A LOAD FLOW BASED APPROACH FOR REACTIVE POWER PROCUREMENT IN DEREGULATED POWER SYSTEM

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ABSTRACT

With the advancement of technology, the demand of electrical energy has increased many folds. There are many problems in transmission of power from one point to another point such as voltage dip, power losses, line failure due to over loading, contractual path flow, transmission congestion, stability issues among others. These issues can be handled properly with the support of ancillary services. So, for the reliable, safe and required degree of quality transmission, the ancillary services are required to be procured from various resources. The major ancillary services are reactive power regulation, frequency regulation, reserves, black start, backup supply, system control, dynamic scheduling, real power transmission losses. All these ancillary services are used in deregulated power system. These services provide the support in transmission of power in interconnected grids. In deregulated power system, the generation, transmission and distribution are controlled by different companies, where as in vertically integrated structures, all the three functions were handled by a single company. Main concern of this research work is with the reactive power regulation. In this research work, an optimization problem has been formulated for reactive power procurement from generation companies. The objective of this optimization problem is to minimize the real power transmission losses subject to the real and reactive power operational constraints. The proposed problem is solved by the application of Newton Raphson load flow (NRLF). In the proposed methodology, NRLF is performed under the base case and in case voltage profile of system buses is violated, further load flows are carried out with the objective of minimization of transmission losses. The proposed methodology has been tested on IEEE 30-bus system in MATLAB environment without/with the procurement of reactive power from single bus or from multiple buses. Results show the improvement in voltage profile by procuring the reactive power from the specified buses.