INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: Brownout-based Power Allocation Strategies in Microgrids

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Thesis Submitted to the Department/ Center	:	Dept. of CSE
Date of completion of Thesis Viva-Voce Exam	:	25-Mar-2023
Key words for description of Thesis Work	:	Microgrids, Dynamic Programming, Optimization, Demand Response, Demand-side Management, Power Allocation, Microgrid Sizing

SHORT ABSTRACT

Future Smart Grids are expected to transform into hierarchically connected networks of miniaturized power systems called Microgrids, which are usually aimed to cater to a small geographical region. Microgrids have been envisaged to integrate heterogeneous distributed energy resources (DERs) including renewables (like photovoltaics, wind turbines and hydro–electricity), fossil fuel based micro–generators and batteries, along with occasional transfers of power from/to the main grid. Microgrid operations management is an important and yet a challenging problem. This is especially because, microgrids must be effectively tuned to maximize renewable energy penetration which are often volatile/intermittent, while still being able to schedule power generation, distribution and consumption in a fashion that ensures an economic and reliable operation. In order to achieve an effective balance between demand and supply, in the face of possible intermittent power shortage scenarios, Demand Response (DR) management strategies for microgrids must include mechanisms that allow adaptive urgency–prioritized control over electricity consumption. Today, with the advancements in smart metering as well as information and networking technologies, implementation of such adaptive power management schemes which require precise knowledge and finer controllability over consumer loads on the demand side, have become practical. The thesis of this dissertation is as follows:

I*n the presence of intermittent power deficits, efficient policies for microgrid sizing, equitable power distribution, appliance scheduling, real–time power balancing, etc., can be designed by using brownout–oriented approaches which allow selective provisioning of electricity to essential appliances while curtailing supply to less important ones, in times of power shortages.*