7.1. INTRODUCTION

This work analyzes technical issues in a deregulated environment of power system. Although this work has been done keeping in view a deregulated environment, it is also applicable even to those developing countries, which are moving towards this effort. This work provides a link between conventional integrated power system and fully deregulated power system through a process of wheeling. The newly developed algorithms will be useful in meeting out the technical challenges in the present power industry.

7.2. RESULTS

The main results of this work are summarized as follows.

1. Optimal Power Flow problem has been solved using Evolutionary Programming algorithm. A non-linear scaling factor has been proposed to improve the convergence characteristics. The developed algorithm has been successfully validated with classical methods of optimum power flow. The proposed algorithm is demonstrated in combined economic emission dispatch environment. The described modified price penalty factor method gives the exact solution for the corresponding load demand of optimal power flow problem. The proposed algorithm is demonstrated with IEEE - 14,30 and 118 bus systems.

2. A general and efficient algorithm, which has been used for determining feasible transactions form a set of simultaneous bilateral and multilateral
transactions. This algorithm is capable of determining the minimum possible curtailment, which has to be done in the proposed non-feasible transactions in order to make them feasible without altering any transmission network configuration. This will be a very important information for the ISO, transaction coordinators and generation load pairs to know the transfer capability of the system.

3. The static available transfer capabilities of the IEEE and Indian utility bus systems are determined with bilateral and multilateral transactions. The computation of ATC is carried with capacity benefit and transmission reliability margins in combined economic emission environment. The static ATC values are determined using wheeling transactions with transmission line constraints.

4. After determining the feasible transactions, generation and demands are analyzed and transmission pricing is determined. This marginal cost as determined by this model is not only fair, but also provides an economical signal, which is an important factor for future planning about the location of new power industries and Independent Power Producers.

5. SRMC of wheeling transactions are calculated using evolutionary programming algorithm. The developed algorithm is capable of achieving global optimum solutions even with the presence of non-smooth fuel cost functions. It is inferred that the wheeling transactions with negative values of SRMC favour the system. The proposed algorithm is demonstrated with IEEE and Indian utility bus systems.
6. An improved embedded cost method used for the computation of transmission pricing is demonstrated with practical bus systems with wheeling transactions. In the proposed method, the reactive power flow changes in the transmission facilities caused by the wheeling transactions have also taken into account for the computation of transmission pricing. The results of the improved method are compared and justified with the conventional flow mile methods.

7. The developed EP algorithm is capable of relieving the congestion of the transmission system by taking into account the increment and decrement bids of power producers. The preferred and rescheduling generator powers were computed using the proposed EP algorithm to relieve the congestion.

7.3 FUTURE WORK

As a consequence of investigations carried out in this work, the following aspects are identified for further research work in this area.

1. In the deregulated power market, the loads are varying rapidly. The power producers must respond quickly to those changes. When the generator powers are varied beyond their real power limits, ramping cost is incurred. So while computing the optimal cost of generation, ramping cost also has to be included. The production cost of generators that includes the ramping cost of generators may also be included in the optimal power flow problem formulation.

2. While computing the transfer capability of the transmission system, transient rotor angle stability limit can be taken into account to ensure the stability and reliability of the power system. The dynamic ATC of the practical bus systems may also be evaluated by including the transient and reliability constraints.
3. To relieve the congestion, power producers are allowed to vary their real power outputs. During this process, the ramping costs are also included along with the congestion costs.

4. Incorporation of the zone issues into the developed model can also be an extension of this work.

5. The ATC, transmission pricing and congestion management analysis are also be carried with FACTS devices.

6. An user friendly web based market simulator may be developed to enable the market participants to know about the ATC, pricing and congestion management settlements in the restructured power market.