ROYAL INSTITUTE OF TECHNOLOGY KTH

Abstract

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STOCHASTIC INVESTMENT IN POWER SYSTEM FLEXIBILITY: A BENDERS DECOMPOSITION APPROACH

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The efficient use of the available assets is the goal of the liberalized electricity market. Nowadays, the development of new technologies of renewable production results in a significant increase in the total installed capacity of this type of generation in the power system. However, the unpredictable nature of this resources results in a changing and non controllable generation that forces the power system to be constantly adapting to these new levels of production. Thermal units, that are the base of generation, are the responsible to replace this changing generation, but their ramp rates may not be fast enough to adapt it. Thus, other resources must be developed to overcome these inconveniences. The degree to which these resources help system stability is called flexibility. In this thesis, depending on operational short-term or investment long-term decisions, different points of view about flexibility are studied. Short-term includes sources as adaptable demand or storage availability while long-term is examined with the investment. To study the influence of sources in short-term planning, a model of the National Electricity Market (NEM) of Australia is developed. Flexibility in long-term is analyzed with IEEE-6 and IEEE-30 node systems, applying Benders decomposition. System Flexibility Index and economic benefit are calculated to measure flexibility. This indicators show the utility of developed model in forecasting the required ramp service in future power systems.