



Resiliency Analysis for the Development of Microgrid Architecture against Climate-Driven Events in the Dominican Republic's Electric Systems

This document details the main points of the research titled: ***Resiliency Analysis for the Development of Microgrid Architecture against Climate-Driven Events in the Dominican Republic's Electric Systems***, being developed by the professors and researchers Ramón Emilio De Jesús (PI), Rafael Batista (CI), and Abraham Espinal (CI), from the School of Mechanical and Electrical Engineering of the Pontificia Universidad Católica Madre y Maestra (PUCMM). The research is part of the Partnerships for Enhanced Engagement in Research (PEER) implemented by the United States Agency for International Development (USAID), one of the winning projects from an application pool of over three thousand with an approved budget of USD \$ 159,066.

The objectives of the project are designed so that the results are a technical and regulatory route to build resilience against the extreme effects of climate change specifically to the Dominican Republic energy infrastructure, with the vision of translating our findings to other island nations.

A reliable electrical network is the backbone of modern society, a key element in all economic activity and processes, and even more so for nations located on islands that face the challenge of geographic isolation and the need for self-sufficiency. Proof of this is the massive damage caused by hurricanes María and Irma on our neighboring island Puerto Rico in September 2017, with damage to the economy estimated at \$90 billion dollars, therefore, it is vitally important to propose technological innovations that increase the level of resilience of the Dominican Republic in the face of this type of event, and work with regional actors and industry to accomplish the same.

The project proposes different simulation scenarios to evaluate the impact of microgrids on increasing the resilience of the local electricity grid in the face of extreme events associated with climate change.

The aim is to create a **hardware-in-the-loop** laboratory **testbed** in the PUCMM-Santiago campus that allows evaluating the proposed algorithms with physical systems representative of the scenarios that are studied, forming a microgrid laboratory that will be used both for research and teaching. Additionally, a study of simulation scenarios is being prepared in which microgrids are formed in the distribution network of the city of Santiago, specifically in circuits that, due to their characteristics, are of special interest for these purposes.

Several collaborative ties have been established for the elaboration of this project. The PEER program seeks to promote collaboration between high-profile researchers associated with the National Science Foundation (NSF) of the United States with researchers from other countries to promote development through research proposals. Therefore, the participation of **Dr. Fabio Andrade Rengifo**, Associate Professor at the University of Puerto Rico with extensive experience in microgrid systems, and **Dr. Nehrir Hashem**, Professor at Montana State University, an expert in the area of microgrids with an h-index of 45 and more than 10,000 citations. The regional energy utility, EDENORTE, is the main stakeholder of the project and is providing technical information such as network topology, feeders, line characteristics, load profiles, location of generators, switching devices, as well as consulting and technical expertise.

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Project overview (Spanish): [***Resiliencia Energética - Microredes frente a eventos climáticos | PUCMM - YouTube***](#)