

MULTI AGENT BASED CONTROL AND PROTECTION FOR AN INVERTER BASED MICROGRID

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Science

Department of Mechanical Engineering

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DECLARATION

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ABSTRACT

Legacy electrical infrastructure is failing to provide the reliability and the resiliency towards faults expected by the modern energy intensive society. Implementation of smarter microgrids, are proving to be part of the solution for this. Development of such systems requires distributed intelligence capabilities absent in legacy control systems. This research focuses on proposing a dual layered, multi agent based control system for distributed control of a microgrid aimed at intentional islanding and dynamic load management. The architecture consists of two layers; primary strategic level layer and secondary execution level layer. The Control agent in the primary, or the strategic level, is capable of supervising the secondary layer agents. The proposed Multi Agent System (MAS) controller provides islanding capabilities to a microgrid during disturbances in the main utility grid. During islanded operation, the MAS is able to maintain the supply to the most critical local loads. If the priority levels of the loads change after loads are shed, the MAS is able to reassign power to the revised most critical load/s. The proposed multi agent based control architecture is developed using the JADE platform and it is used to control a microgrid simulated in MATLAB/SIMULINK. In order to validate the effectiveness of the proposed method, investigations are carried out for islanding and dynamic load management scenarios simulated on the test network. The results of these studies show the capability of developing a reliable control mechanism for islanding operation of microgrids based on the proposed concept.



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Dedicated
To my parents

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LIST OF ABBREVIATIONS

Abbreviation	Description
DG	Distributed Generation
DSM	Demand Side Management
FIPA	Foundation for Intelligent Physical Agents
FOSS	Free and Open Source Software
GHG	Green House gasses
GUI	Graphical User interface
JADE	Java Agent Development Framework
MAS	Multi-Agent Systems
NCRES	Non-conventional Renewable Energy Sources
OS	Operating Systems
PC	Personal Computer
PCC	Point of Common Coupling
PV	Photovoltaic (cell)
PWM	Pulse Width Modulation
SCADA	Supervisory Control and Data Acquisition



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