Islanding Detection and Load Shedding Implementation for Integrated Multiple Distributed Generation fed Smart Grids

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PROPOSAL DETAILS

(SUR/2022/003634)

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[College (Private)]

Technical Details :

Scheme : State University Research Excellence (SERB SURE)

Research Area : Electrical Electronics & Computer Engineering (Engineering Sciences)

Duration : 36 Months

Contact No : +919154463336

Date of Birth : 13-Apr-1989

Nationality : INDIAN

Total Cost (INR) : 15,12,500

Project Summary :

Islanding detection is a major task in micro grids. The literature survey of standard databases found that detecting balanced islanding events or close power mismatch islanding cases challenging. In this case, the net flow of energy transfer between the DG system and grid is zero. The islanding detection parameters may vary if there is a mismatch between the load and generation in the islanded area is more. The existing remote control methods are more expensive to implement on practical power distribution systems. The passive islanding methods are failed to detect close power mismatch islanding cases, the active strategies are continuously injecting the disturbance signal for islanding detection that degrade the power quality of the system. Most of these methods fail to classify islanding and non-islanding events accurately; sometimes, non-islanding events are treated as islanding events and vice versa. Till now, no work has been carried out in the balanced islanding detection and load shedding implementation of multiple DG system fed integrated grid. The following specific and novel methods are proposed based on the ongoing work of the investigator concerning Principal Investigator publications. This research mainly focuses on developing an efficient islanding detection method under balanced or small power mismatch conditions and feeding the load connected in the islanded area using hybrid ROCOF islanding detection method and priority based load shedding algorithm implementation.

Objectives :

Till now, no work has been carried out in the balanced islanding detection and load shedding implementation of multiple DG system fed integrated grid. The following specific and novel objectives are proposed based on the ongoing work of the investigator concerning Principal Investigator publications are as follows a. Design and develop a unique islanding detection method for balanced islanding and small power mismatch islanding detection of integrated DG. b. To incorporate low-frequency current injection-based active method with zero power quality issues for exact classification of non-islanding events from islanding events. c. To implement the proposed ROCOF-based hybrid islanding detection method on multiple DG integrated systems as per the IEEE 1547 DG integration standards. d. Unique implementation of decision tree method of priority-based load shedding algorithm on multiple DG fed smart grids on standard IEEE bus system for utilization of energy produced in the islanded DG systems and to maintain the stability of the islanded area. e. To incorporate high power quality improvement features on the islanded micro grids with reference reactive power control of grid interfacing inverters for cost-saving energy utilization.

Keywords :

Micro grid Islanding detection, Load shedding, Smart grids, Energy cost savings

Expected Output and Outcome of the proposal :

• Achieves a unique islanding detection method for balanced islanding and small power mismatch islanding detection of integrated hybrid DG system.
•The implemented ROCOF based hybrid islanding detection method on multiple DG integrated systems will detect the islanding cases per the IEEE 1547 DG integration standards in less than 2 seconds.
• The implemented load shedding algorithm may supply power to the load connected in the islanded micro grid area with high power quality improvement features irrespective of power in main grid.
• In the final stage, the project is implemented in Malla Reddy Engineering College, by considering a Solar PV system, Wind system, Diesel generators and load connected in the college as an isolated micro grid when power is off in the main grid which is most beneficial to the college to supply load connected in the emergency areas.
• After successful implementation, the project team may get 2 patents with a grant, 3 to 4 IEEE transactions in SCI journals with high impact factor and 5-6 IEEE international conference presentations with proceedings
• Three UG project teams, 3 PG students and one PhD student may complete their academic projects and get their degrees
• It may help to reach the targets set by India's government committed to lowering the country's predicted carbon emissions to 1 billion tonnes by 2030, decreasing the carbon intensity of the industry to less than 45% by the end of the decade, reaching net zero carbon emissions by 2070.

Any other relevant information:

As our Indian Government has targets to reduce 45% carbon emissions by 2030 and to make it zero by 2070, this research work is much required to encourage the researchers to reach the goal of our nation. This project encourages the use of green energy India. Its place a vital role in smart homes and smart cities.

Suitability of the proposed work in major national initiatives of the Government:

Make in India, Smart Cities, Smart Village

Theme of Proposed Work:

Energy, Environment

Collaboration Details for last 5 Years :

Planned Collaboration for the proposed work with any foreign scientist/ institution ? **Yes**

S.No.	Name	Type of Collaboration
1	Dr. Flah AYMEN Associate Professor National Engineering School of Gabes City Riadh Zerig 6029 Gabes, Tunisia Tunisia	Dr. Flah AYMEN is a great scientist in this area of research. His team of researchers is executing a good no of projects in his lab in the area of Microgrids, islanding detection, Electric vehicles and wireless charging tools. Our team will visit his lab and get knowledge on advanced tools used in this research for using them in our project especially advanced controllers, machine learning applications, wireless charge tools for EV applications and other. The team also get knowledge of other projects executed by Dr. Flah AYMEN. Dr. Aymen accepted my invitation, and he is ready to share his expertise with us. In my previous projects we worked with Dr. AYMEN, achieved best results and published more than 10 articles in various SCI journals with collaboration.

SNo.	CO-PI Details
1	 **Obbu sekhar** sekhar.obbu@gmail.com Associate Professor(Electrical Engineering) **National Institute of Technology Delhi** A-7, Institutional Area, near Satyawadi Raja Harish Chandra Hospital, DELHI, DELHI *Institution under central government* D.O.B : 22 May, 1982
2	 **Marimuthu P** spm.muthu78@gmail.com Professor(EEE) **Malla Reddy Engineering College** Maisammaguda, Dhulapally (Post via. Kompally), Secunderabad, Rangareddy Dt, TELANGANA, HYDERABAD *College (Private)* D.O.B : 11 Jun, 1977