Recent Progress:

1. **PSLF License Expires June 30**.
2. Differences in steady state behavior due to R being on a different base.
3. PSDS doesn't account for 'effective droop' in system where not all machines are governed:

$$R_{eff_i} \triangleq R_i \frac{\Sigma \mathrm{M}_{\mathrm{Base}_{GOV}}}{\Sigma \mathrm{M}_{\mathrm{Base}}}$$

   This can be accounted for in LTD via a simulation parameter.
4. Kundur 4 Machine system step and ramp validated.
5. Alternate input of System H tested.
6. Six Machine System created to test additional features. (see reverse)
7. Step and ramp perturbances for loads, generators, branches, and shunts refined.
8. Logging added to branch and shunt agents.
9. System slack identified programatically.
10. GitHub updated: `https://github.com/thadhaines/`

Current Tasks:

1. Continue to Update Code flowchart to aid in further development.
2. Work to incorporate Matt's *Suggested Use Cases* into simulation.
   - Add Timer, Power Plant, and Balancing Authority Agents
   - Work to Define Definite Time Controller, Power Plant, and Balancing Authority user input
   - Define Agent actions for AGC/LFC (i.e. ACE / UCE / SCE calculations)
   - Further Refine perturbance Agents for Generator/Slack Agents

Current Questions:

1. Is System Damping, D, in MW*s/Hz? Any common settings?
2. Should D be defined as negative or should $\Delta\omega = \omega - 1$ when scaling D?

Future Tasks:

(a) Formulate feasible plan of action for casting all WECC governors to LTD governors (tgov1). Something like:
   i. Parse models of interest from dyd.
   ii. Create dyd from parsed model.
   iii. Automate a 'scaled' Pref step test for a one machine infinite bus in PSDS.
   iv. Read and analyze output data
   v. Generate/Calculate LTD equivalent model parameters from results (this will probably use MATLAB and `jfind`)
   vi. Export custom dyd for LTD simulation. (PSDS would still use original the dyd, though *could* use modified dyd)

(b) Add import mirror / bypass mirror init sequence option to prevent repeated mirror creations.

(c) Create an agent for every object: ULTC, SVD, Transformer, …

(d) Investigate line current data and ULTC action in PSDS.

(e) Account for different types of loads (exponential load model)

Matt Requests:

(a) Enable multiple dyd files to overwrite / replace previously defined agents/parameters

(b) Allow for variable time steps.

Six Machine: The two area six machine model shown in Figure 1 has enough generators to experiment with power plant agents, balancing authorities using AGC control, multiple generators per bus, and automated shunts to control bus voltage.

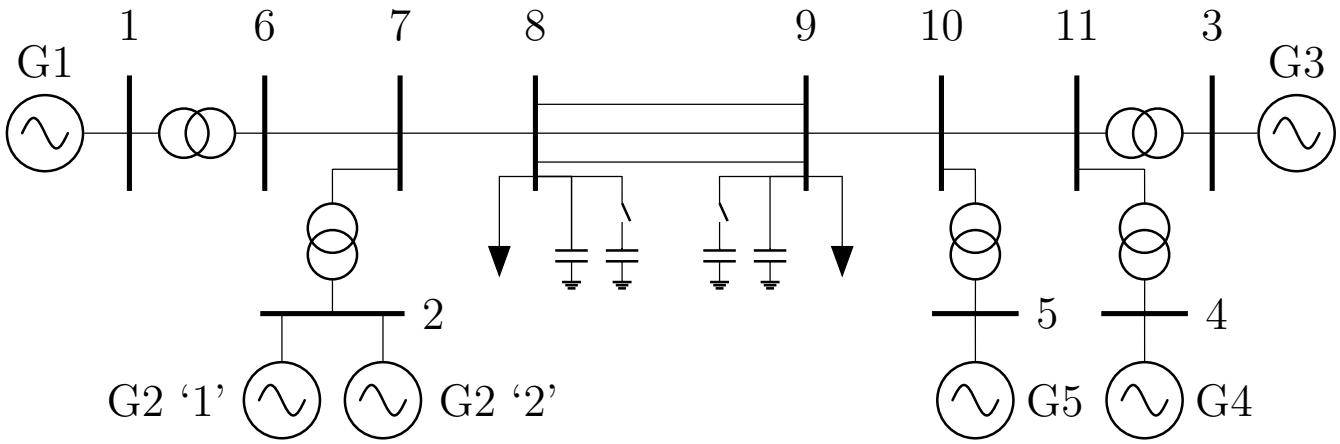
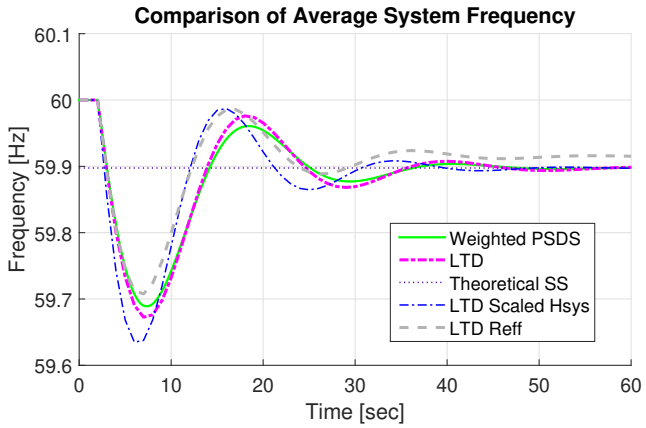
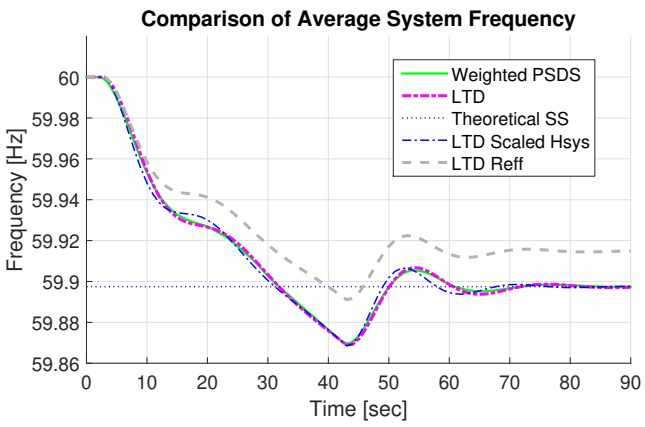


Figure 1: Six Machine System Model.

Additional Features: While the behavior of PSDS can be matched fairly closely using LTD[1], simulation parameters allow system inertia to be scaled[2], and effective droop to be taken into account[3]. The default LTD system frequency response and the effects of these additional simulation features are shown in Figures 2a and 2b.



(a) 75 MW Load Step.



(b) 75 MW Load Ramp over 40 Seconds.

Figure 2: Comparison of LTD system frequency to PSDS weighted frequency.

Note that the plotted theoretical steady state value was calculated using the ideal R values. If effective R values are used for the calculation, the calculated result matches the LTD Reff simulation result.

[1]LTD is using a 1 second time step while PSDS is using a 4.167 ms time step.
[2]Hsys scaled by 75%.
[3]Generator 5 is un-governed.