"Research is the Foundation of Knowledge"

Research Projects Completed - 2022

Development of a novel predictive based Smart Distribution Management System (S-DMS) to maximize the rooftop PV absorption capacity of last mile networks.

Grant no: RG/2018/EA&ICT/01

Names and affiliations of Investigators

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Front panel of the distribution line model designed to test voltage violations and mitigation methods

INTRODUCTION (Text: Calibri, 11, single space)
(Maximum 50 words)

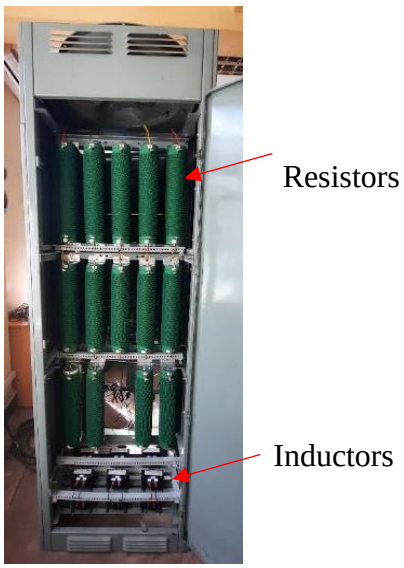
Integrating roof-top PV modules is limited due to the possible voltage and line loading limit violations. In this research, network management strategies executed through a Smart Distribution Management System (S-DMS) that integrates different controllable entities in distribution networks is considered to support these networks thus increasing the PV integration.

PROJECT ACHIEVEMENTS/OUTPUTS (maximum 75 words)

A novel strategy to minimize unbalance in LV networks based on automatic re-phasing of grid-connected rooftop PV systems was proposed with PV re-phasing switch to perform automatic re-phasing of the PV systems. The discrete bacterial foraging optimization algorithm (DBFOA) was introduced to determine the optimal phase combination of grid-connected single-phase PV systems. A three-phase three-limb inverter was hardware implemented and tested. A three-phase four-wire distribution system of 540 m is modeled using resistors and inductors.

UPDATED STATUS AFTER THE FINAL REPORT ACCEPTED BY THE NSF
(Maximum 75 words)

The hardware implemented inverter was connected to a DC-DC boost converter to develop a complete PV system. The DC-DC boost converter is used to test different maximum power point tracking (MPPT) techniques to capture the maximum available PV power. The hardware implemented line model is used to create voltage violations to test the mitigation methods. A SCADA system is developed to get the smart meter data in the line model.



Internal view of the resistors and inductors used to develop the line model

Fabricated circuit for re-phasing inverter

Postgraduate degrees completed, if any.

- Name of the Research Student:

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……..

- Degree: (PhD/M Phil / M Sc/ MD)
- Year completed: ……
- Thesis title:

RELEVANCE TO SOCIO ECONOMIC DEVELOPMENT OF THE COUNTRY (Maximum 75 words)

Currently, CEB is not allowing to connect more rooftop PV to the distribution network in some areas as there is a risk of violating voltage and current limitations. By using the proposed re-phasing method, voltage and currents in the network can be maintained within the standards while integrating more renewables to the network in order to reduce the carbon footprint. The revenue to the rooftop PV holders can also be enhanced with this approach.

RECOMMENDATIONS FOR FOLLOW-UP IN TERMS OF TECHNOLOGY DEVELOPMENT/ START-UP BUSINESSES, IF ANY (Maximum 75 words)

The proposed method can be tested in a real network with the collaboration of solar panel producers. By convincing the customers about the extra income with the proposed method, they will be persuaded to install rooftop PV systems. This will both beneficial to the solar panel producers and customers as well as to the environment.

As the technological development, more MPPT methods using latest technologies such as artificial neural networks can be developed and tested in the hardware setup.

For more details of the project, contact:

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