



## METADATA

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## Abstract

Substantial environmental reasons have decisively contributed to the large penetration of renewable energy sources (RES) in producing electrical energy. Given that RES mainly produce substantial amounts of power utilising wind turbines and photovoltaic (PV) systems, the control technologies of these systems play a significant role in their development and further penetration in electricity production. Technical issues regarding the various prevalent topologies for the diverse types of wind turbines and PV systems are thoroughly analyzed both at the descriptive level as well as at the level of their dynamic operation. Issues of maximizing the generated power based on external conditions or optimizing quality characteristics such as reactive power injections, etc., are theoretically analyzed and then used to design appropriate control schemes. Integrated solutions are proposed, which consider all the individual systems and devices, such as filters, lines and controlled power electronics

devices that constitute the power interface to the local loads or the grid. The analysis is developed based on the overall dynamic/mathematical description of the complete system considered each time, incorporating the required control and feedback loops. The entire analysis is based on systems theory with stability being a condition that is incorporated and satisfied while simultaneously the main control objectives are being fulfilled. In this way, it is possible to make specific design calculations for the complete wind turbine and photovoltaic systems. The operation of RES with an emphasis on wind turbines and photovoltaic systems is also crucial for modern power systems. The exchange of energy both from and to the main grid is already taking place, while the emergence of new local systems such as microgrids, energy storage systems, etc., makes even more essential the need for the proper development of the control technologies of all the units, which are analyzed in this book.

