

List of Figures

1.1	Deregulated electricity market model	7
1.2	PoolCo Model	10
1.3	Bilateral/Multilateral model	12
1.4	Equivalent circuit of TCSC	14
1.5	Capacitive mode of TCSC	15
1.6	Inductive mode of TCSC	15
1.7	Bypassed thyristor mode	16
1.8	Blocked thyristor mode	17
1.9	Vernier mode	17
1.10	The impedance vs. delay angle(α)characteristic of the TCSC	18
2.1	Graphical representation of PSO	32
3.1	Basic definition of TTC	47
3.2	Equivalent circuit of a transmission line after placing TCSC	54
3.3	Convergence characteristic of PSO in IEEE 30-bus test system	69
3.4	Convergence characteristic of PSO in UPSEB 75-bus test system	70
4.1	Graphical representation of a producer surplus	73
4.2	Graphical representation of consumer surplus	74
4.3	Graphical representation of Social Welfare	75
4.4	consumer and producer surplus under unconstrained case	77
4.5	Surplus under constrained case without TCSC	78
4.6	Surplus under constrained case with TCSC	79
4.7	Voltage magnitude at load buses by PSO and NLP methods	91

4.8	Graphical representation of comparison of surplus obtained by PSO and NLP methods	92
4.9	Convergence characteristic of NLP method	93
4.10	Convergence characteristic of PSO method	94
4.11	Voltage magnitude of various load buses without and with TCSC	96
4.12	Comparison of consumer surplus obtained by PSO and EP methods	97
4.13	Comparison of merchandize surplus obtained by PSO and EP methods	97
4.14	Comparison of producer surplus obtained by PSO and EP methods	98
4.15	Comparison of merchandize and producer surplus obtained by PSO and EP methods	98
4.16	Convergence characteristic of PSO and EP in IEEE 30 bus test system	99
4.17	Surplus of various market participants	101
4.18	Effect of TCSC on voltage profile of some heavily loaded load buses	102
4.19	Convergence characteristic of PSO	103
5.1	Comparison of real power spot price obtained from PSO based starting points and default starting points in interior point method	123
5.2	Comparison of reactive power spot price obtained from PSO based starting points and default starting points in interior point method	123
5.3	Real power wheeling charges (\$/MWh) of selected bilateral transactions	125
5.4	Reactive power wheeling charges (\$/MVARh) of selected bilateral transactions	126
5.5	Proposed bilateral transaction matrix (without TCSC)	127
5.6	Effect of TCSC on secure bilateral transaction matrix	128
5.7	Comparison of secure bilateral transaction matrix obtained by Interior point method and PSO	128
5.8	Active power wheeling charges without and with TCSC	131
5.9	Reactive power wheeling charges without and with TCSC	132
5.10	Effect of TCSC on secure bilateral transaction matrix	133
5.11	Active power spot prices (\$/MWh) of generator buses	134
5.12	Active power spot prices(\$/MWh)of load buses	135
5.13	Reactive power spot prices (\$/MVARh) of generator buses	135

5.14	Reactive power spot prices (\$/MVARh) of load buses	136
5.15	Active power wheeling charges without and with TCSC	136
5.16	Reactive power wheeling charges without and with TCSC	137
5.17	Proposed and secured bilateral transactions	138
6.1	L-index values of some load buses before and after rescheduling for IEEE 30 bus system	153
6.2	Convergence characteristic of PSO for active power rescheduling cost of 30 bus system	155
6.3	Sensitivity factors of congested line no.13	157
6.4	Sensitivity factors of congested line no. 59	157
6.5	Convergence characteristic of PSO for active power rescheduling cost of 75-bus system(Output of all generators are rescheduled)	159
6.6	Convergence characteristic of PSO for active power rescheduling cost of 75-bus system(Output of only selected generators are rescheduled)	160
A.1	IEEE 6 bus test system	185
B.1	IEEE 30-bus test system	191
C.1	UPSEB 75-bus test system	194