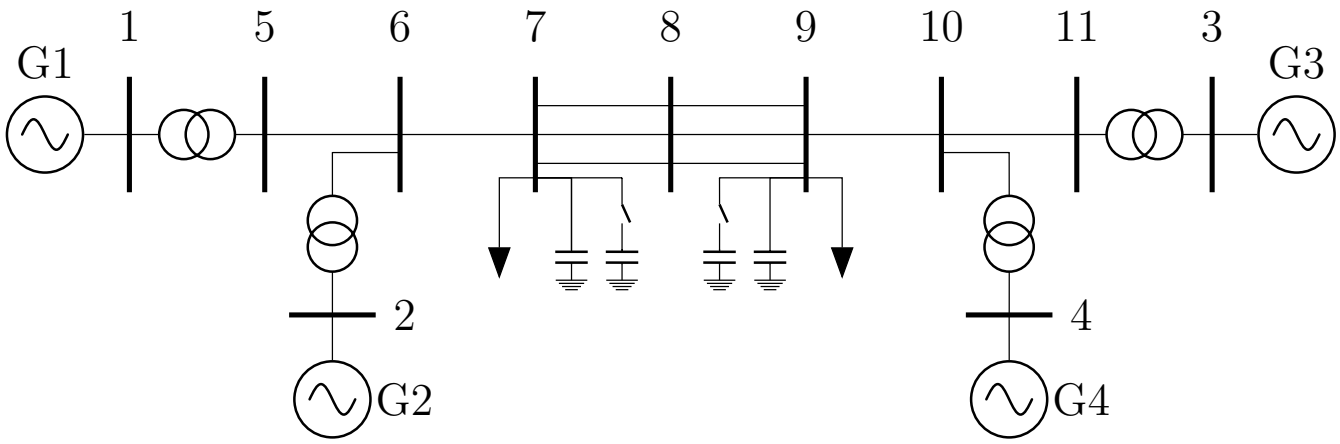

Figure 1: Slightly Modified Kundur System.

System Information

```
genrou   1 "1" 22.00 "1 " : #9 mva=900.00   ... "h" 6
genrou   2 "2" 22.00 "1 " : #9 mva=900.00   ... "h" 3.5
genrou   3 "3" 22.00 "1 " : #9 mva=900.00   ... "h" 4
genrou   4 "4" 22.00 "1 " : #9 mva=900.00   ... "h" 3

sexs     1 "1" 22.00 "1 " : #9 1.0 5.0 1000.0 0.05 -5.0 5.0 0.1 0.0 -5.0 5.0 0.0
sexs     2 "2" 22.00 "1 " : #9 1.0 5.0 1000.0 0.05 -5.0 5.0 0.1 0.0 -5.0 5.0 0.0
sexs     3 "3" 22.00 "1 " : #9 1.0 5.0 1000.0 0.05 -5.0 5.0 0.1 0.0 -5.0 5.0 0.0
sexs     4 "4" 22.00 "1 " : #9 1.0 5.0 1000.0 0.05 -5.0 5.0 0.1 0.0 -5.0 5.0 0.0

tgov1 1 "1" 22.00 "1 " : #1 mwcap=900.0000 0.050000 0.5 1.000000 0.0   1.0000  15.0000 0.0
tgov1 2 "2" 22.00 "1 " : #1 mwcap=400.0000 0.040000 0.5 1.000000 0.0   3.0000  10.0000 0.0
tgov1 3 "3" 22.00 "1 " : #1 mwcap=800.0000 0.050000 0.4 1.000000 0.0   3.0000  10.0000 0.0

....
At t = 0:
Load on bus 7 = 500 P, 100 Q
Load on bus 9 = 900 P, 100 Q
All Gens ~350 Pgen, 88 Qgen
```

General Speed up: LTD 2 second time step ≈10x faster than PSDS; 1 second time step ≈5x faster than PSDS.

Step Test: Load on Bus 9 +30% (270 MW step) at t=2

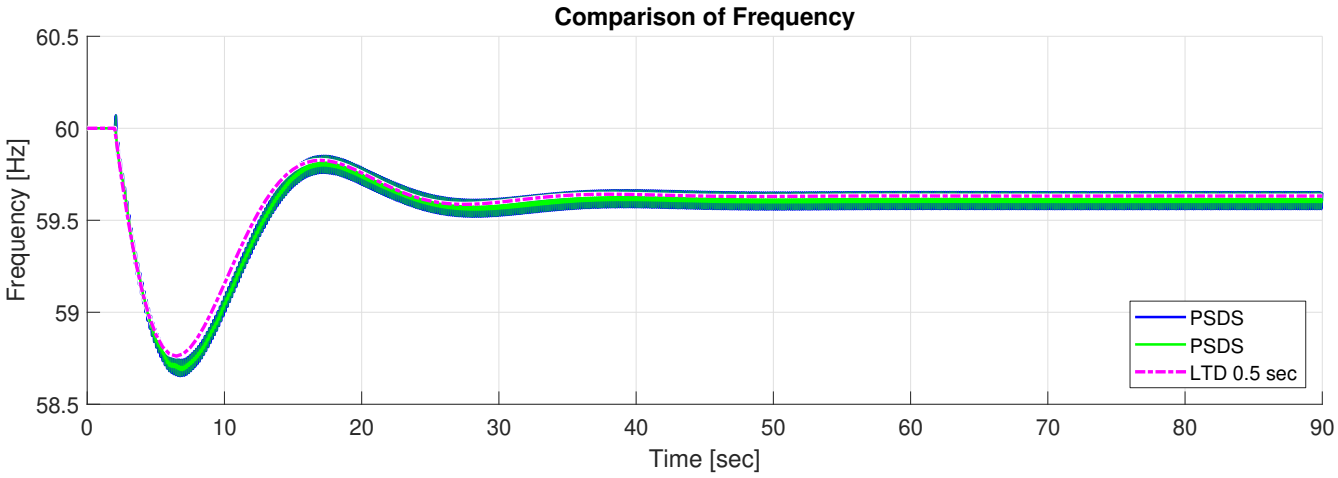

Figure 2: System frequency response.

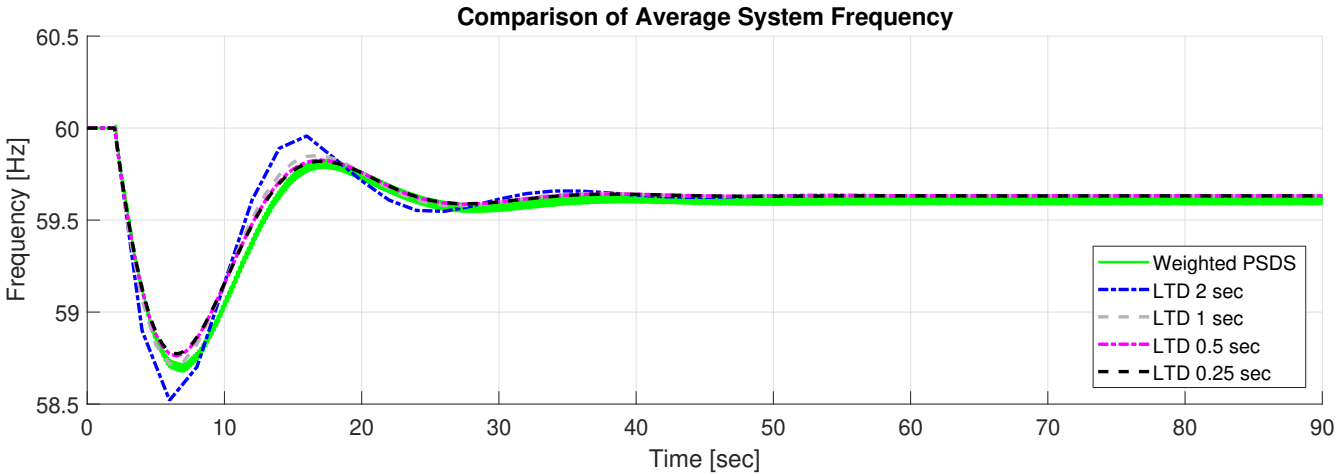

Figure 3: Average frequency.

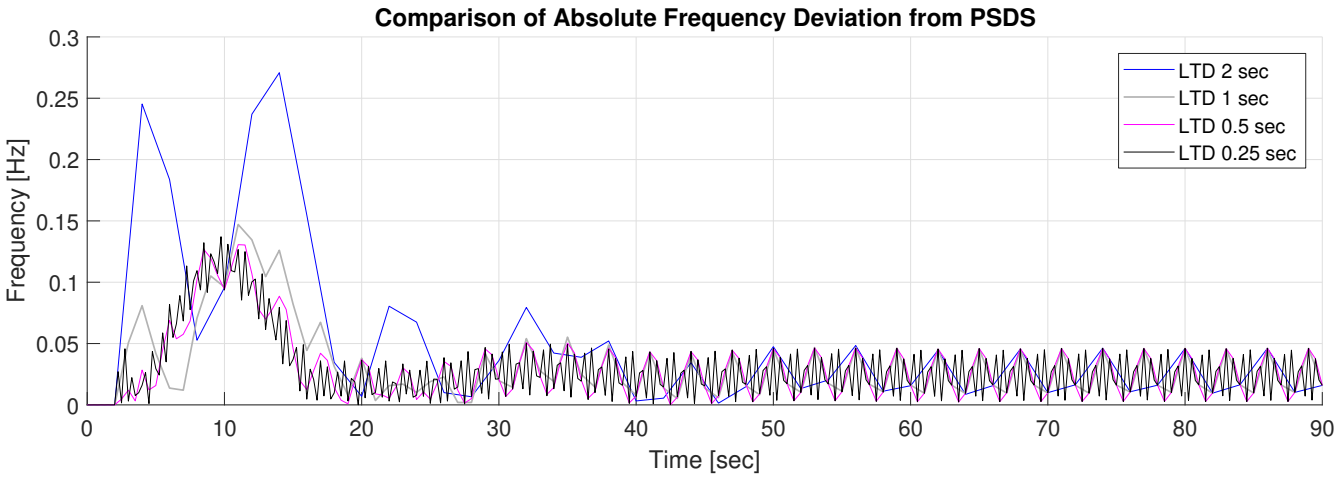

Figure 4: Relative Hz difference of PSDS - LTD (i.e. $\left|f_{PSDS}(t) - f_{LTD}(t)\right| \times 60\text{Hz}$).

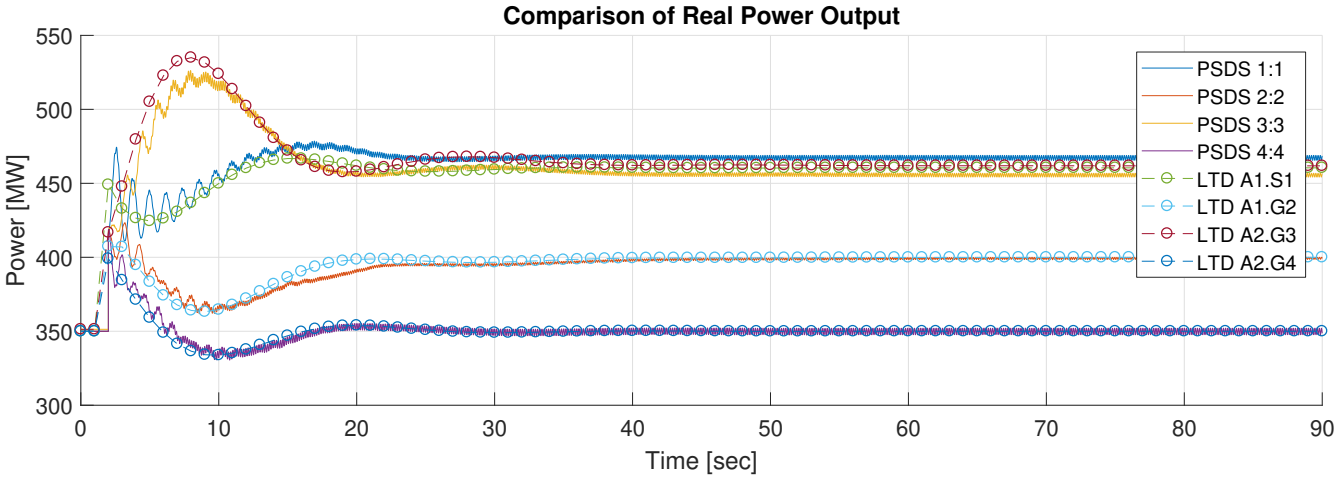

Figure 5: Electrical Power Output

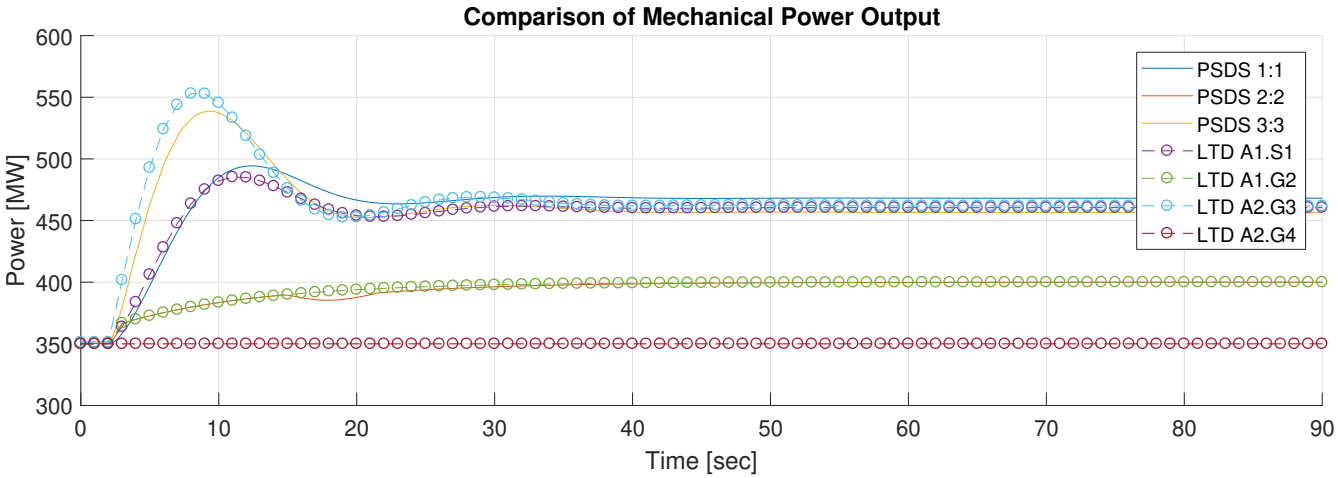

Figure 6: Generator Mechanical Power Output

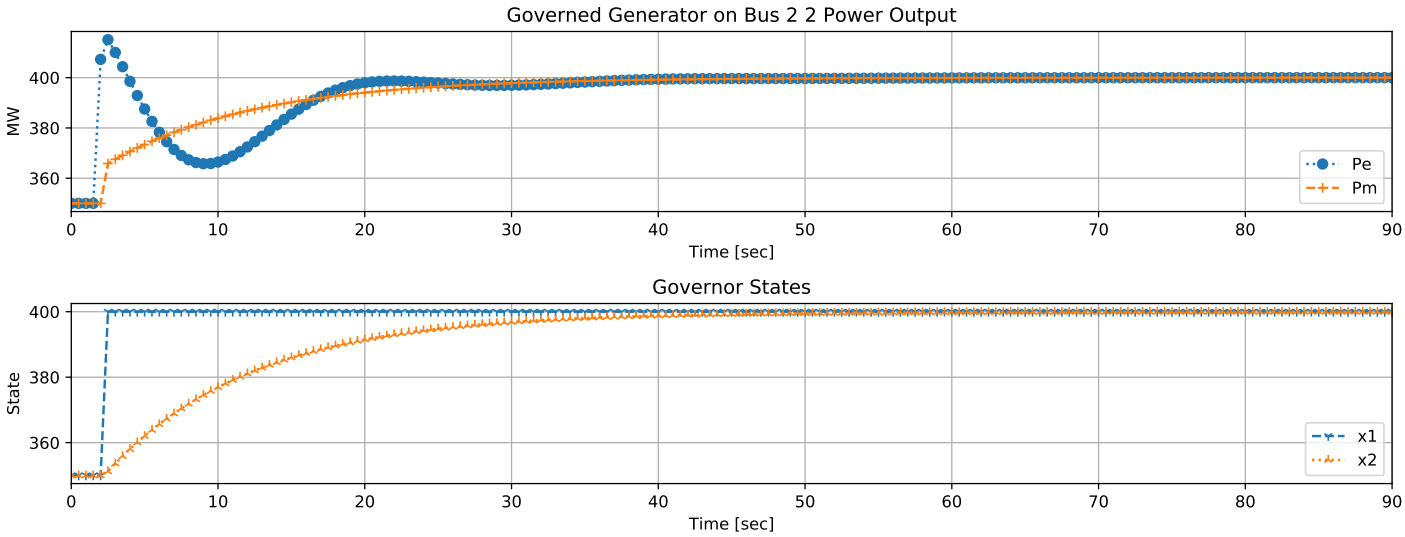

Figure 7: Dynamic state information of Generator 2.

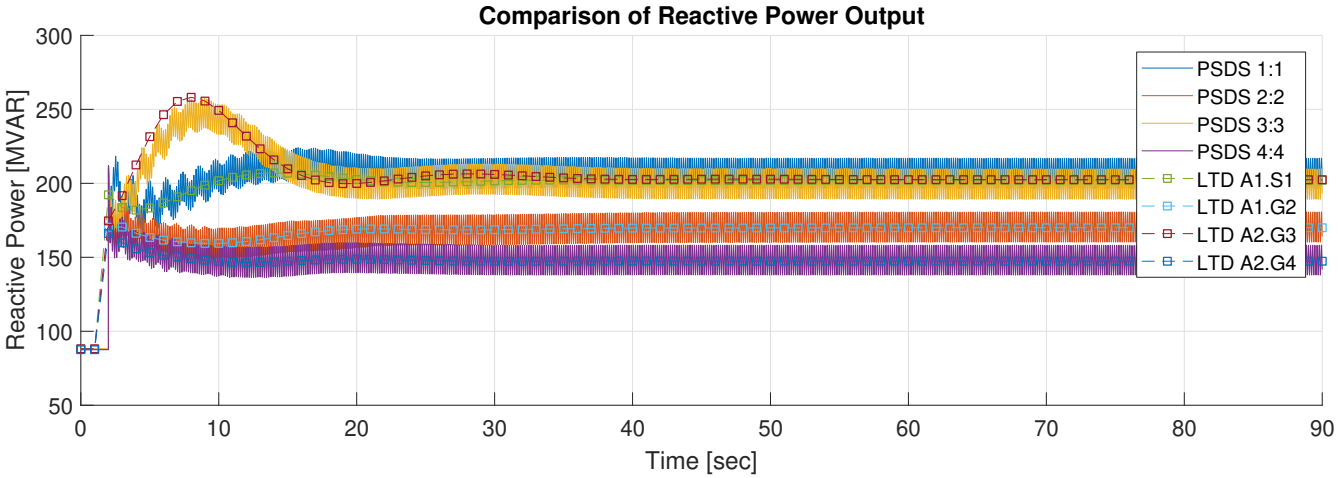

Figure 8: Reactive Power Output

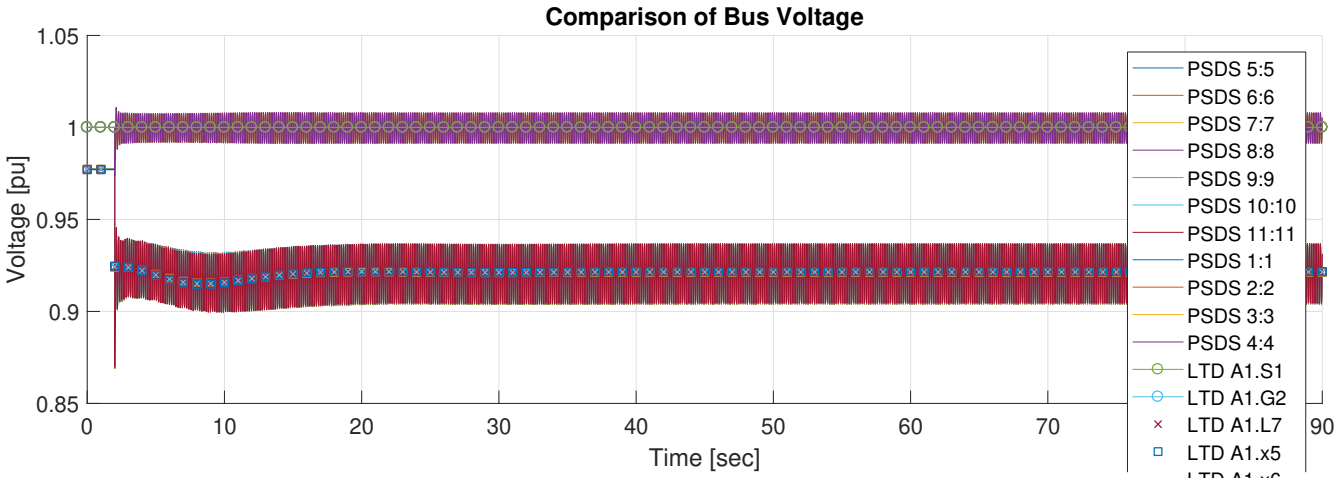

Figure 9: System Bus Voltages

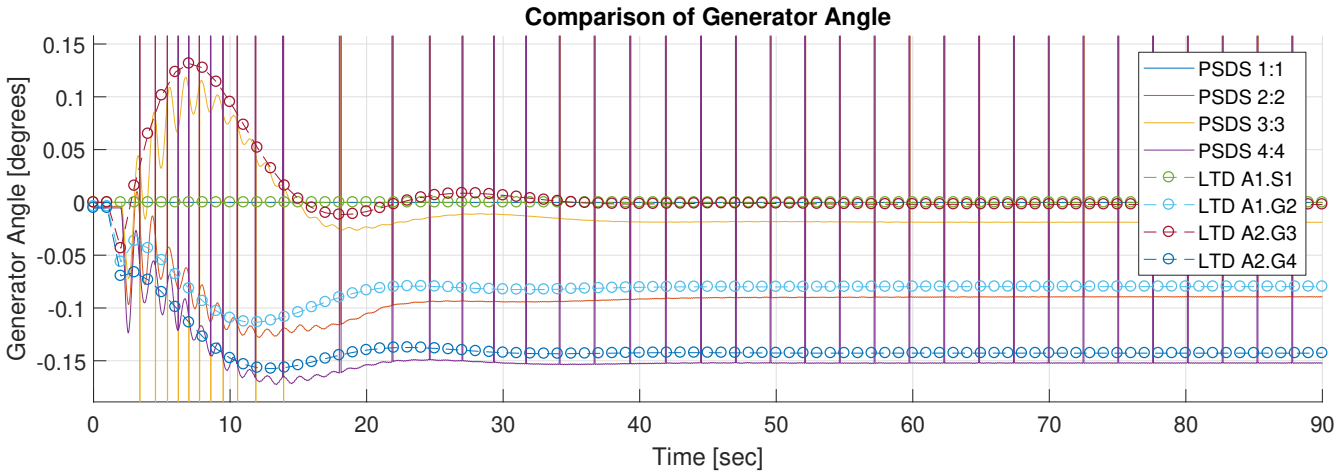

Figure 10: Generator Angles

Ramp Test: Load on Bus 9 +30% (270 MW) from t=2 to 42.

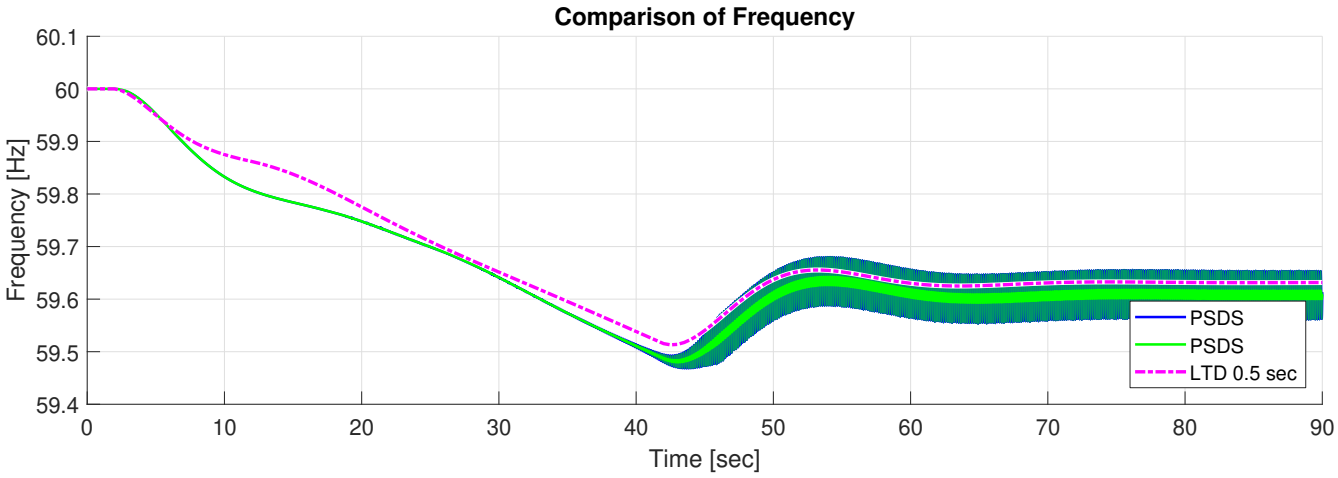

Figure 11: System frequency response.

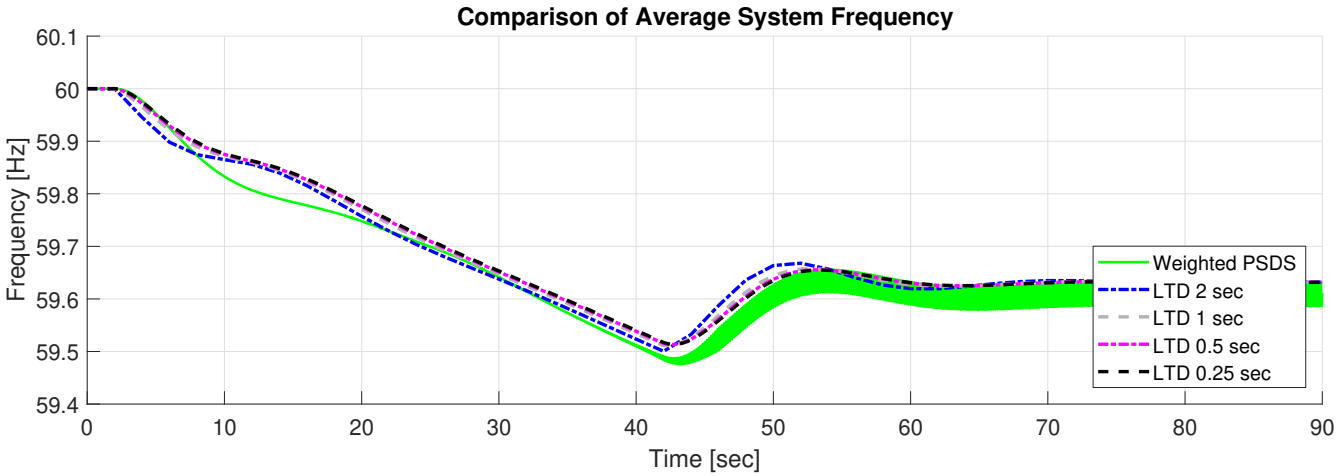

Figure 12: Average frequency.

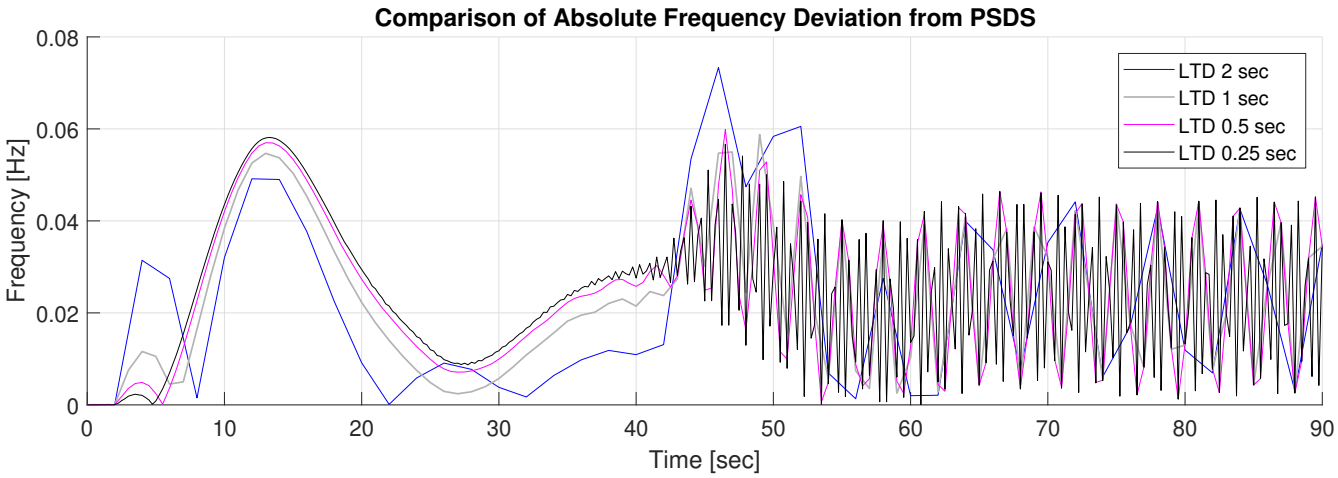

Figure 13: Relative Hz difference of PSDS - LTD (i.e. $\left|f_{PSDS}(t) - f_{LTD}(t)\right| \times 60\text{Hz}$).

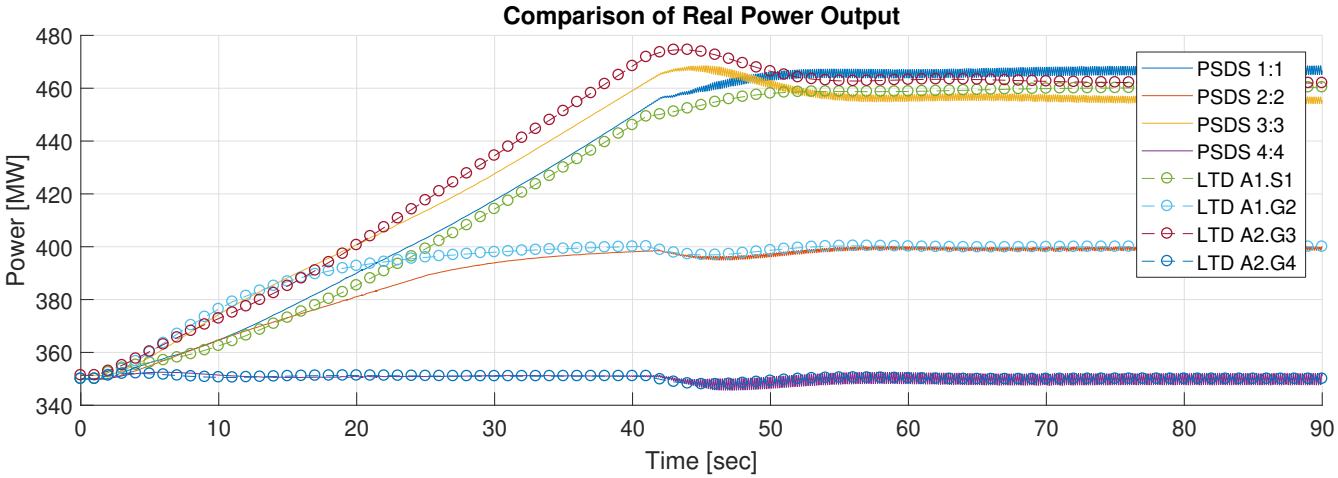

Figure 14: Electrical Power Output.

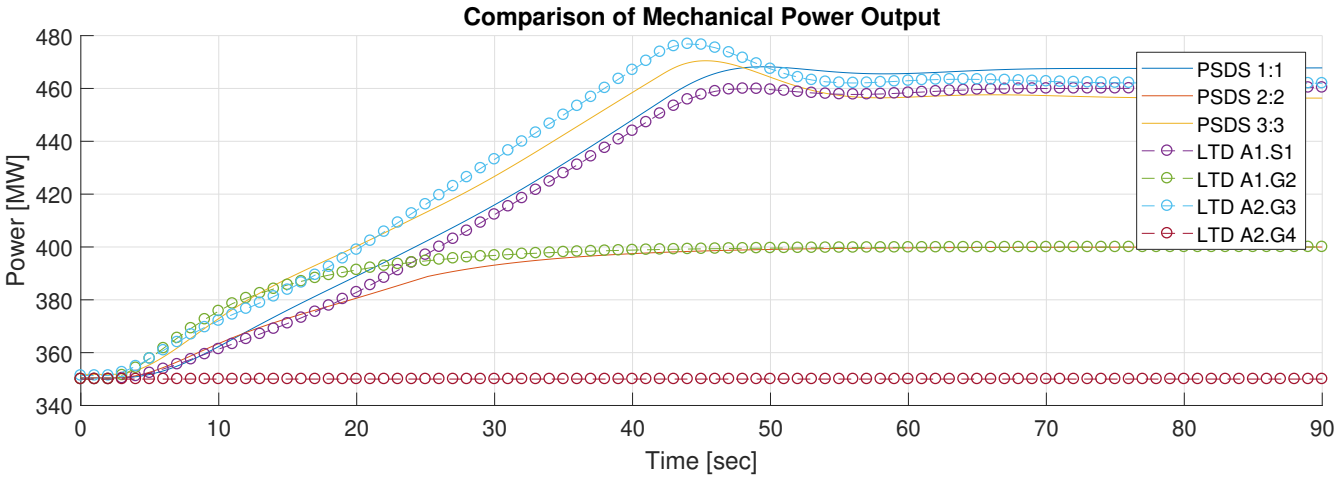

Figure 15: Generator Mechanical Power Output

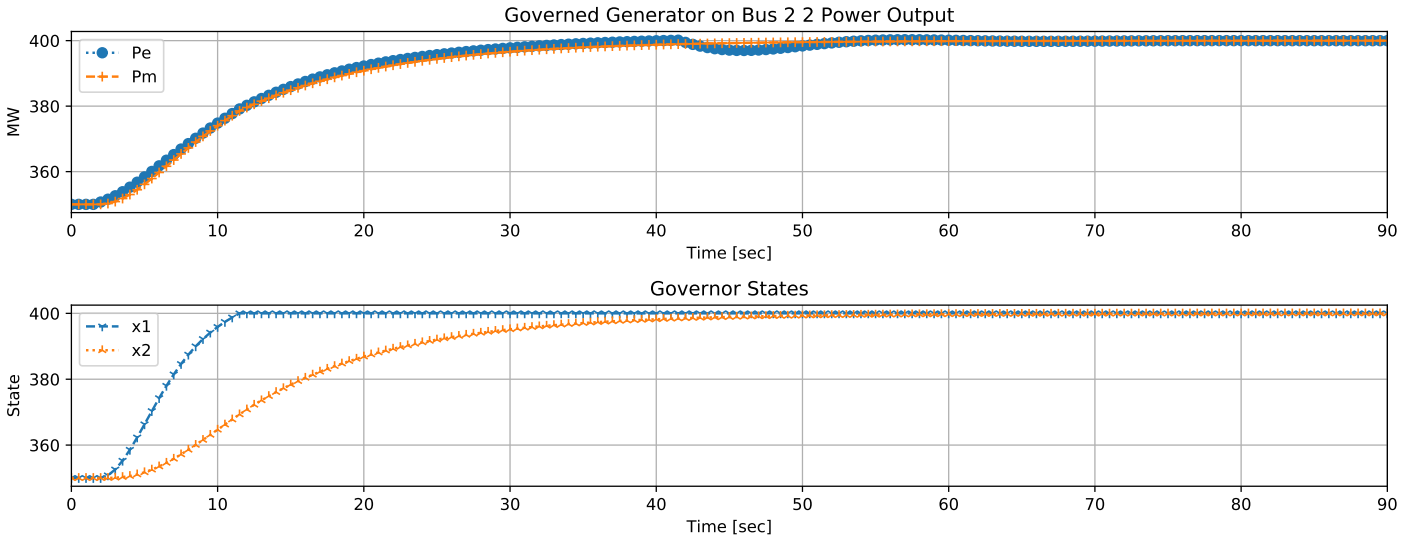

Figure 16: Dynamic state information of Generator 2.

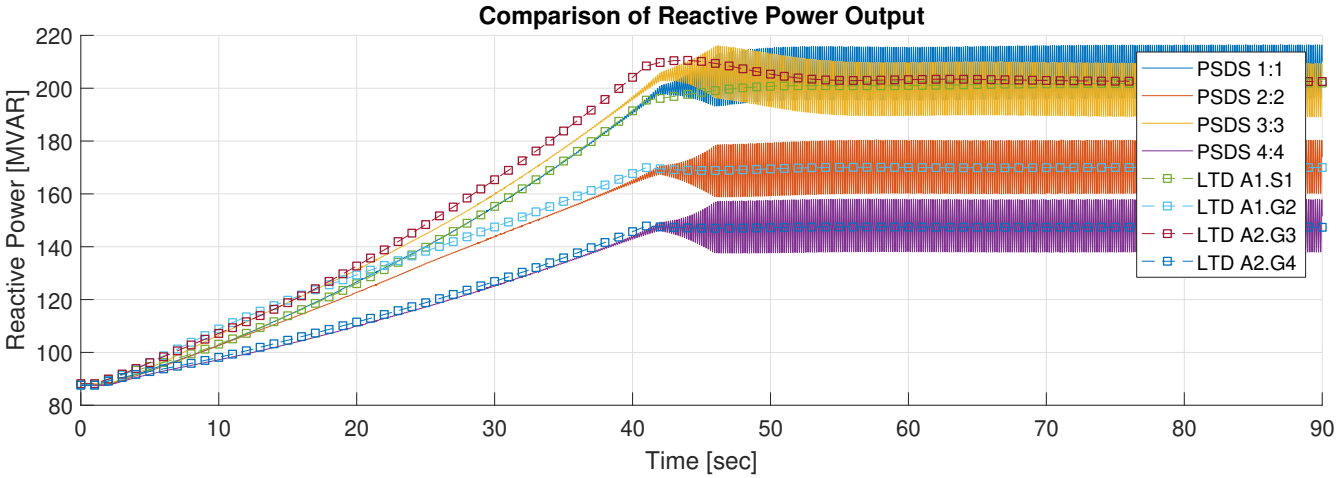

Figure 17: Reactive Power Output

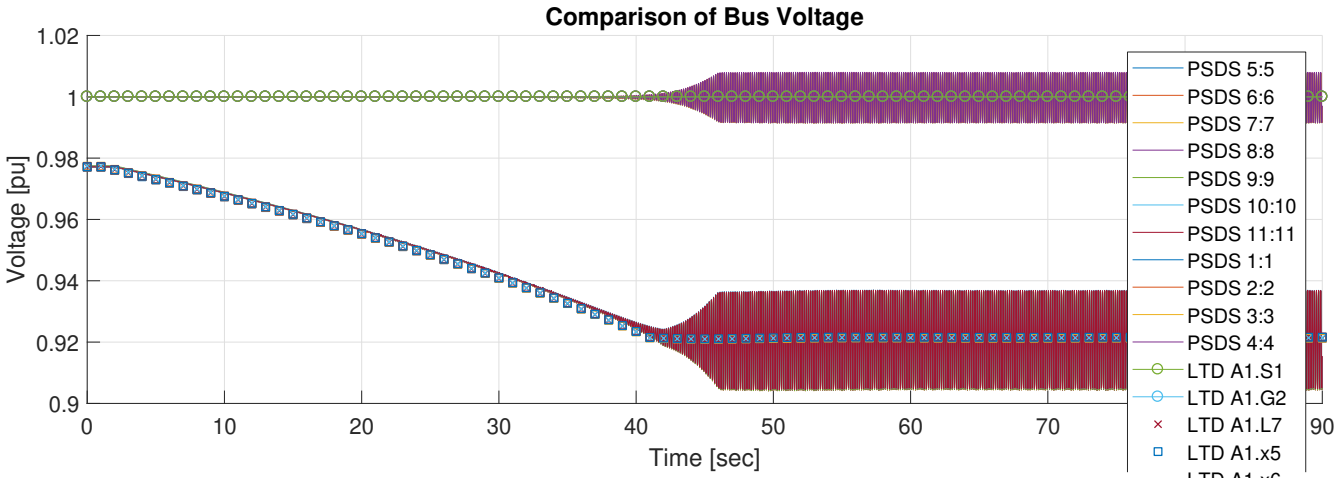

Figure 18: System Bus Voltages

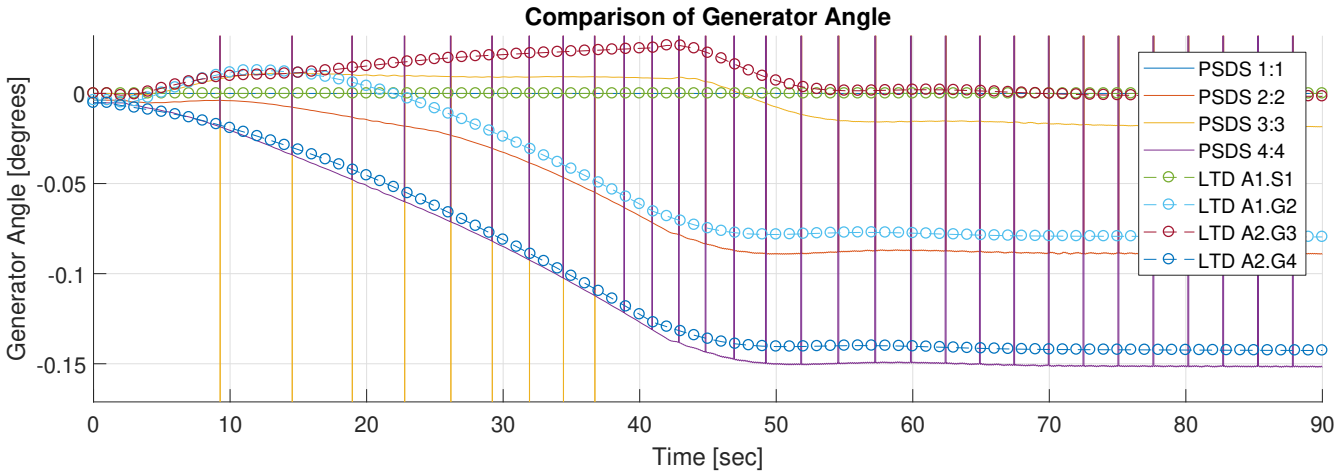

Figure 19: Generator Angles