

論 文 の 要 旨

題目 An Advanced Load Frequency Control Based on Adaptive Model Predictive Control
(適応モデル予測制御に基づく負荷周波数制御)

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The growth of human population has increased the fossil fuel demand while the fuel reserves would not satisfy the demand in future. On the other hand, people have recognized that the use of fossil fuels has contributed to the increase in the temperature of the earth a few decades ago. Therefore the invention of the other energy sources are urgently needs as alternative energies. Renewable energy sources (RESs) from wind, solar, biomass, etc. seems to be the promising alternative energy since it is renewable by natural cycle and it is almost no pollution in converting and recycling. Unfortunately, RESs tend to be unstable and depend to the other variables such as weather, altitude, etc. Then the RESs penetration into power grid is not interested in the beginning of inventions.

Nowadays the researches and technology of RESs are almost mature and people have tried to send the energy to the power grid. Due to its unpredicted behavior, the stability and security of the power system will be the importance issues to be investigated. An Energy Management Systems (EMS) is introduced to face both stability and security problem due to the penetration of RESs into the power grid. This EMS system may include Load Frequency Control (LFC), Economic Dispatch, Unit Commitment, Load Forecasting, Interchange Schedule and Reserve Management into the system to find an optimal solution to distribute the energy while keeping the power system in stable.

An LFC system has played an importance role in an EMS system for maintaining load frequency in real time to ensure the frequency in stable condition and to keep the stability of power systems under load changes and fluctuation by maintaining power interchanges between areas. The penetration of RESs generation into power grid has introduced significant issues about power system stability and security. In such a way, the use of conventional controller may not sufficient to protect the power system against the power changes. In this dissertation, an LFC in adaptive scheme is proposed to be applied in an EMS system. The adaptive controller adopts an internal model control (IMC) structures using two scenarios, i.e. static controller with adaptive internal model and both the adaptive controller and adaptive model. The adaptive feature is reaching by applying system identification method.