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Frequency Response – Technical Subgroup

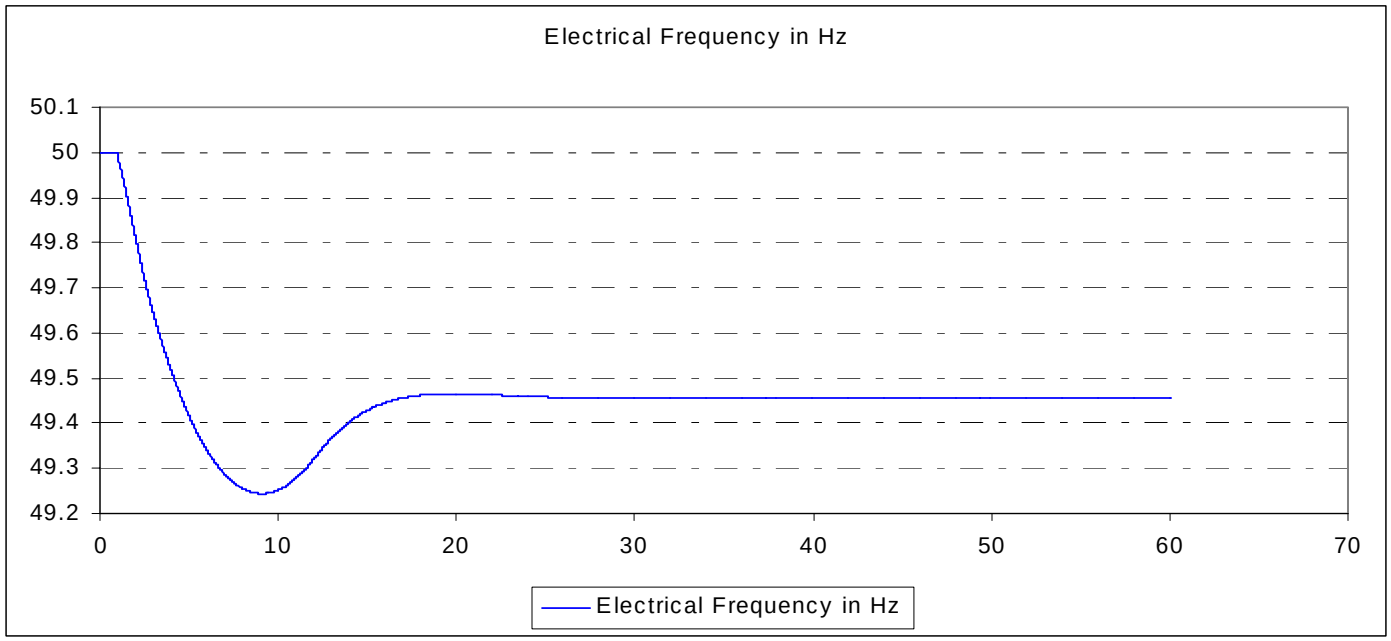
Dynamic Simulation Update – 28th March 2011

Key Points for this Meeting

- Generation Background assumptions have been updated in line with group discussions (see separate spreadsheet)
- Governor models have been refined
  - Specific parameters adopted for delays and ramp rates
    - Synchronous Plant
      - Delay - 1s
      - Ramp rate equivalent to 8MW/s per generator or 16MW/s module (assuming 2:1 configuration)
    - Asynchronous Plant
      - Delay – 1s
      - Ramp rate equivalent to MW/s per module (capacity) in base model
  - The following slides present results from key 2020 generation scenarios
    - Full range of scenarios are being evaluated to meet the group's objectives of evaluating frequency control requirements
    - Feedback needed from working group members
    - 1800MW loss simulated
    - Models tuned for timescales up to Primary Response only
    - Fast acting proportional governor action examined

Low Demand Low Wind

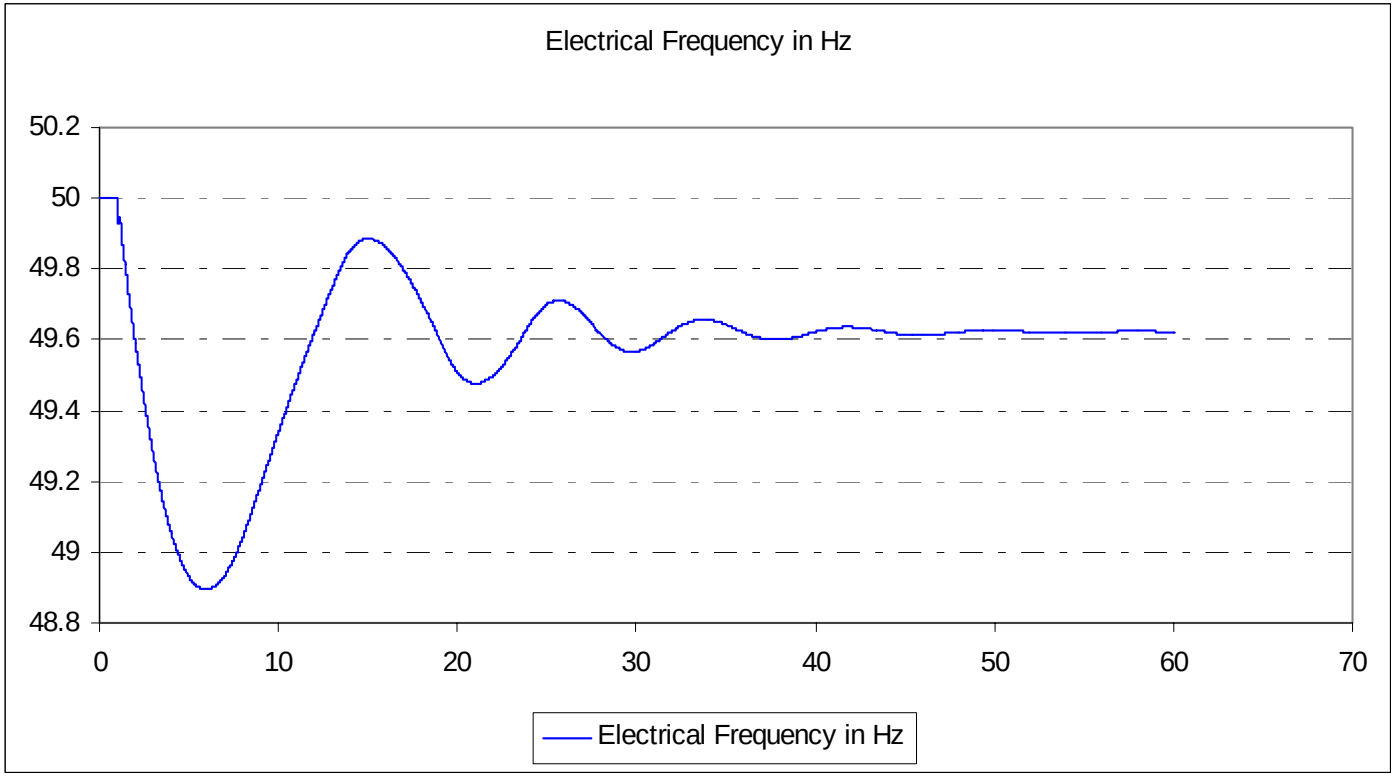
- Frequency containment achieved with response holding on synchronous plant in the absence of synthetic inertia



- Approximately 1400MW of dynamic response and 200MW of static response delivered

Low Demand High Wind

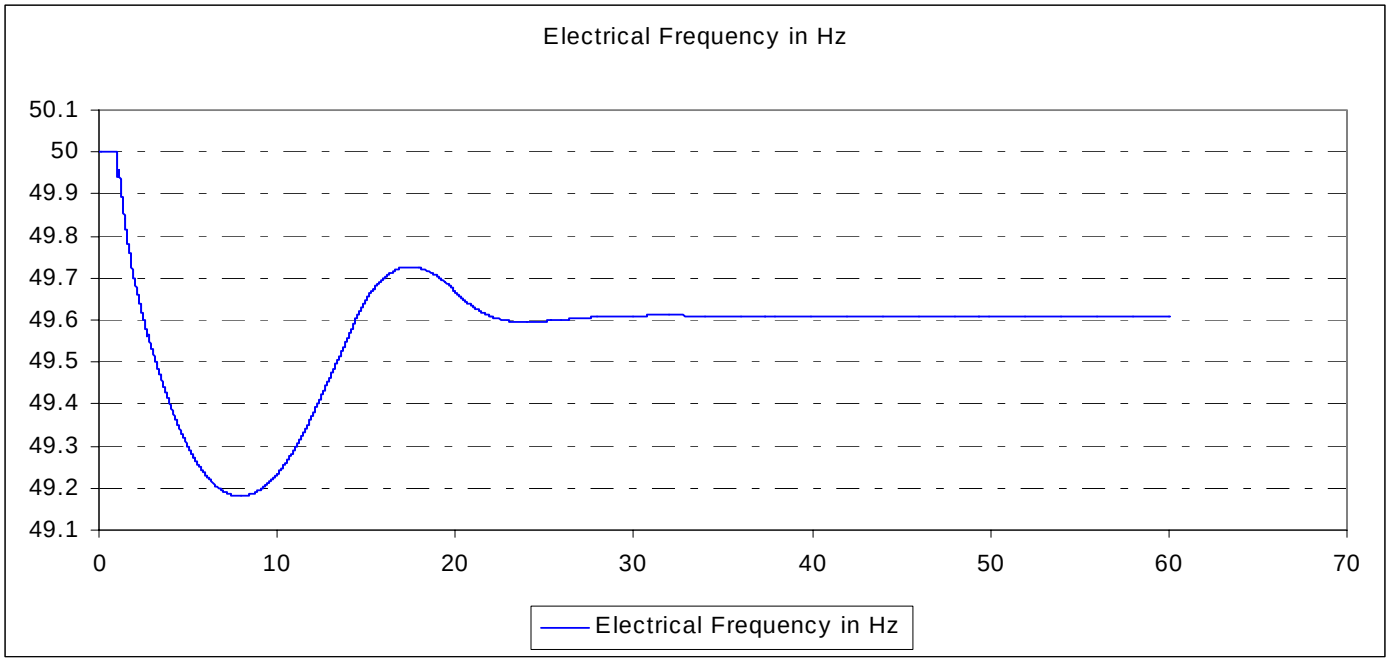
- Frequency containment not achieved in the absence of synthetic inertia



- 650MW of dynamic response from synchronous gens, 1200MW from wind turbines and 200MW static delivered

Low Demand High Wind

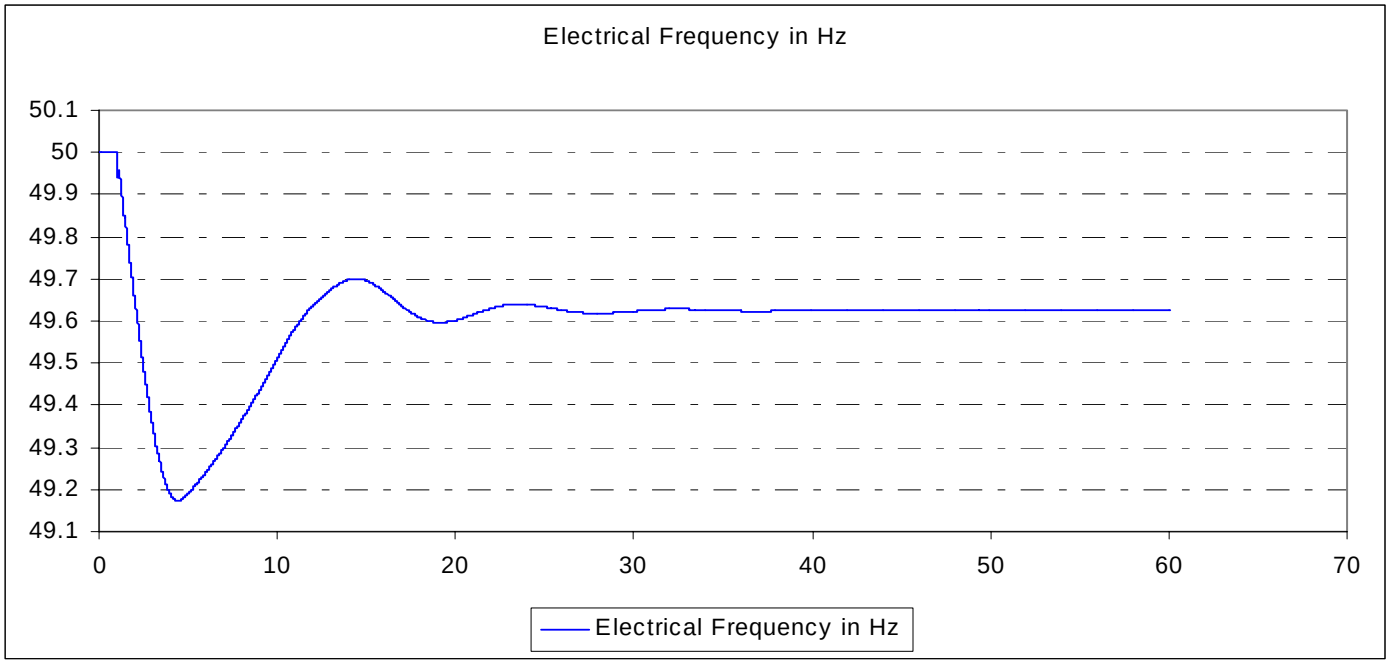
- Frequency containment achieved using df/dt triggered control



- 450MW of dynamic response from synchronous Gens, 1200MW from wind turbines, 200MW static response and 800MW of synthetic inertia delivered

Low Demand High Wind

- Frequency containment achieved using fast acting governor action on asynchronous frequency sensitive generation



- 400MW of dynamic response from sync gen, 1200MW of dynamic response from wind turbines within 4 seconds and 200MW of static response.

Summary of key points

- Simulation results highly sensitive to assumptions
  - Ramp rates
    - Capability, multiples of machines and deload point assumptions
  - Delays
    - Longer delays in response delivery would invalidate results
- Significant volume of synthetic inertia needed under 25GW high wind scenario
  - frequency containment enabled by
    - df/dt control or
    - fast acting response on frequency sensitive asynchronous generation
      - are these ramp rates and response times achievable?
- Simulation work at higher demands suggests synthetic inertia requirement becomes apparent at 35GW
  - Further information to be provided in meeting