



Leaders in Mechanical Engineering & Civil and Environmental Engineering Lecture Series



“Economic Valuation of Reserves in Power Systems with High Penetration of Wind Power”

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Abstract:

This presentation discusses a methodology to determine the optimal level of reserves and to calculate the cost of providing such reserves within a daily time framework in a power system with a high penetration of wind power. Reserve requirements are driven by the tradeoff between the value of lost load and the energy and reserve offers. In particular, the methodology is based on a novel and flexible procedure for clearing electricity markets with high levels of uncertainty due to the imperfect knowledge of the stochastic processes involved, as in the case of those markets working with a high penetration of wind power. This procedure averts the need for binding the market outputs to a specific realization of stochastic processes, embeds the advantages of the simultaneous energy and reserve market-clearing procedures and makes use of the modeling capability of the stochastic programming. The procedure is then formulated as a two-stage stochastic programming problem, where the first stage represents the electricity market, its constraints and rules, and the second stage represents the power system, its operation and physical limitations. Thus, the variables pertaining to the first stage correspond to the market decisions, which consider the realizations of stochastic processes without being explicitly linked to one specific realization, but to all of them. This stochastic programming problem can be solved using appropriate mathematical programming based decomposition techniques. The methodology proposed is illustrated using an example. Some conclusions are finally drawn.

Biography:

Antonio J. Conejo, full professor at the Universidad de Castilla-La Mancha, Spain, received the M.S. from MIT and the Ph.D. from the Royal Institute of Technology, Sweden. He has published more than 100 papers in SCI journals and is the author or coauthor of books published by Springer, John Wiley and McGraw-Hill. He has been the principal investigator of many research projects financed by public agencies and the power industry. He is an Editor of the IEEE Transactions on Power Systems and an IEEE Fellow.

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