Thermal Power Plant Models for Power System Simulation Studies

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Abstract

Power system dynamic simulations take important part in making various decisions on securing the reliability of power system stability. As for the power system frequency stability simulations, modeling of the MW response of major power plants, that is, the generator output power response to the frequency excursions is significant to predict the dynamic behavior of frequency under power system failures.

So far, in the research activities with electric power companies of Japan, CRIEPI has developed simulation models of the nuclear power plants with light water reactors and the thermal power plants commercially operated in Japan. The thermal plants here mean the fossil-fueled plants with once-through boilers, and the combined-cycle power plants.

In this paper, at the first half, the outline of the fossil-fueled plant model is described, and then an example of the influence of the plant control (boiler-turbine coordinated control) and the main steam sliding pressure control on the MW response under the frequency decline is presented. The influence is shown through the comparisons of the measured plant responses with simulation results in a field test of a LNG-fueled unit.

At the latter half of the paper, the outline of the combined-cycle plant model is described, and then some examples of comparisons between the measured responses of the plants and simulation results are presented with regard to the ACC power plants in normal operations and field tests. After this, simulation results of the MW responses of the combined-cycle plant to the frequency excursions are demonstrated.