grid electrification
- Growing demand for distributed power generation
- Growing impetus on energy efficiency and effective energy management
- Higher penetration of renewable energy in electricity mix
- Increasing need for grid stability and resilience

PATENT AND INNOVATION TRENDS – KEY AREAS OF RESEARCH

- Use of more than one energy generation source in parallel in a network
- Arranging batteries in a microgrid network to ensure grid balancing
- Network power distribution for AC and DC types
- Data processing systems designed for managing electric, gas and water network systems
- Networking schemes aimed at sharing the load between generators

PROMINENT COUNTRIES/ TECHNOLOGY PROVIDERS

KEY APPLICATION AREAS

- Residential and commercial projects with distributed renewable energy
- Off grid/ rural electrification
- Military establishments
- Industrial clusters with dedicated microgrid network
- Utility scale renewable energy projects
- Telecom towers

OPPORTUNITIES FOR KSA LOCALIZATION

Manufacturing of the following technology components:

- Solar Panel Assembly
- Batteries, Inverters and Charge Controllers
- Energy Meters
- Cables, wires and other low and medium voltage equipment

CHALLENGES TO SCALING IN KSA

1. Subsidized electricity tariffs and fuel costs affect financial viability of renewable energy and energy storage projects including microgrids
2. Absence of regulatory framework to incentivise development of distrib-uted energy resources, microgrids or energy storage projects
3. Absence of financial incentives and subsidies to improve payback periods and ROI
4. Limited end user awareness about technology and benefits