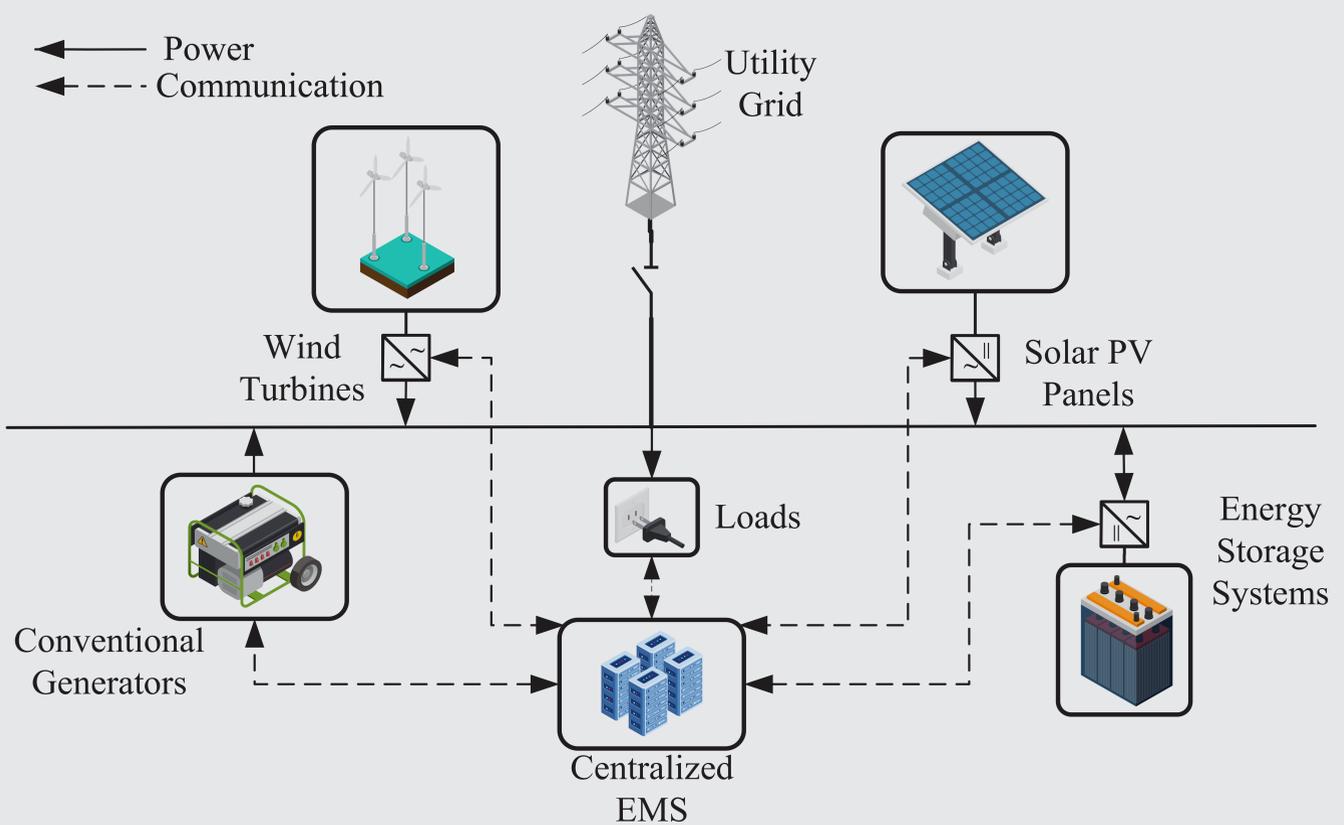


OPTIMIZATION FOR ISLANDED MICROGRIDS

A Master's thesis by Gowtham Meda Vanaprasad & Sarthak Chopra
Energy Engineering, Aalborg University



What is the concrete problem you have worked with?

A microgrid is a local, distribution level smart grid with the capability of disconnecting from the main energy grid and operating autonomously. Microgrids offer technical, environmental, and economical benefits and have emerged as a prominent technology attempting to challenge the norms of the conventional power system. However, islanded microgrids face many challenges and controlling the operation of its various components optimally can be difficult. Thus arises the need of an energy management system (EMS). An EMS is a supervisory level of control that adds intelligence to the system with the aim of optimizing the operation by increasing efficiency, reducing costs, or any other objective of interest.

What is your solution to the problem?

In this thesis, an offline energy management scheme is proposed that attempts to optimize the microgrid operation with minimizing costs and maximizing contribution from renewable energy sources. The proposed scheme was simulated on both a test system and a benchmark system, and the results approve the effectiveness of the proposed scheme. The EMS ensures optimal operation and reliable supply of power in the microgrid. The project was written in collaboration and under the guidance of researchers from the Center for Research on Microgrids (CROM) at AAU and is expected to be published in a scientific journal soon.

Which SDG does your project relate to?



Sustainable Development Goal 7
- Ensure access to affordable, reliable, sustainable and modern energy for all

By including an objective of maximizing renewable energy, or conversely, minimizing curtailment of renewable energy, the scheme reduces the environmental impact from conventional fossil-based energy in the system. Moreover, by optimizing the entire microgrid operation for a given time horizon, a reliable system operation can be achieved that ensures the supply of clean electricity to the end consumers.



Sustainable Development Goal 11
- Make cities and human settlements inclusive, safe, resilient and sustainable

Although historically microgrids have been powered by conventional sources only, to be in-line with the Sustainable Development Goals and given the nature of the ongoing climate crisis, microgrids need to be powered by renewable sources of energy too. Moreover, microgrids with renewable sources, along with complementary technologies like energy storage systems, can certainly aid in achieving the dual goals of electrification, specifically rural electrification, and fulfilling the sustainable energy targets for 2030 and 2050.