

Modeling, analysis and control approaches of multimegawatt medium-voltage power-electronic-based power systems and their applications

Abstract. - In recent years, there have been an increased number of grid-connected DGUs through power electronic interfaces, which, in turn, has led to harmonic distortion problems. Adverse power quality effects due to harmonic distortions are, for instance, interfering with communication, control and protection systems, reduction of the equipment lifespan, create additional losses in the power system, resonance and stability problems. The harmonic distortion not only depends on the harmonic sources, but also on the interaction with the grid, loads, controls, and the others DGUs. Besides, in power networks with closed-loop controlled power electronic converters, the harmonic content of the harmonic sources is tied to the harmonics in the signals measured for the control schemes; introducing undesirable behavior on the controllers performance, which can lead even to stability problems. It is a common practice to assume certain ideal operating conditions which neglect the harmonic interaction, to simplify the model when performing some specific analysis, designs or studies. However, these ideal operating conditions are increasingly difficult to sustain as valid. Harmonic generation, interaction of controls and harmonic components, resonances, harmonic stability issues, and power quality problems in general, among others, are phenomena commonly reported in power-electronic-based power systems and must be addressed in modeling, analysis and control of multimegawatt medium-voltage power-electronic-based power systems.

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Biography

Dr. Juan Segundo Ramírez received the Ph.D. degree from Universidad Michoacana de San Nicolás de Hidalgo, Michoacán, Mexico, in 2010. He is Full Professor at the Universidad Autónoma de San Luis Potosí (UASLP), S.L.P., Mexico. In 2011 he was awarded the Weizmann price for the best Ph.D. thesis in engineering and technology in Mexico. In the same year, he was awarded the PRODEP Profile and the membership of the National System of Researchers (SNI). At the present, he has participated as director or co-director of five master thesis, four Ph.D. thesis, and three bachelor thesis. At the present, he has 19 journal papers and two book chapters. He is the co-founder of the Industrial Postgraduate Program on Electrical Power System at the UASLP. He is in charge of the Electrical Power System Laboratory at the UASLP.