Abstract: Monitoring and fault diagnosis system for Micro-Grids dedicated to smart buildings.

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In the context of the energy transition, smart buildings are beginning to play an important role in the development of the country. They must participate in the integration of renewable energy sources to facilitate self-consumption and zero energy, adapting to internal or external limitations and guaranteeing the correct functioning of the system through a detection and monitoring system. Today some buildings have microgrids and there are control systems that manage the system. However, everything is susceptible to failure, therefore a supervision system that is monitoring the components is necessary.

The concept of the electricity grid has been changing in recent years, previously the electricity grid mainly contained Big Power Plants: (coal, natural gas, biomass, nuclear, wind, solar, etc.), transmission lines, and transformers mainly that worked in a unidirectional. Now we find a different, evolved and constantly changing electrical network called Microgrid (MG) which is a group of interconnected loads and distributed energy resources. MGs have clearly defined electrical boundaries and, can connect and disconnect from the grid to enable it to operate in both grid-connected or island mode.

Two case studies of MGs located in the ESTIA BERI building and the laboratory building of the Javeriana University are being worked on and, the simulation is being developed in Matlab's Simulink software. The MG generally has loads, distributed energy resources, and control systems, these elements are susceptible to failures. Through the systematic review of the literature, different classifications of faults have been identified, for example, according to their location or their time characteristics. The measured variables can show an increase or decrease that is outside the thresholds outlined, therefore it is necessary to generate a Fault Detection and Diagnosis (FDD) process which allows the fault to be identified quickly and to have the most information about it. An FDD strategy allows a failure could be detected, isolated, and identified prematurely, in such a way that it can be located, as well as to determine its occurrence and its cause. To solve the diagnosis problem, some hybrid methods by using a combination of techniques such as system identification, state observers, and artificial intelligence have been explored.

When identifying and analyzing the most critical systems, great interest was observed in the faults that occurred in the solar panels and the batteries, since it is a critical point for the generation and storage of energy of the network. Important needs have been identified in terms of FDD for microgrids: quick detection and diagnosis, the classification of the faults, and diagnosis when multiple faults have occurred. This is important to develop an appropriate method to carry out a reconfiguration of the system and put it into operation in safe conditions. Strategies based on artificial intelligence to make decisions are being explored and are being integrated into the supervision system.

KEYWORDS: Fault diagnosis, Monitoring, Supervision, Prediction, Building microgrids, Photovoltaics.

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