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Grid-Connected Photovoltaic System: System Overview and Sizing Principles

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Abstract : The optimal size of a photovoltaic (PV) array is considered a critical factor in designing an efficient PV system due to the dependence of the PV cell performance on temperature. A high temperature can lead to voltage losses of solar panels, whereas a low temperature can cause voltage overproduction. There are two possible scenarios of the inverter’s operation in which they are associated with the erroneous calculations of the number of PV panels: 1) If the number of the panels is scant and the temperature is high, the minimum voltage required to operate the inverter will not be reached. As a result, the inverter will shut down. 2) Comparably, if the number of panels is excessive and the temperature is low, the produced voltage will be more than the maximum limit of the inverter which can cause the inverter to get disconnected or even damaged. This article aims to assess theoretical and practical methodologies to calculate size and determine the topology of a PV array. The results are validated by applying an experimental evaluation for a 100 kW Grid-connected PV system for a location in Halifax, Nova Scotia and achieving a satisfactory system performance compared to the previous work done.

Keywords : sizing PV panels, theoretical and practical methodologies, topology of PV array, grid-connected PV
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