

Transmission constrained generation expansion planning using soft computing techniques

Generation Expansion Planning (GEP) problem is an important problem for the decision planners in the power utilities. The growth of population and increasing consumption of electricity expose countries to build additional power units. Because of technical and economical differences of the energy sources, generation expansion planning is used to determine the best unit type for the additional capacity. Costs have always been a very important factor in decision making, in particular for choices between alternative energy sources and electricity generation technologies. Eventually, costs, risks and benefits of an energy source need to be analyzed in comparison with those of other energy sources and options. GEP in fact defines when, where and which new generating unit should be commissioned online in the long term of planning horizon. The main goal of GEP is to minimize the total investment, operating and maintenance and interruption costs associated with the addition of new power generating units in the planning horizon subject to constraints such as, forecasted demand, transmission, acceptable level of reliability, fuel mix and environmental criterions.

The Transmission constrained generation expansion planning (TC-GEP) problem is a large scale and challenging problem for the decision makers (to decide upon site, capacity, type of fuel, etc.) as there exist a large number of combinations. Normally the TC-GEP problem has an objective and a set of constraints. The main objective is the minimization of total system cost with transmission and reliability are the constraints. Nowadays, there is growing interest in renewable energy generation projects due to environmental and sustainability concerns. The rising coal cost, pollution impacts associated with conventional plants make the renewable sources as an attractive proposition for development.

In this research work distributed generators such as wind and solar and other renewables are considered as the expansion candidates in addition to the conventional plants. In this work, a slandered test system will be considered to analyze the

- i) GEP with conventional resources with and without transmission constraints.
- ii) ii) GEP with renewable in addition to conventional resources with and without transmission constraints
- iii) iii) GEP with renewable in addition to conventional resources with and without reliability constraints
- iv) iv) GEP with renewable in addition to conventional resources with and without transmission and reliability constraints

by using soft computing techniques.