

Analysis of Wind Energy impact on Power System using Realistic Model

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Abstract

With a rapid increase of DG (Dispersed Generation) like wind power and solar power generation sources etc. in Japan and around the world, the assessment studies of DGs connection to a power system are important in order to appraise their positive as well as negative effects. In order to make an assessment of the possible impacts of the different kinds of wind energy systems on the power system, we have developed digital simulation model of doubly-fed type wind energy system, conventional induction generator type and DC link type. The developed simulation model is based on an instantaneous value, and runs on EMTP-RV (DCG).

Generally, the simulation model based on an instantaneous value is suitable for harmonic wave's analysis and analysis of respondent movement at an accident for a short term range. Moreover, it is not suitable for the analysis of the respondent movement for a long term range according to the change in the velocity of the wind. Therefore, we studied about the speed-up method of simulation to enable the analysis for a long term range. The results of studies, the simulation model based on an instantaneous value that we have developed is possible for a long term range such as analysis of frequency variation.

In order to verify the usability of the developed model, we assessed the impact of doubly-fed wind energy system on a power system by considering simple induction generator type as well as DC link type wind energy systems in different proportions in relation to the power system capacity. We also discussed about the effects of voltage fluctuation by taking the start or stop of wind type DG system as a main parameter for assessing the impact on a power system. Sudden variations in outputs are also simulated on simplified 77kV power system of CEPCO (Chubu Electric Power Co. Inc). In addition, we observed variations of outputs in wind-parks.

Some results of studies such as smoothing of outputs and the relation between reactive power and voltage fluctuation are reported in IERE general meeting.