Islanded Operation of Distribution Grid with High Penetration of Renewable Energy Sources

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Renewable energy sources are being connected not only to transmission but also to distribution grids. Medium voltage distribution grids are meshed grids that are operated radially. Their reliability is determined by their reconfiguration capability. However, portions of medium distribution grids can lack of supply in case of specific disturbances or abnormal operating conditions.

Al alternative to the lack of supply in medium voltage distribution grids is the use of the available renewable energy resources. The feasibility of the use of renewable energy sources depends on their ability to control both voltage and frequency to guarantee the quality of the electrical supply.

This contribution will show from real life tests [1] that stable operation islanded operation of medium voltage distribution grids is not feasible due to the limited control capability of renewable energy sources connected through power electronic converters under grid feeding control scheme. It will show that medium voltage distribution grids can run properly while isolated from the main grid if they incorporate battery energy storage systems. Records of real life tests will prove it.

In addition, this contribution discusses the conditions por parallel operation of several battery energy systems under grid forming control scheme with inverter based generation under grid feeding schemes [2]. Stability conditions will be drawn.

References

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Short biography of Prof. ***Luis Rouco Rodríguez***

Luis Rouco Rodríguez obtained the titles of Industrial Engineer and Doctor Industrial Engineer for the Technical University of Madrid in 1985 and 1990 respectively. He is a Professor of the Technical School of Engineering (ICAI) of the University Pontificia Comillas of Madrid. He has been The Director of the Department of Electrotechnics and Systems in the period 1999-2005. It teaches courses of Electrical Machines in the studies of Industrial Engineer and of Advanced Analysis of Systems of Electric power and of System stability of Electric power in the Program of Postdegree in Electric power School.

He has been The Director of the Specialist's Course in Operation of the Electrical System REE-ICAI in the period 2004-2007 and of the Master in Electrical Technology ENDESA-ICAI in the period 2007-2011. Prof. Rouco Rodríguez develops his activities of research in the Institute of Technological Researh (IIT) where it has supervised numerous projects of research and consultancy for the public Spanish administrations (Department of Education, Department of Promotion, GIF, etc.), the principal electrical Spanish companies like Endesa, Iberdrola, Natural Gas, Electrical Network of Spain, Union Fenosa and Viesgo and other industrial companies as ABB, Iberian AEG of Electricity, Ardanuy Ingeniería, Babcock and Wilcox Española, Hard Felguera, Eliop, Grouped Businessmen, Indra, Initec Energía, To hoist, SEMI, Sener and Assembled Technologies. Also it has developed projects for companies and foreign institutions as Alstom (Switzerland), University of La Plata and CAMMESA (Argentina), RTE-France and INESC - I Carry (Portugal). The areas of work of the Prof. Rouco Rodríguez are the shaped one, analysis, simulation and control of the systems of electric power.

Prof. Rouco Rodríguez has published great number of articles in conferences and national and foreign magazines. Prof. Rouco Rodríguez is member of the IEEE and of CIGRÉ, President of the Spanish Chapter of the Power and Energy Society of the IEEE and member of the Executive Committee of the National Committee of CIGRÉ's Spain. He has been an investigative visitor in Ontario Hydro (Toronto, Canada), MIT (Cambridge, Massachusetts, The United States) and ABB Power Systems (Vasteras, Sweden).