Behavioral Analysis of Microgrid System - Various Configurations

Objectives -

- Simulate and Develop a model of a Microgrid System to have on-site generation at customer side.
- Demonstrate operation of Microgrid under Islanded mode and in various configurations.
- Simulation and analysis of test bed in various configurations.
- Laboratory scale hardware design and implementation of simulated model.

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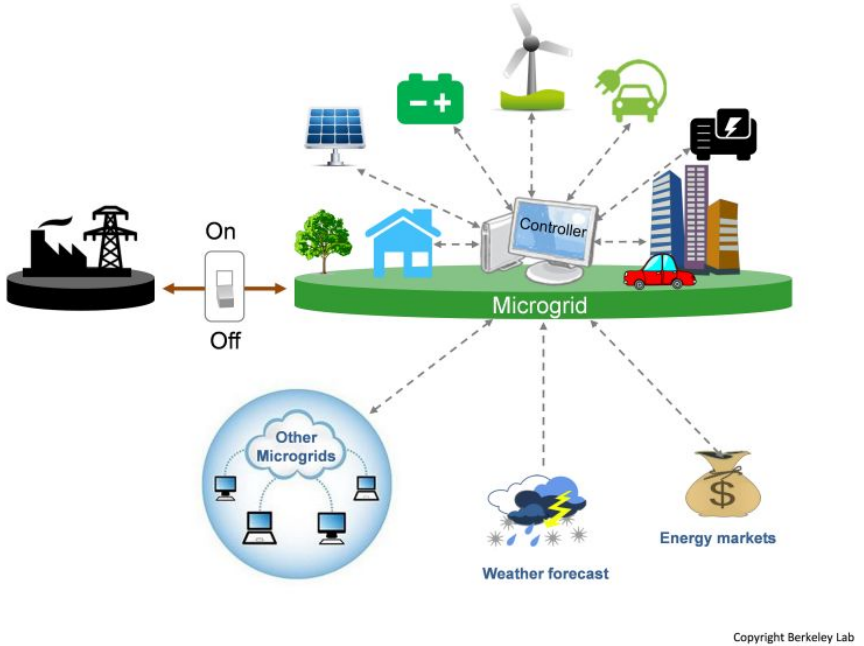
Applications/Target Users:

Pattern of microgrid market:

- Urban
- Semi-Urban
- Remote

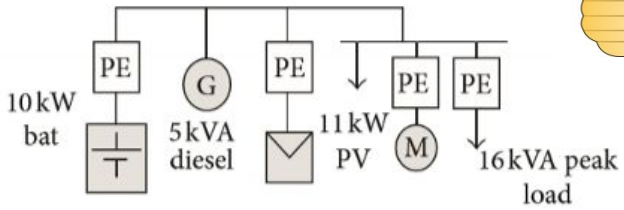
End Use:

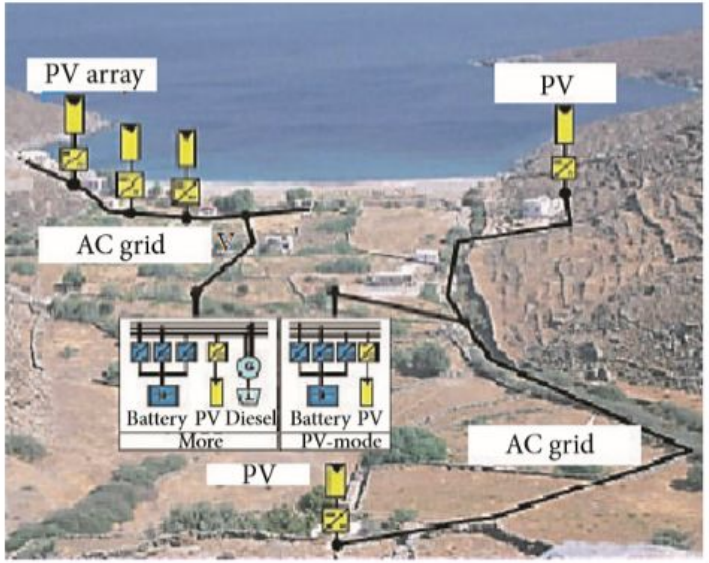
- Commercial & Industrial
- Remote
- Government
- Utilities
- Institutes & Campuses
- Military
- Healthcare



Existing Microgrid Systems:

- **Greece: Kythnos Microgrid.** The Kythnos Microgrid was designed to supply power in a remote island in Greece. In this Microgrid, solar PV system and diesel are used as DG sources and battery as a storage system. This Microgrid is isolated and electrifies 12 houses in the island.

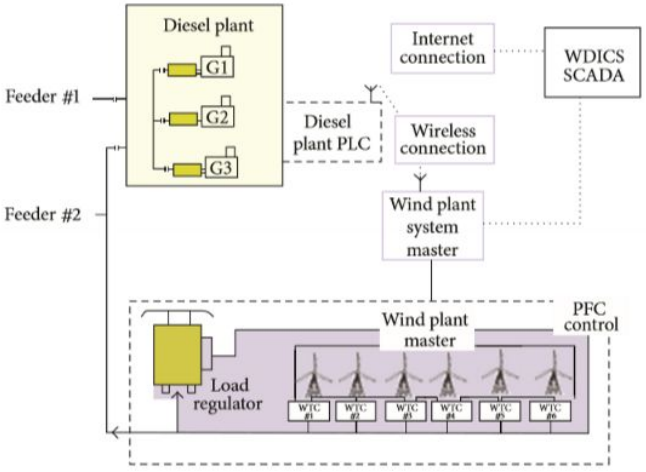




Existing Microgrid Systems:

- **Canada: Ramea Microgrid.** In the Ramea integrated wind-diesel project, Wind energy and diesel have been used as DG sources. An important feature of this Microgrid is that it is grid connected and it does not have any storage system.

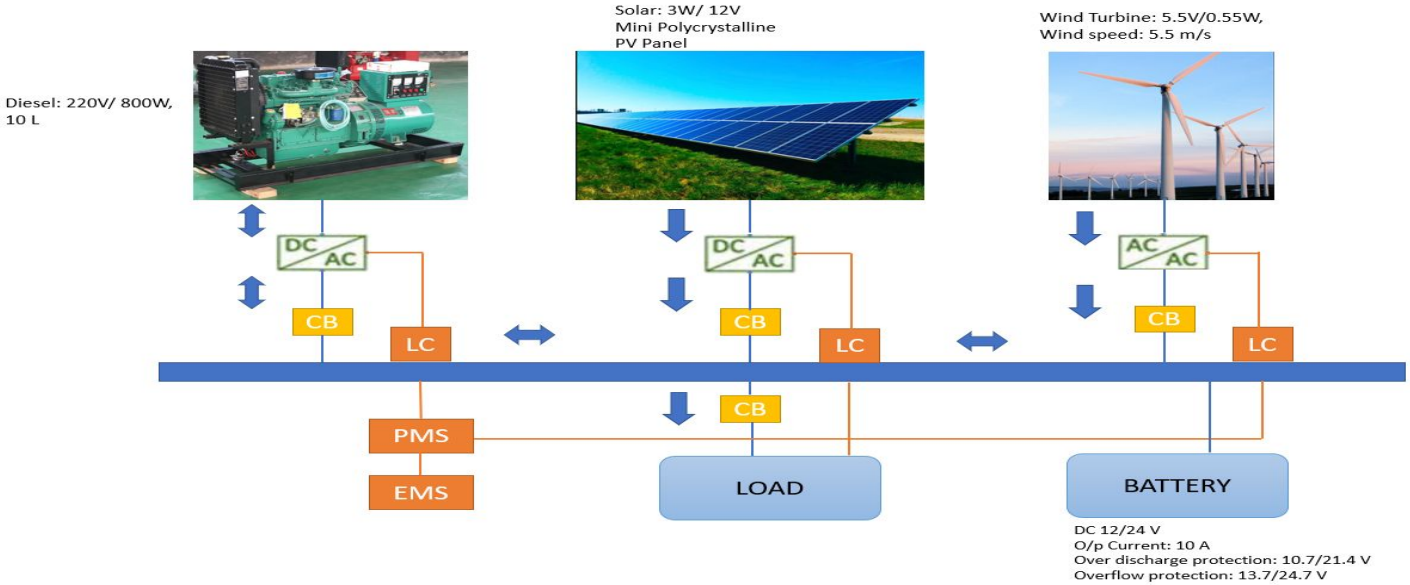
Ramea wind-diesel project



Advantages/Improvements over Existing Systems:

- Provides flexibility to use cleaner energy sources like Solar and Wind Energy.
- Design of infrastructure that increases reliability , controllability, and power quality of the system during power blackouts and disturbances.
- Provision to integrate highly-efficient CHP, reducing fuel use, line losses, and carbon footprint.
- Ability to operate in islanded mode, as well as to disconnect from utility grid during grid failure and operate independently.
- It reduces demand on utility grid thereby preventing grid failure.

System specifications:



System Requirements:

Hardware requirements:-

- PV Cells (Solar Panels)
- Energy Storage System (Battery)
- Diesel Generator
- Miniature Wind Generator
- DC bus
- Test Bed (Loads like Motors, fans, lamps etc.)
- DC/AC and DC/DC Converters

The hardware requirements listed above are variable, and subject to change based on further experimentation and testing.

Software requirements:-

- Matlab/Simscape
- Simulink

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Tentative Timeline:

Phase 1	
Complete and exhaustive literature survey	September to mid-October 2020.
Simulation of Microgrid in Various Configurations	November 2020.
Phase 2	
Finalization of Hardware Design for prototype	December 2020 to January 2021.
Build and Test Period for Hardware Prototype	February 2021 to March 2021.
Presentation of Prototype and Final Simulation	April 2021.

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Thank you!