Nuntiya Chaiyabut 2014: Optimal Spinning Reserve for Wind Power Uncertainty using Security – Constrained Unit Commitment with EENS Index. Doctor of Engineering (Electrical Engineering), Major Field: Electrical Engineering, Department of Electrical Engineering. Thesis Advisor: Assistant Professor Parnjit Damrongkulkamjorn, Ph.D. 109 pages.

This thesis presents the algorithm for computing the optimal spinning reserve for power system which consists of thermal generation and wind power generation, using security – constrained unit commitment with reliability index. The spinning reserve consists of two parts: the traditional spinning reserve; and the reserve due to wind power uncertainty. The spinning reserve for wind power uncertainty is considered with the acceptable reliability level, which is the expected energy not supplied (EENS). The uncertainty of forecasted wind power is modeled as normal distribution consisting of seven sections. The wind power and probability of each section are used to calculate the expected energy not supplied together with the spinning reserve due to wind power uncertainty. The mixed integer non-linear programming problem is solved by the method which is divided into two parts: the DC security-constrained unit commitment (DC-SCUC) and the AC optimal power flow (ACOPF).

The results show that the spinning reserve takes into account the uncertainty of wind power within the acceptable level of reliability and the power output of committed generators satisfy security operation. In this study, the spinning reserve for wind power uncertainty should not be less than 0.412 MW with an increasing of 1 MW of forecasted wind power.

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