1st Open Day and Workshop
14th July 2022

INSTITUTO DE SISTEMAS E ROBÓTICA
UNIVERSIDADE DE COIMBRA

Optimization and management of Microgrids to deliver high power quality in critical and disaster situations

Alexandre Filipe Matias Correia // alexandre.correia@isr.uc.pt

Motivation

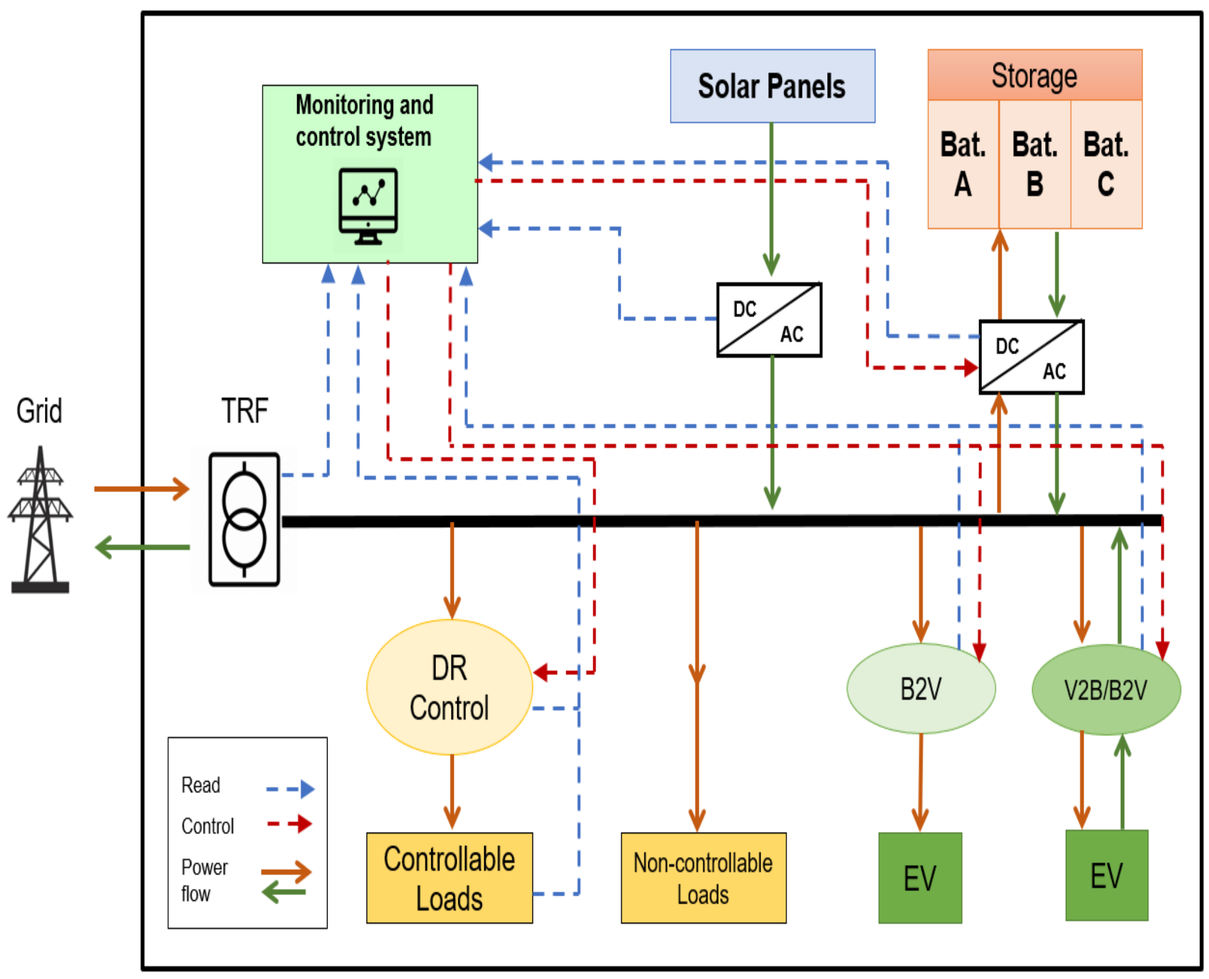
- One of the main symptoms of the severity of climate change is the increase in natural disaster frequency and magnitude.

- The emerging concept of electrical microgrids is changing the paradigm of how power grids are built and managed.
- Using distributed energy sources and innovative control strategies this work intends to implement a microgrid capable of ensuring high-quality supply of critical and priority loads during disaster situations and energy scarcity.
- **Energy flexibility is the key tool!**

Methodology:

- ➢ Maximize the use of local energy generation;
- ➢ Use energy storage systems to reduce the mismatch between generation and demand and to contribute to self-sufficiency;
- ➢ Take advantage of vehicle-to-grid to supplement storage and supply critical loads during emergencies;
- ➢ Classify and characterize priority loads, schedulable loads and non-essential loads;
- ➢ Use telemetry and sensors to measure all the required parameters and coordinate active assets;
- ➢ A multiobjective analysis will be made to optimize economic, technical and environmental results.

Microgrid of the Department of Electrotechnical and Computer Engineering



Research questions:

1. *How can the existing resources in a microgrid be optimized for reliability and environmental impact?*
2. *What is the best method to implement stable and reliable microgrids in remote and isolated areas?*
3. *How long can a microgrid maintain self-sufficiency without sacrificing the stability of operation and quality of supply, specifically in remote and isolated areas?*
4. *How much resiliency and/or redundancy is needed to mitigate damages to supply and operation during disaster situations in a microgrid?*

Contributions

“ This work aims to contribute with a methodology and results to optimize and improve the managing strategies of electrical microgrids through the usage of smart algorithms capable of coordinating the various distributed resources with a focus on ensuring the stability of operation and safety of supply during critical situations ”