Grid Code Frequency Response Working Group
Stewart Whyte – System Development



Synthetic Inertia

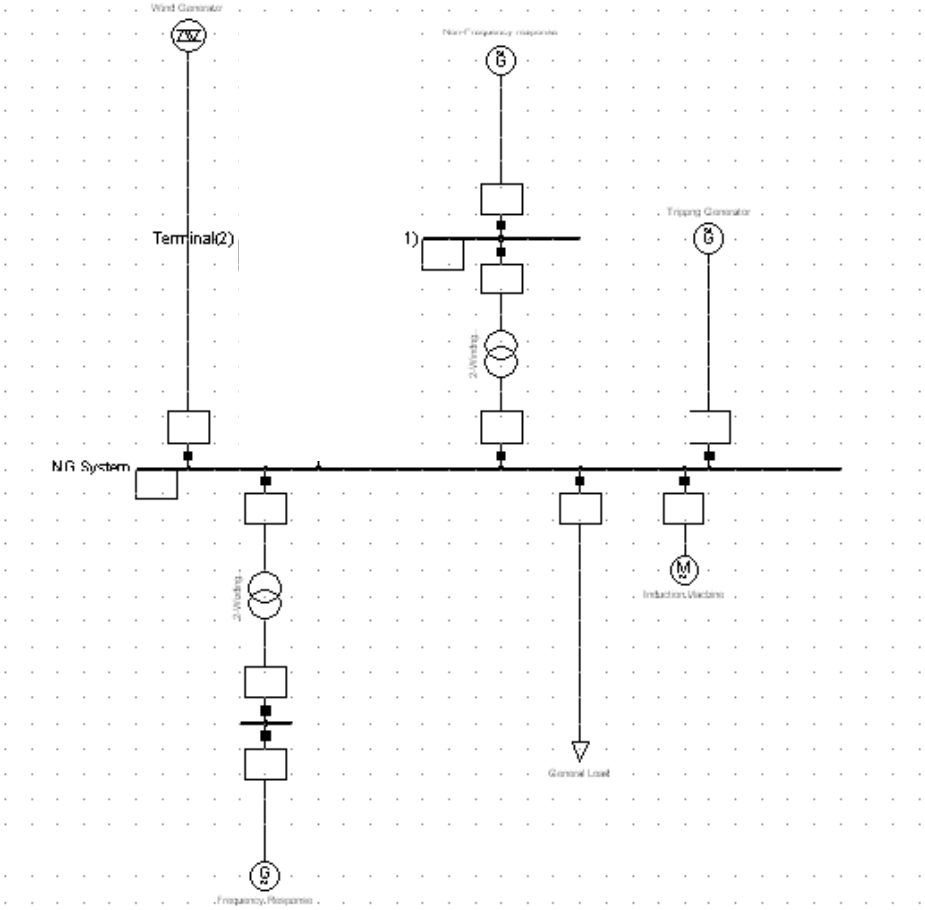
3rd December

Today's Outline

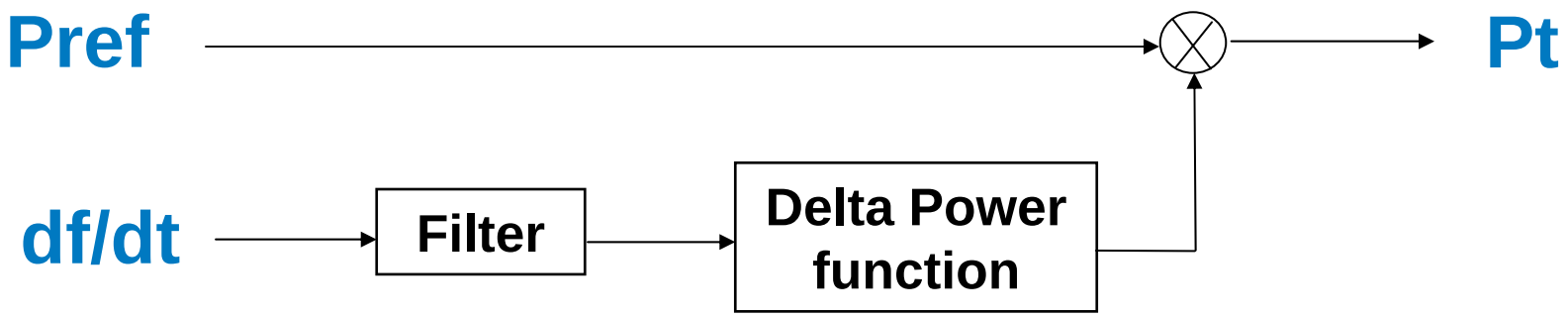
- Overview of Minutes and Actions from last meeting - TI
- Synthetic Inertia Delay - SW
- Summary of Actions
- Next meeting

System model and system conditions

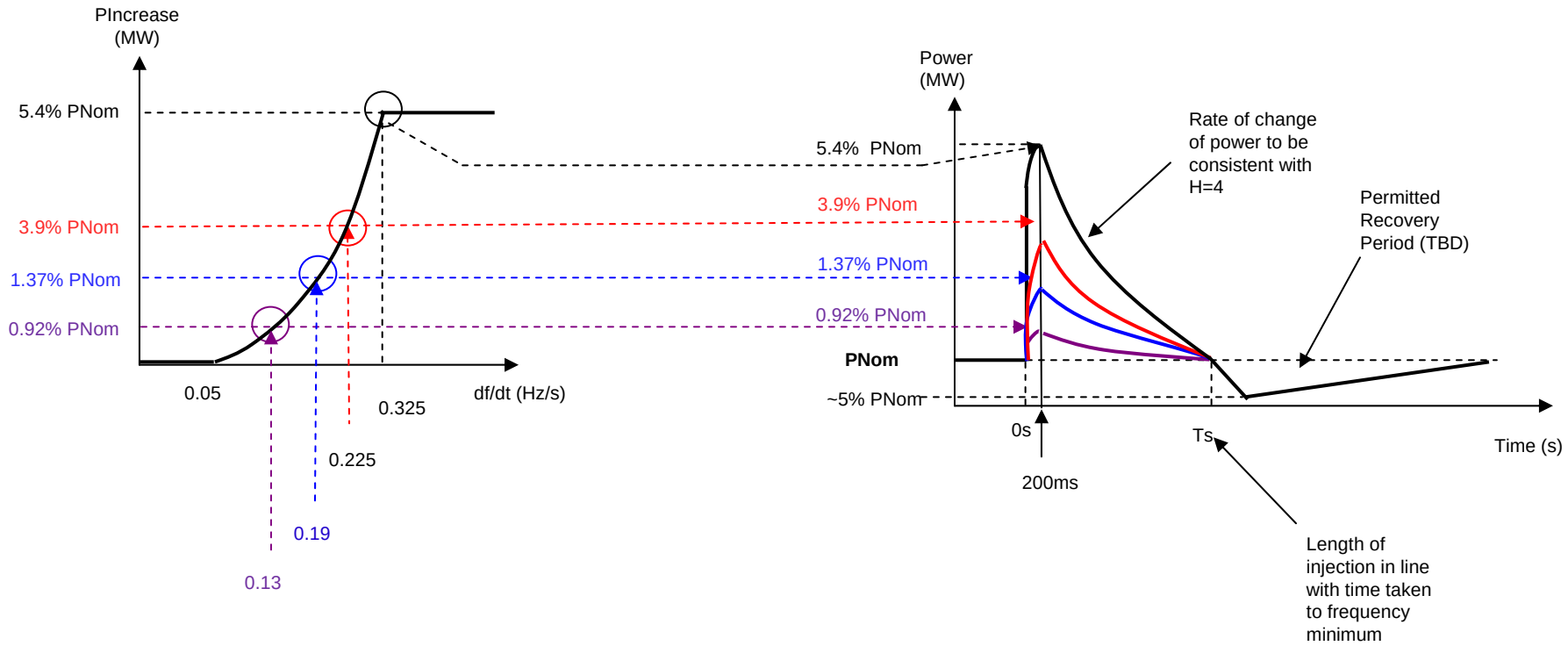
- Generation
  - Wind
  - Conventional
- Trip a single generator
  - 1320MW and 1800MW
- Demand
  - 25GW
  - Static and Rotating
- Frequency Responsive Generator
- Non Frequency Responsive Generator
- Wind generator (static generator)



Synthetic Inertia controller used for National Grid modelling



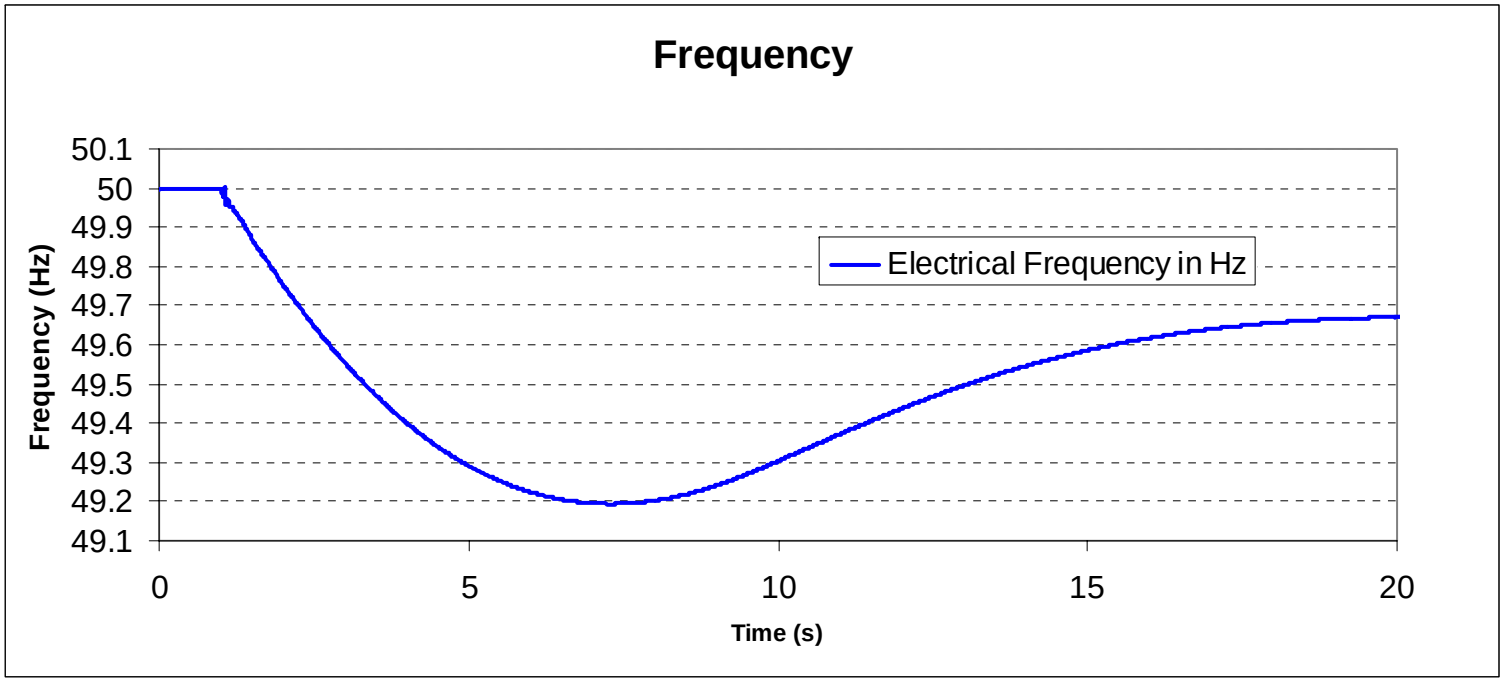
Current Synthetic Inertia proposals



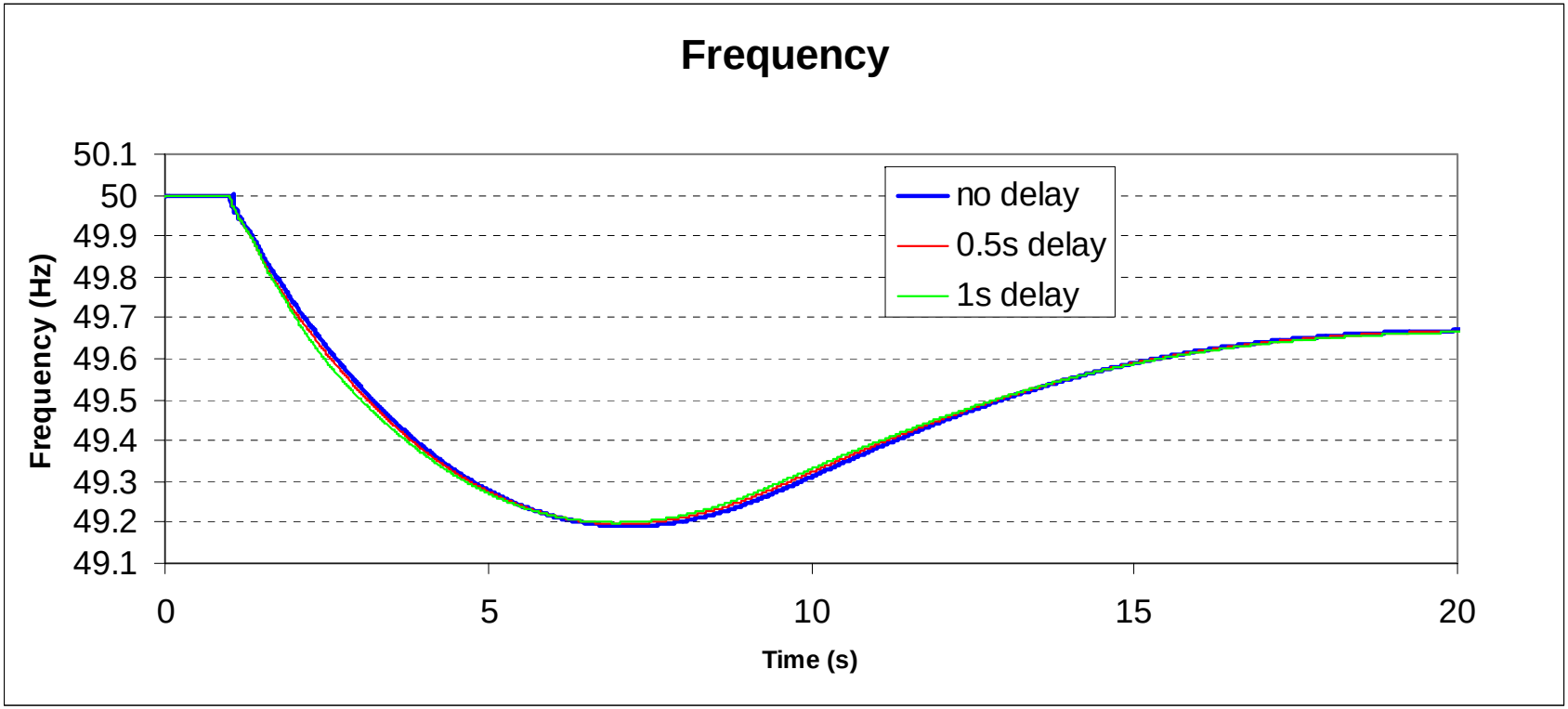
Studies Conducted on Synthetic Inertia

- 25GW and 40GW system studied
- 1800MW loss
- Frequency Response Generator is given relevant head room
  - Provides correct response for no wind condition
- Non Frequency Response Generator is assumed to be at full load
  - In 1800MW loss case at 25GW without any wind, this had to be increased in size
- Wind Generator is providing synthetic inertia
  - Ramp is still in roughly 200ms in all instances
- Different SI delays are studied
  - No delay
  - 0.5s delay
  - 1s delay

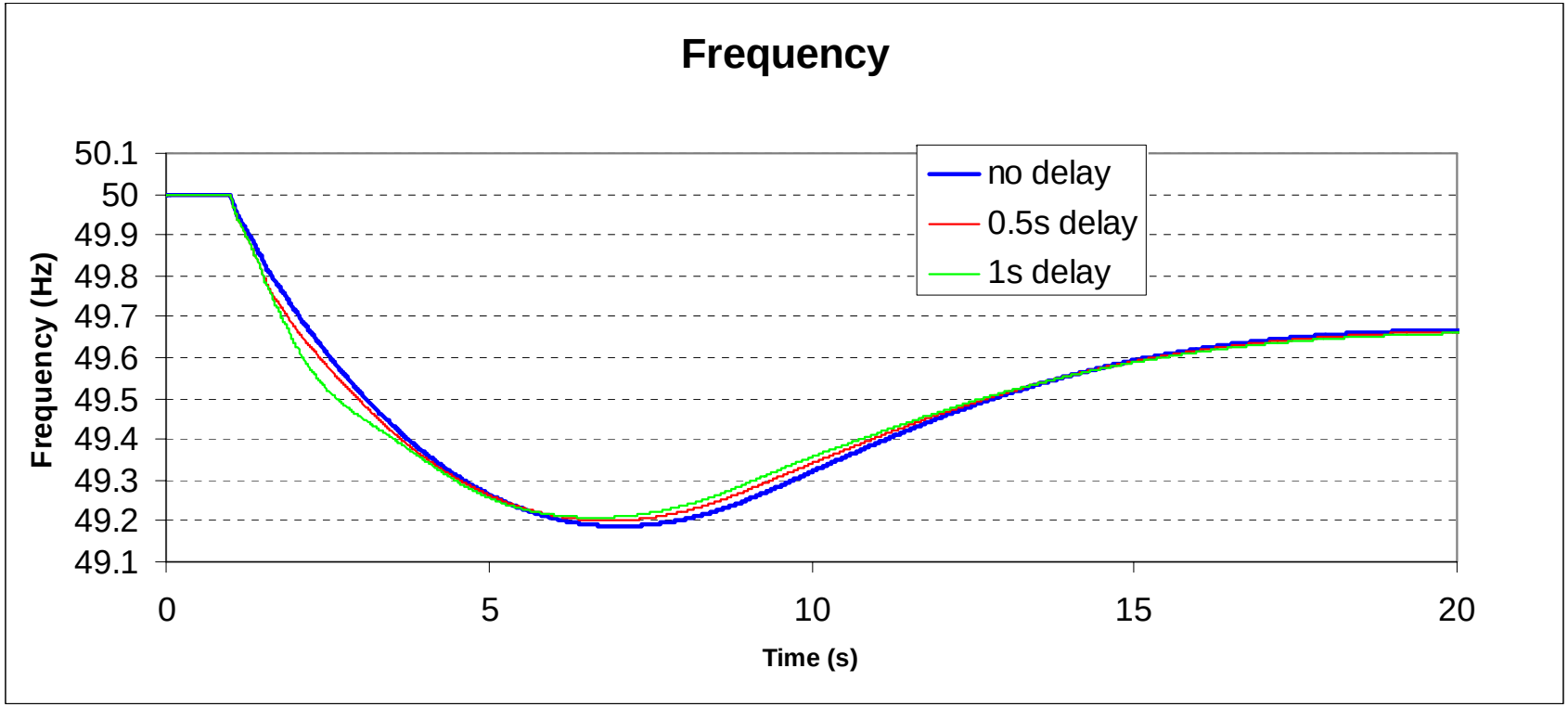
25GW system, 33GVA system,1800MW Loss



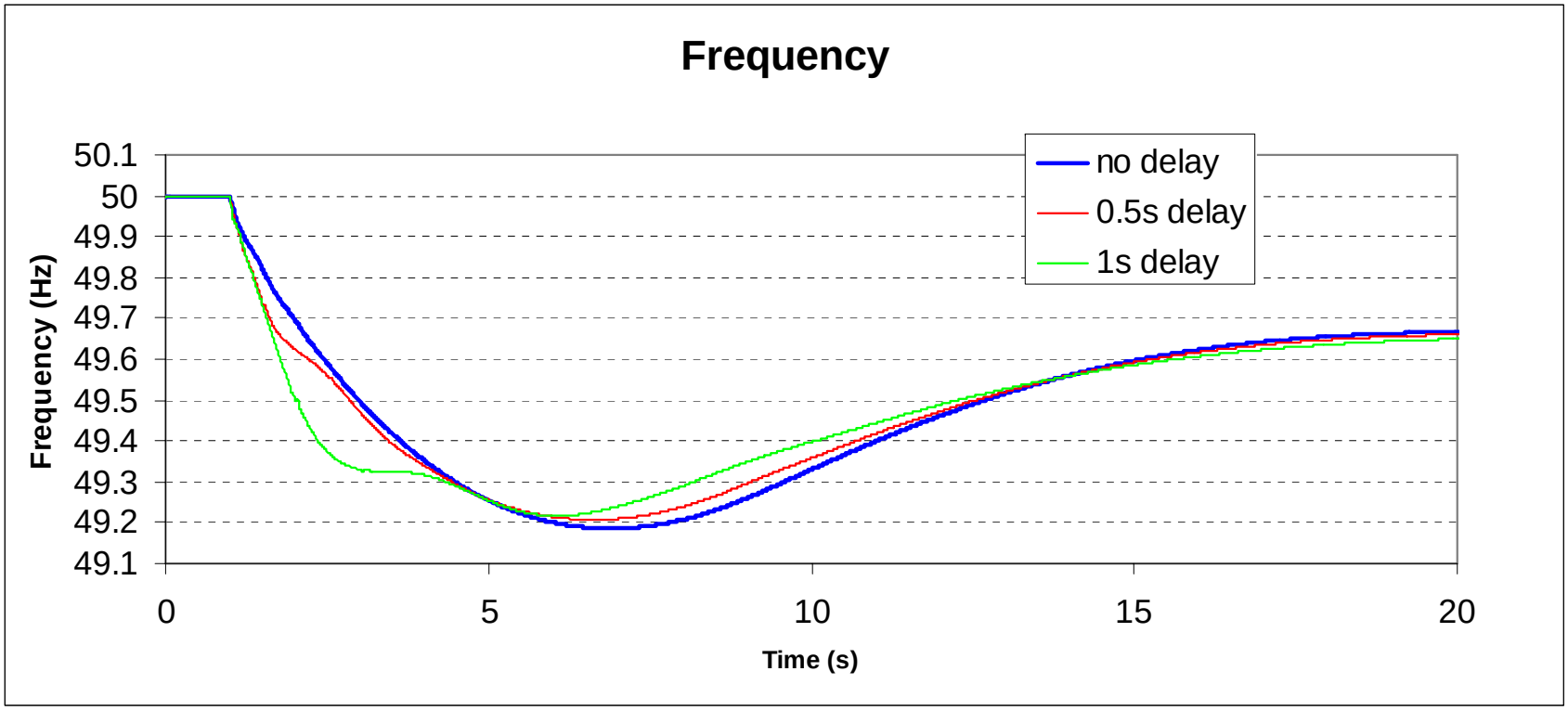
25% wind with different SI delays



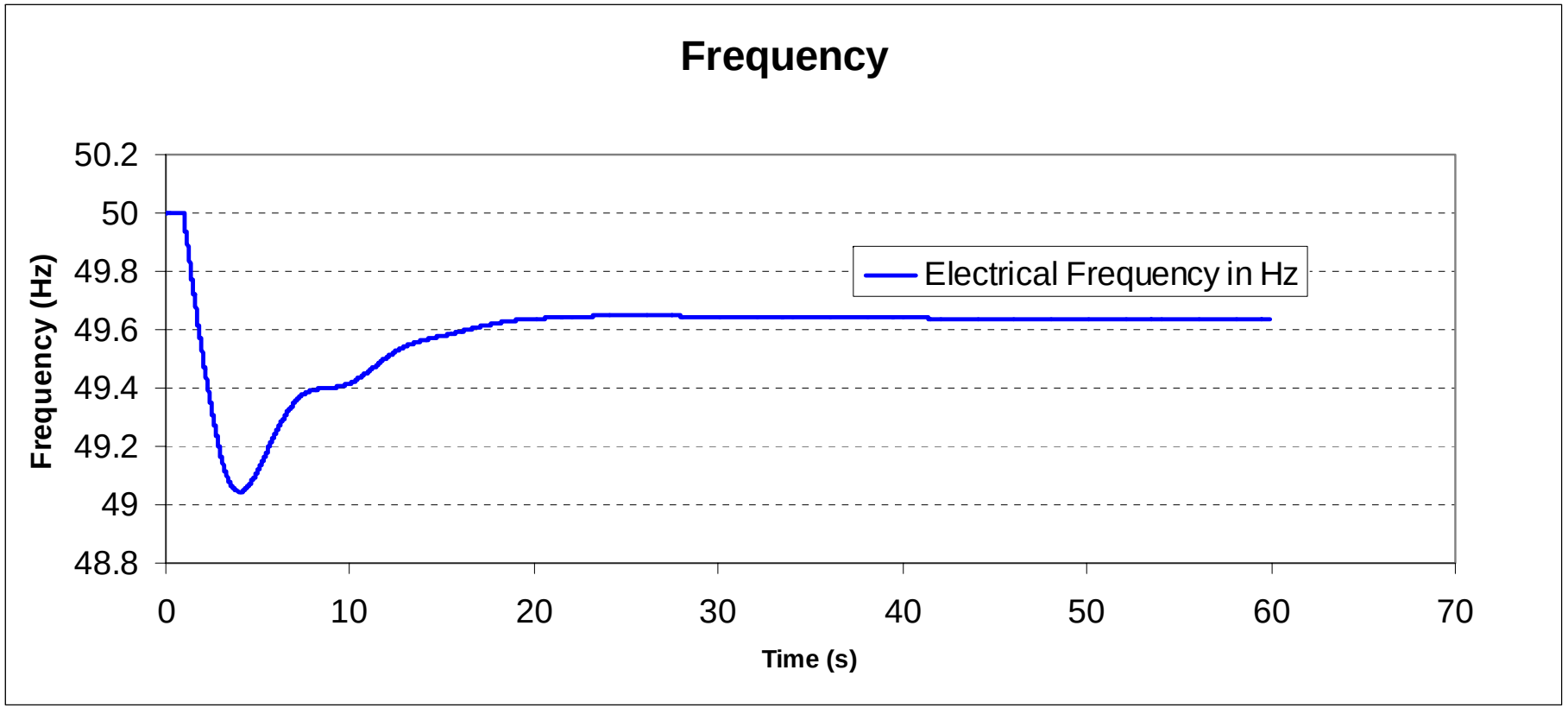
50% wind with different SI delays



75% wind with different SI delays

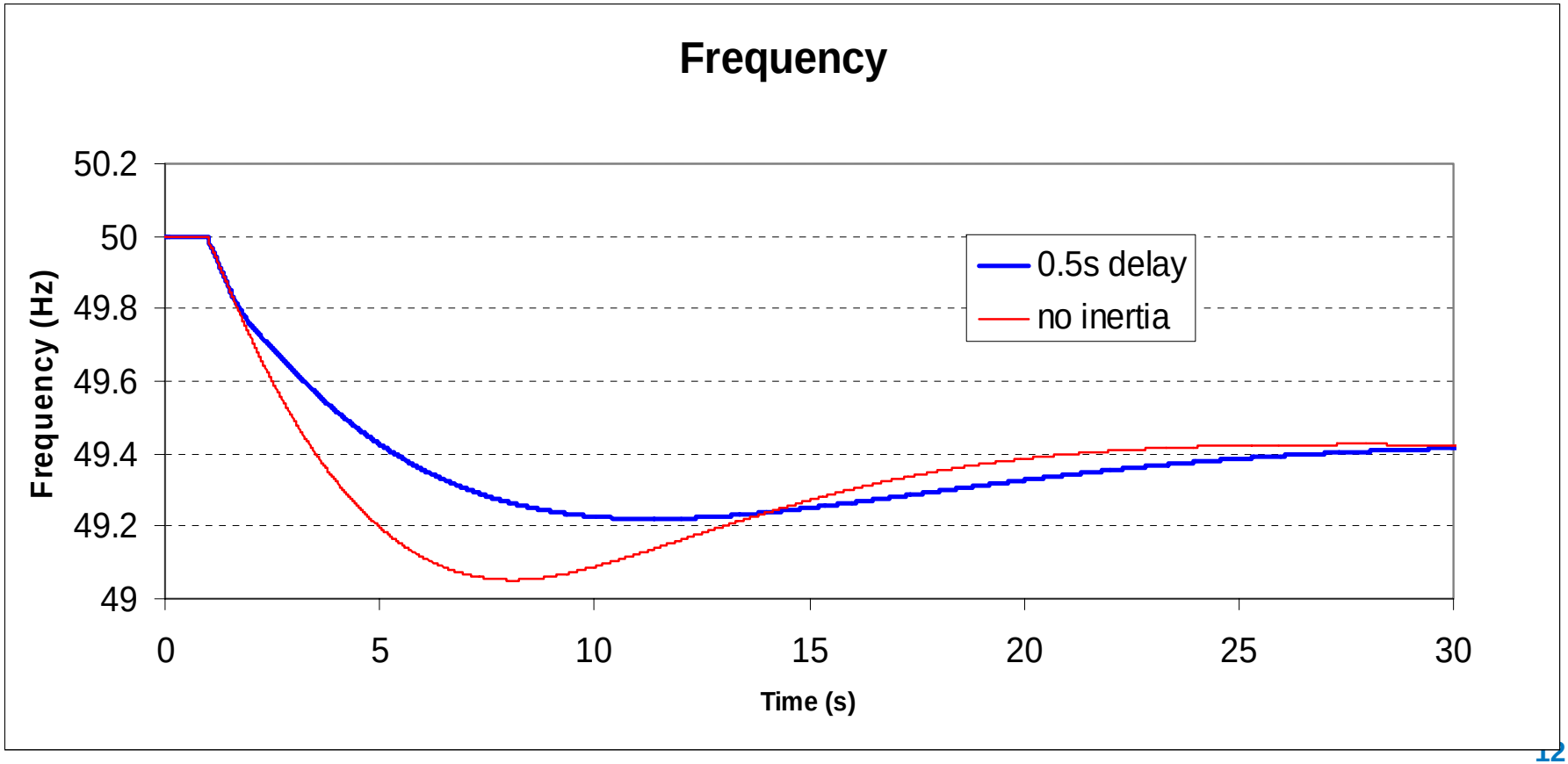


75% wind with a 2s delay



40GW system

- 40GW demand
- 50% wind generation



Conclusions

- Delay of up to 1s can be tolerated
- More work needs done to look at the ramp rate of the inertial contribution
- Inertial Contribution is required on larger systems where there is a significant penetration of wind