MANAGING THE RESOURCE INTERMITTENCY TO MAXIMIZE THE SOLAR PHOTOVOLTAIC PENETRATION

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DECLARATION OF THE CANDIDATE AND SUPERVISORS

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(Dr. Asanka S. Rodrigo)

ABSTRACT

Sri Lanka as a developing country is in its way for a green environment with energy security. Sri Lanka has already agreed to reduce 20% of the greenhouse gases through the signed agreement COP21 of the United Nations Environmental Framework Convention on Climate Changes (UNFCCC).

The solar resource is the most commonly available renewable energy source in Sri Lanka. Therefore Sri Lankan government set its target to install 1000MW solar photovoltaic rooftop systems by 2020 from launching the programme called "Battle for Solar Energy". The number of solar rooftop installations increased rapidly with the launch of this programme and at present the total rooftop installation capacity is more than 100 MW.

The intermittency behavior is the main obstacle associated with solar photovoltaic energy generation. The utility (Ceylon Electricity Board (CEB)) has to maintain thermal power plants running as spinning reserves to overcome the effect of intermittent nature of solar photovoltaic power plants. This research titled as "MANAGING THE RESOURCE INTERMITTENCY TO MAXIMIZE THE SOLAR PHOTOVOLTAIC PENETRATION" was carried out to find out a way for maximizing solar photovoltaic penetration. Two models were developed using Matlab Simulink to study the behavior of solar power plants integrated to the power distribution system. One is a centralized PV system and the other is a system of small PV plants geographically scattered and connected over a low voltage distribution feeder. The cumulative capacity of the scattered system is similar to the capacity of the centralized system.

The measurements of the simulations reveal that, more solar photovoltaic capacity can be connected to the distribution system while meeting the grid code requirements when the solar PV systems are geographically scattered.

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ABBREVIATIONS

PV : Photovoltaic

DC : Direct Current

AC : Alternating Current

CEB : Ceylon Electricity Board