Title: Advanced Control for Wind Turbine Grid Connection Requirements

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In the recent years the use of wind energy as an alternative to conventional sources has significantly increased. The growth of installed wind power capacity connected to the transmission and distribution network made an adaptation of the grid code necessary. Indeed, as it is already being experienced in some countries such as Denmark and Germany, this new scenario no longer allows wind farms to simply inject the maximum power they are able to extract from the wind into the grid and to disconnect when a network fault occurs. As a result, a new set of grid connection technical requirements establishes some major constraints and performance that wind farms have to meet to contribute to the proper functioning of the electrical grid. In this work we refer to those involving grid frequency control, power curtailment and other active power injection constraints. Since conventional wind turbine modes of operation are based on maximum power point tracking (MPPT) at low wind speed and power limiting at high wind speed, new advanced control methods need to be employed to let the turbine function in different operating points that would ensure the satisfaction of the grid requirements. In this presentation, we show how, in Matlab/Simulink simulation environment, the proposed control architecture proves to fulfil the aforementioned active power constraints while outperforming classic linear controllers such as the PI one. Simulations for different scenarios of interest are carried out based on CART (Control Advanced Research Turbine) parameters.

Biography

Nicolò Gionfra received the bachelor degree in Electronic Engineering, and the Laurea Magistrale degree in Systems Engineering at “La Sapienza” University of Rome in 2011 and 2013 respectively, and the Research Master degree in Automatic Control at CentraleSupélec in 2013. He is currently a PhD student in the automatic department at CentraleSupélec. His research interests include wind turbine and farm control, renewable energies, optimal and nonlinear control.

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Session name/ number: 9-1
Category: Oral presentation