

LIST OF FIGURES

Figure 2.1	Contingency ranking based on voltage stability margin	14
Figure 2.2	Nose curve of critical bus 4 under line outage 2-3 with $k = 1.0$ (IEEE 14-Bus system)	24
Figure 2.3	Nose curve of critical bus 9 under line outage 7-9 with $k = 1.2$ (IEEE 14-Bus system)	24
Figure 2.4	Nose curve of critical bus 24 under line outage 21-22 with $k = 1.0$ (New England 39-Bus system)	30
Figure 2.5	Nose curve of critical bus 28 under line outage 19-33 with $k = 0.5$ (New England 39-Bus system)	30
Figure 2.6	Nose curve of critical bus 171 under line outage 168-171 with $k = 0.5$ (NRPG 246-bus system)	39
Figure 2.7	Nose curve of critical bus 164 under line outage 160-164 with $k = 0.5$ (NRPG 246-bus system)	39
Figure 2.8	Nose curve of critical bus 174 under line outage 166-173 with $k = 0.2$ (NRPG 246-bus system)	40
Figure 3.1	Nose curve (λ -V curve) obtained using continuation power flow method	44
Figure 3.2	Nose curve of critical bus 5 under line outage 1-2 for $k = 0.2$ (IEEE 14-bus system)	54
Figure 3.3	Nose curve of critical bus 4 under line outage 2-3 for $k = 1.0$ (IEEE 14-bus system)	54
Figure 3.4	Nose curve of critical bus 24 under line outage 21-22 for $k = 0.2$ (New England 39-bus system)	66
Figure 3.5	Nose curve of critical bus 28 under line outage 28-29 for $k = 0.5$ (New England 39-bus system)	67
Figure 3.6	Nose curve of critical bus 15 under line outage 15-16 for $k = 1.0$ (New England 39-bus system)	67
Figure 3.7	Nose curve of critical bus 29 under line outage 29-38 for $k = 1.2$ (New England 39-bus system)	68
Figure 3.8	Nose curve of critical bus 174 under line outage 165-174 for $k = 0.2$ (NRPG 246-bus system)	81
Figure 3.9	Nose curve of critical bus 171 under line outage 168-171 for $k = 0.5$ (NRPG 246-bus system)	81
Figure 3.10	Nose curve of critical bus 174 under line outage 219-77 for $k = 1.0$ (NRPG 246-bus system)	82
Figure 3.11	Nose curve of critical bus 171 under line outage 165-171 for $k = 1.2$ (NRPG 246-bus system)	82
Figure 4.1	P -V curve of bus- i	88
Figure 4.2	Q -V curve of bus- i	89

Figure 4.3	Flowchart for determining loading margin of system using proposed approach	92
Figure 4.4	P - V curve of critical bus 5 obtained using proposed quadratic curve fitting method and by CPF method for line outage 2-4	97
Figure 4.5	Q - V curve of critical bus 4 obtained using proposed quadratic curve fitting method and by CPF method for line outage 2-3	99
Figure 4.6	P - V curve of critical bus 20 obtained using proposed quadratic curve fitting method and by CPF method for line outage 29-38	101
Figure 4.7	Q - V curve of critical bus 29 obtained using proposed quadratic curve fitting method and by CPF method for line outage 10-32	103
Figure 4.8	P - V curve of critical bus 174 obtained using proposed approach and by CPF method for line outage 194-198 (NRPG 246-bus system)	106
Figure 4.9	Q - V curve of critical bus 158 obtained using proposed approach and by CPF method for line outage 156-158 (NRPG 246-bus system)	107
Figure 5.1	STATCOM model	112
Figure 5.2	Flowchart for online control of maximum loadability using STATCOM	115
Figure 5.3	Comparison of P - V curves of critical bus 5 with STATCOM and without STATCOM for line outage 2-3 based on PMU measurements	119
Figure 5.4	Comparison of Q - V curves of critical bus 5 with STATCOM and without STATCOM for line outage 2-3 based on PMU measurements	119
Figure 5.5	Comparison of P - V curves of critical bus 29 with STATCOM and without STATCOM for line outage 21-22 based on PMU measurements	123
Figure 5.6	Comparison of Q - V curves of critical bus 29 with STATCOM and without STATCOM for line outage 29-38 based on PMU measurements	124
Figure 5.7	Comparison of P - V curves of critical bus 174 with STATCOM and without STATCOM for line outage 156-158 using PMU measurements	128
Figure 5.8	Comparison of Q - V curves of critical bus 174 with STATCOM and without STATCOM for line outage 156-158 using PMU measurements	128
Figure A.1	Single line diagram of the IEEE 14-bus system	157
Figure B.1	Single line diagram of the 39-bus New England system	159
Figure C.1	Single line diagram of the NRPG 246-bus system	164