Research
08/17/20

Mini WECC
10 Minute AGC Recovery
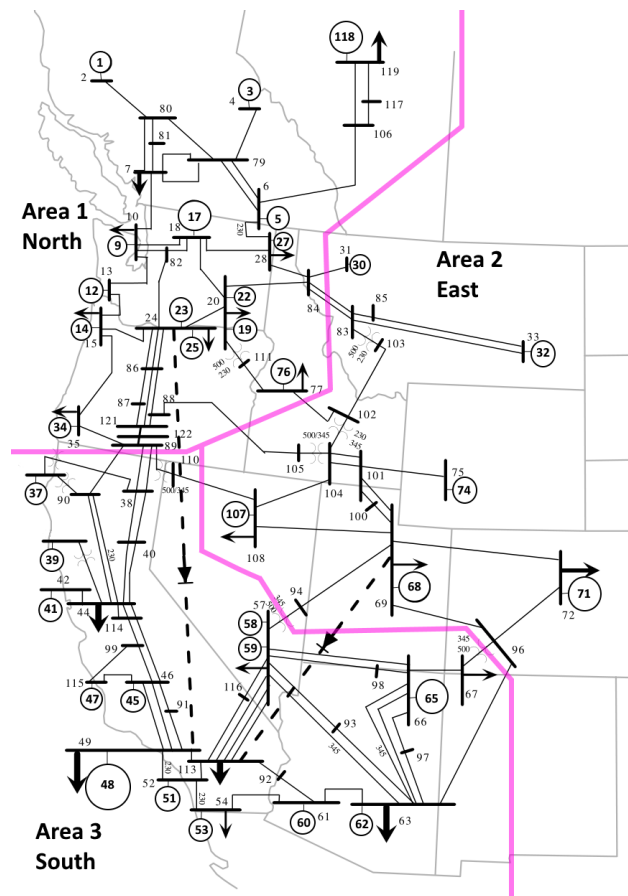
Thad Haines
Page 1 of 6

10 Minute AGC recovery of Mini WECC after 435 MW load Step

- Mini WECC system:

    - Buses: 122

    - Lines: 171

    - Loads: 88

    - Machines: 34

    - States: 623

- Event: +435 MW load step on Bus 2 in Area 1 at t=1.

- Each area has identical conditional AGC that acts at t=40 and again when t=160, 280, 400, 520 (i.e. 2 minute action time).

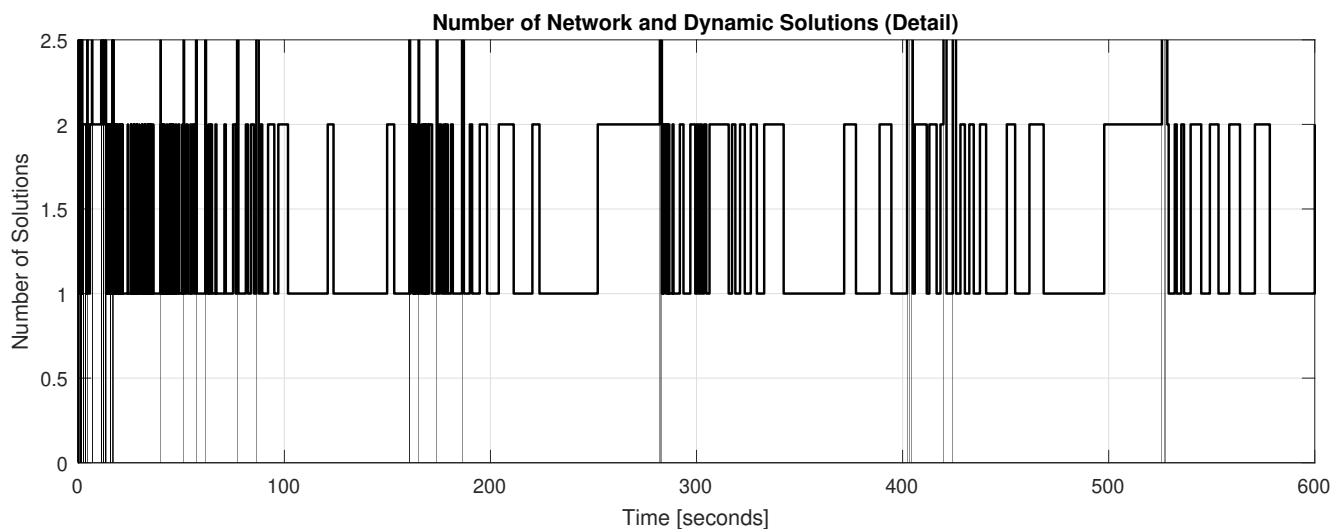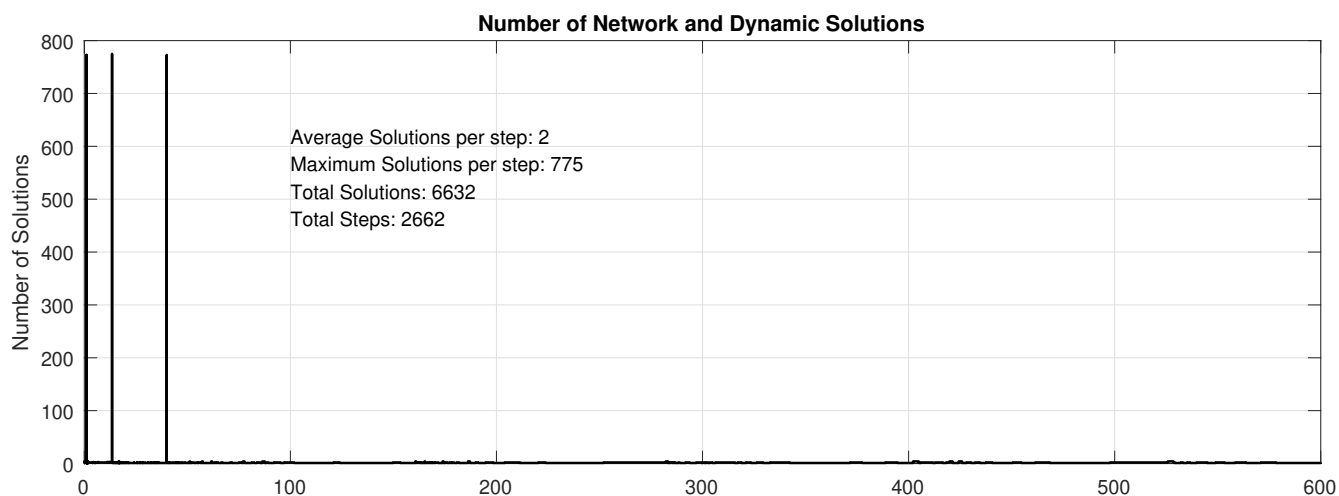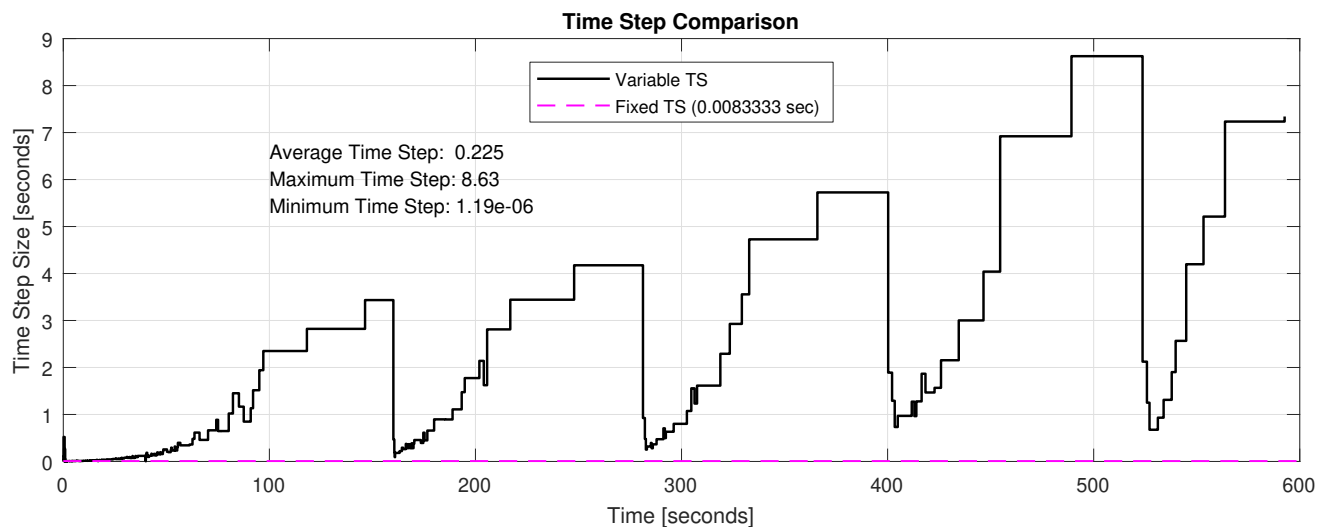- ODE solver tolerances:
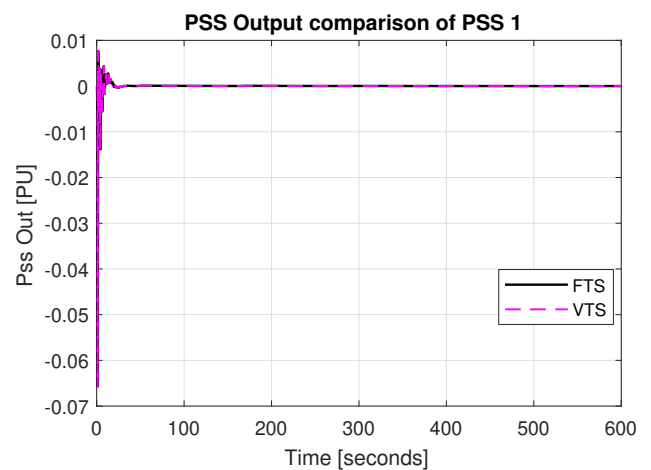
    Relative: 1e-5

    Absolute: 1e-7

Result Summary:

- Using the ode23/ode23t methods provided a 9.06x speed up over Huen's 'fixed step' method.
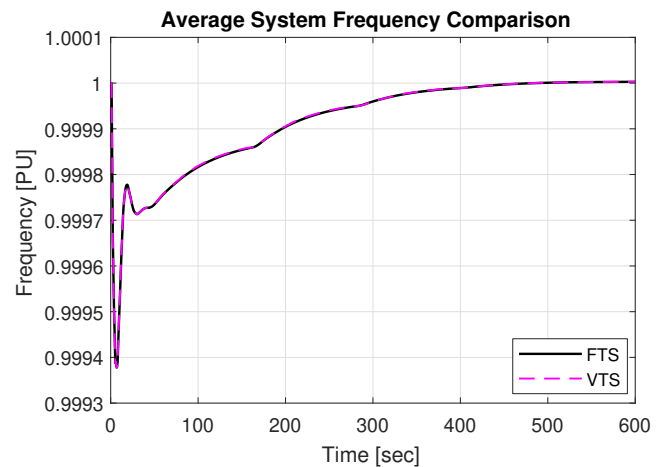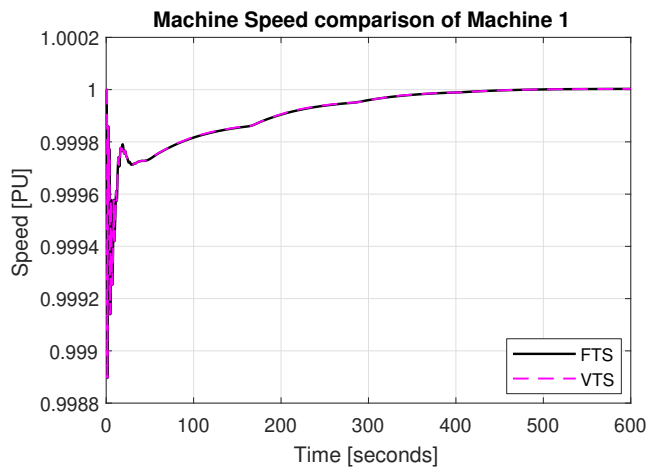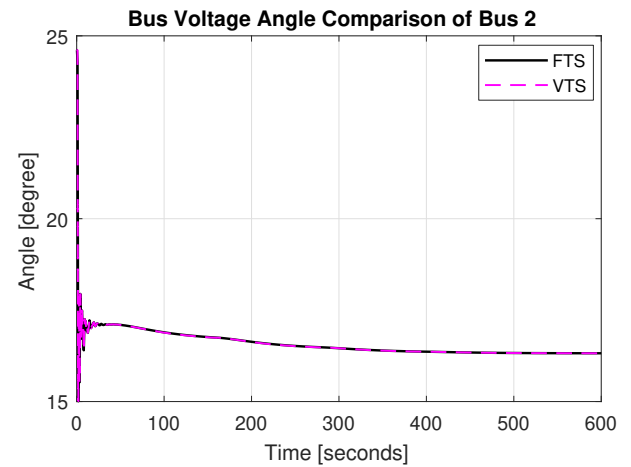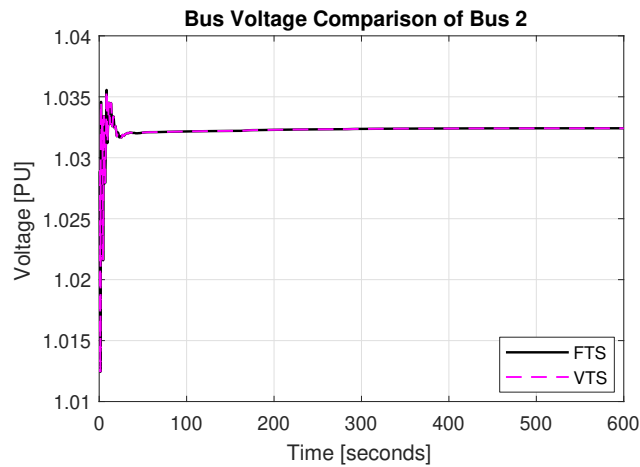
- Recorded data is approximately 23.75 times smaller when using VTS. (778,259,381 bytes versus 32,772,591 bytes)

- Variable time step (VTS) methods appeared to capture fast dynamics well.

- VTS and fixed time step results may 'drift' slightly when time steps become large. Effect can be reduced via ODE solver tolerance settings.

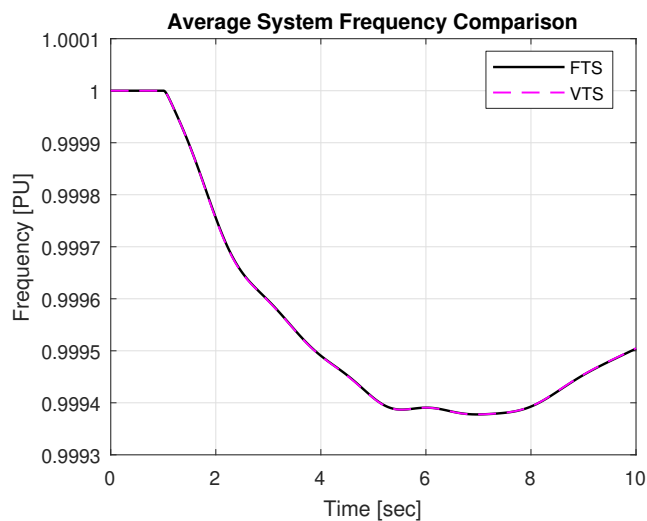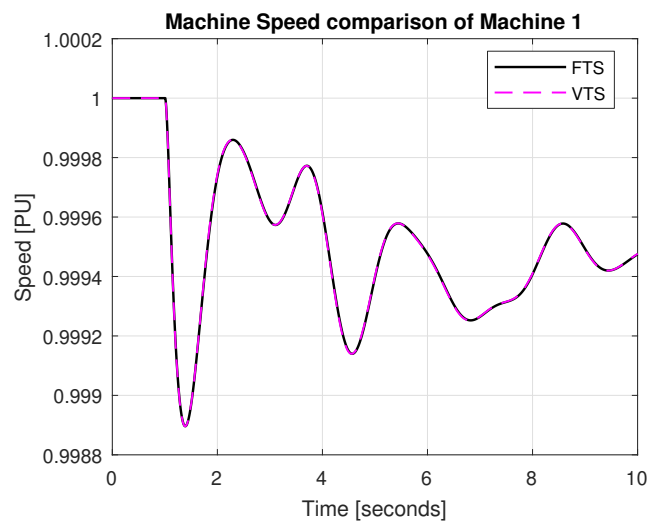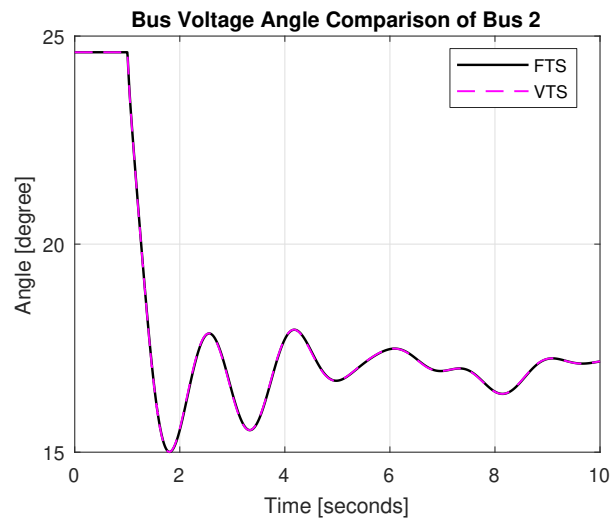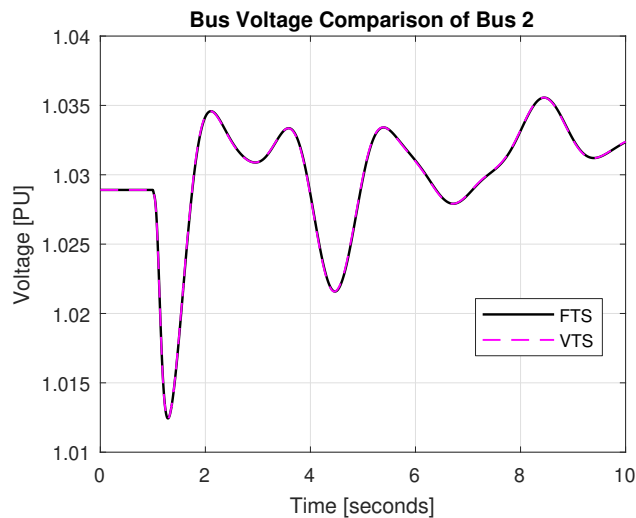| | Step Size [seconds] | | | | Solutions Per Step | | | | |
Method	Max.	Min.	Ave.	Total Steps	Ave.	Max.	Total Slns.	Sim. Time	Speed Up
Huen's	0.0083	8.33e-3	0.0083	72,001	2	2	144,002	483.64	1.00
ode23 / ode23t	8.6300	1.19e-6	0.0570	2,662	2	775	6,632	53.40	9.06

Research
08/17/20

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Thad Haines
Page 2 of 6

Step Size and Solution Count Data

Time Step Comparison

Average Time Step: 0.225
Maximum Time Step: 8.63
Minimum Time Step: 1.19e-06

Legend: Variable TS — Fixed TS (0.0083333 sec)

Number of Network and Dynamic Solutions

Average Solutions per step: 2
Maximum Solutions per step: 775
Total Solutions: 6632
Total Steps: 2662

Number of Network and Dynamic Solutions (Detail)

Research
08/17/20

Mini WECC
10 Minute AGC Recovery

Thad Haines
Page 3 of 6

Select Comparisons: t = 0:600 (full simulation)

Research
08/17/20

Mini WECC
10 Minute AGC Recovery

Thad Haines
Page 4 of 6

Select Comparisons: t = 0:10

Research
08/17/20

Mini WECC
10 Minute AGC Recovery

Thad Haines
Page 5 of 6

Select Comparisons: t = 0:40

Research
08/17/20

Mini WECC
10 Minute AGC Recovery

Thad Haines
Page 6 of 6
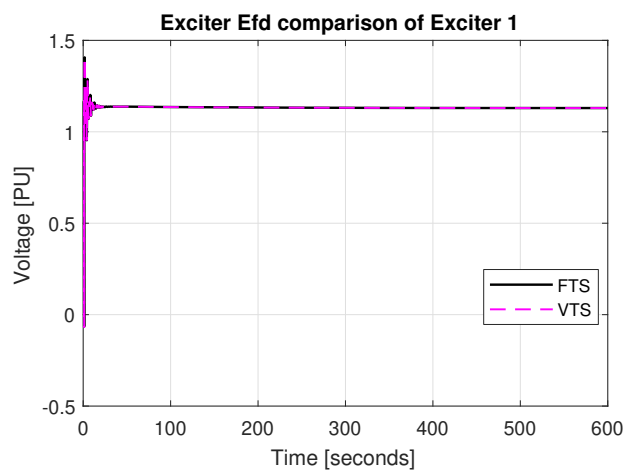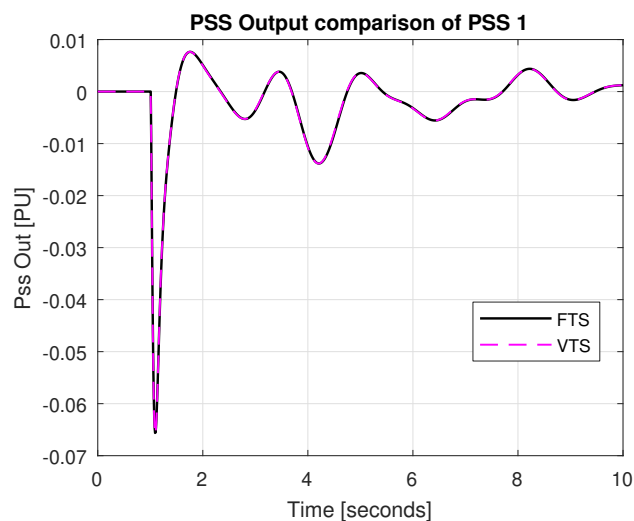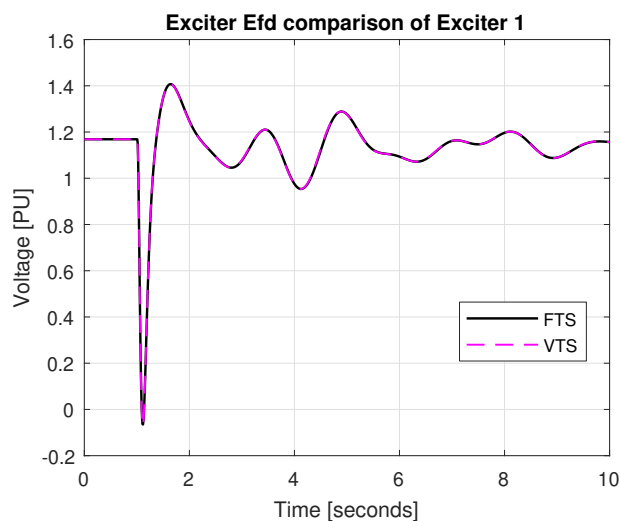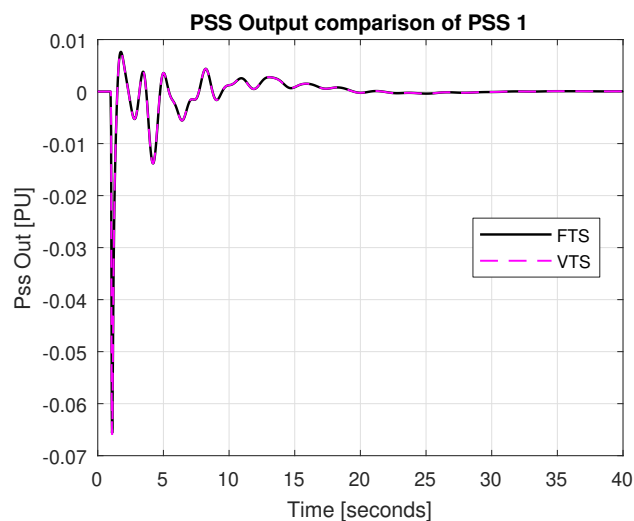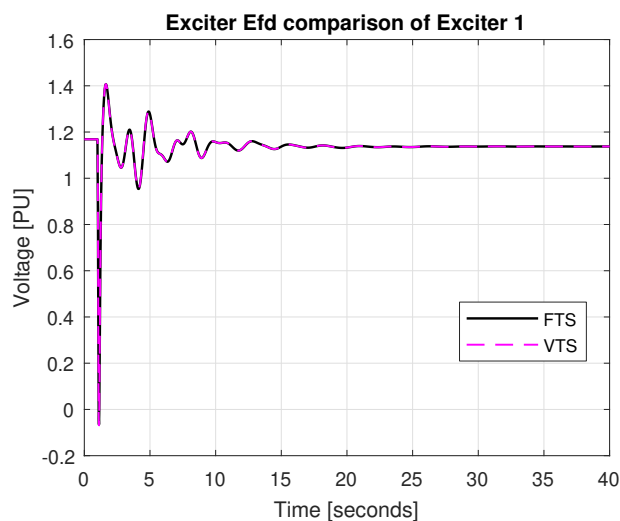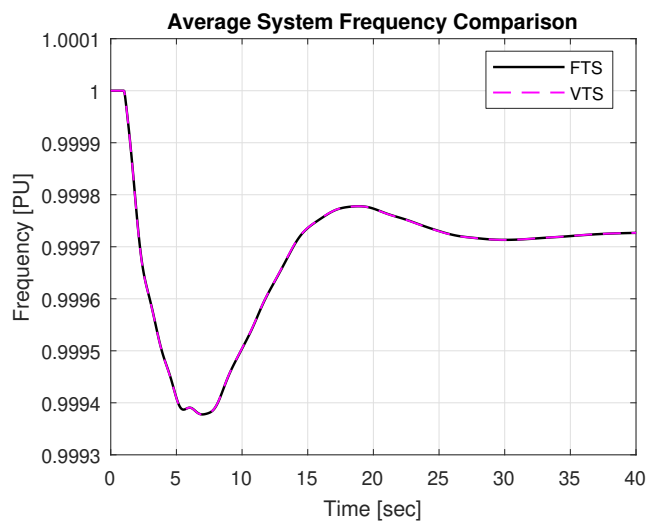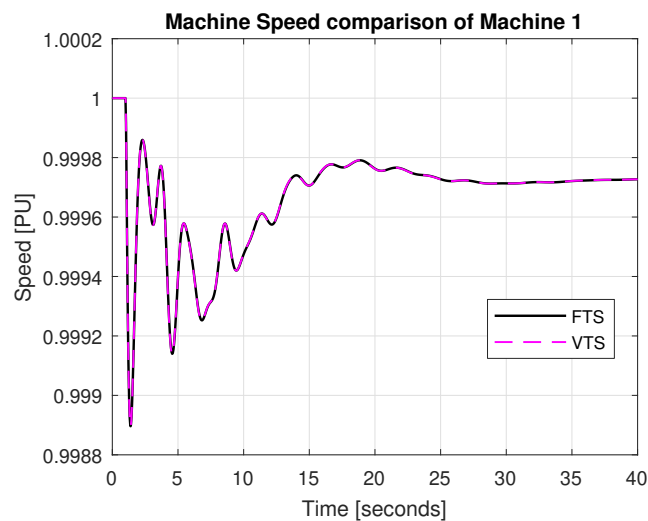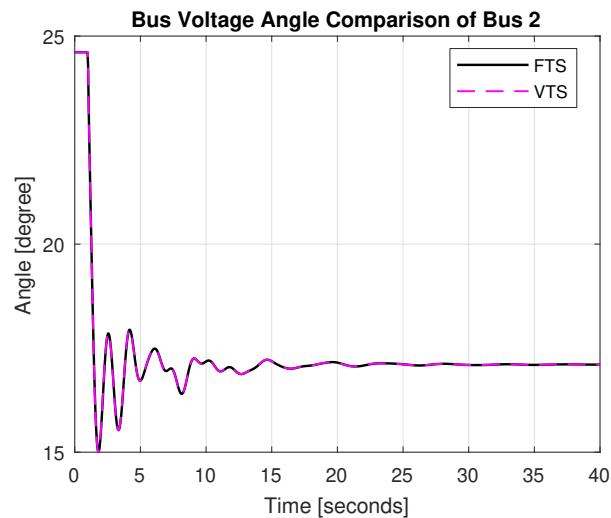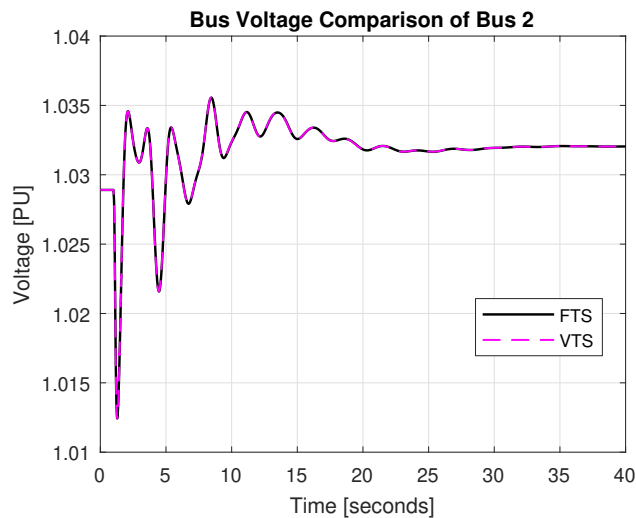
Select Comparisons: t = 260:360 (Result 'Drift' - Scale should be noted)