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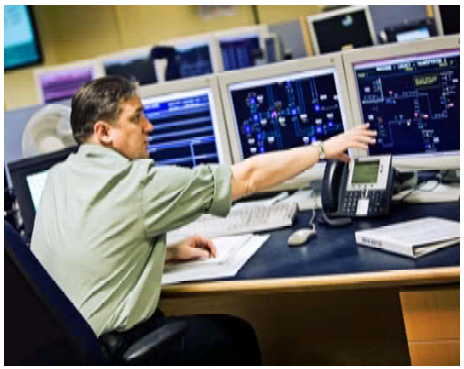
Frequency Management



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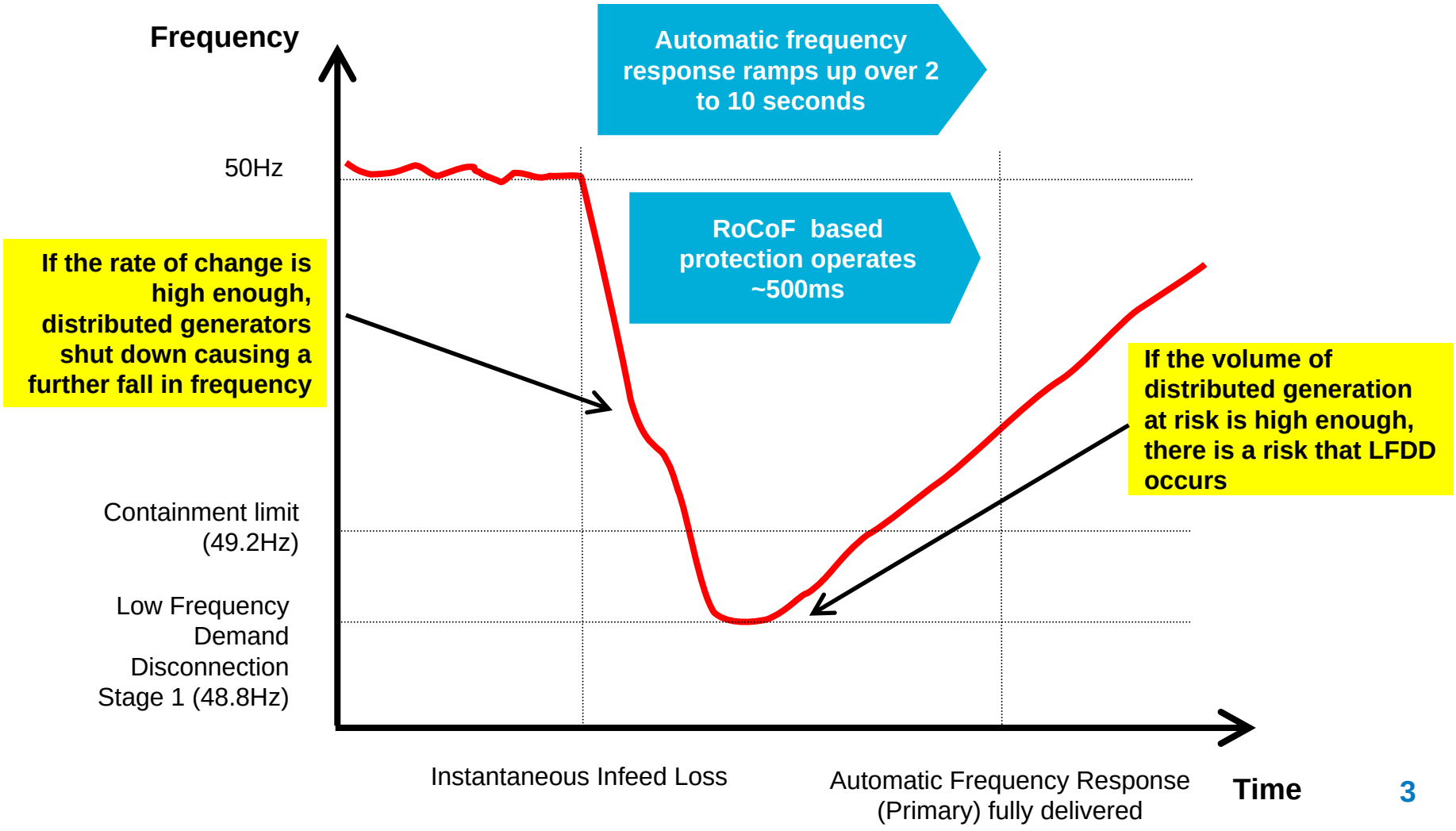
Frequency Control

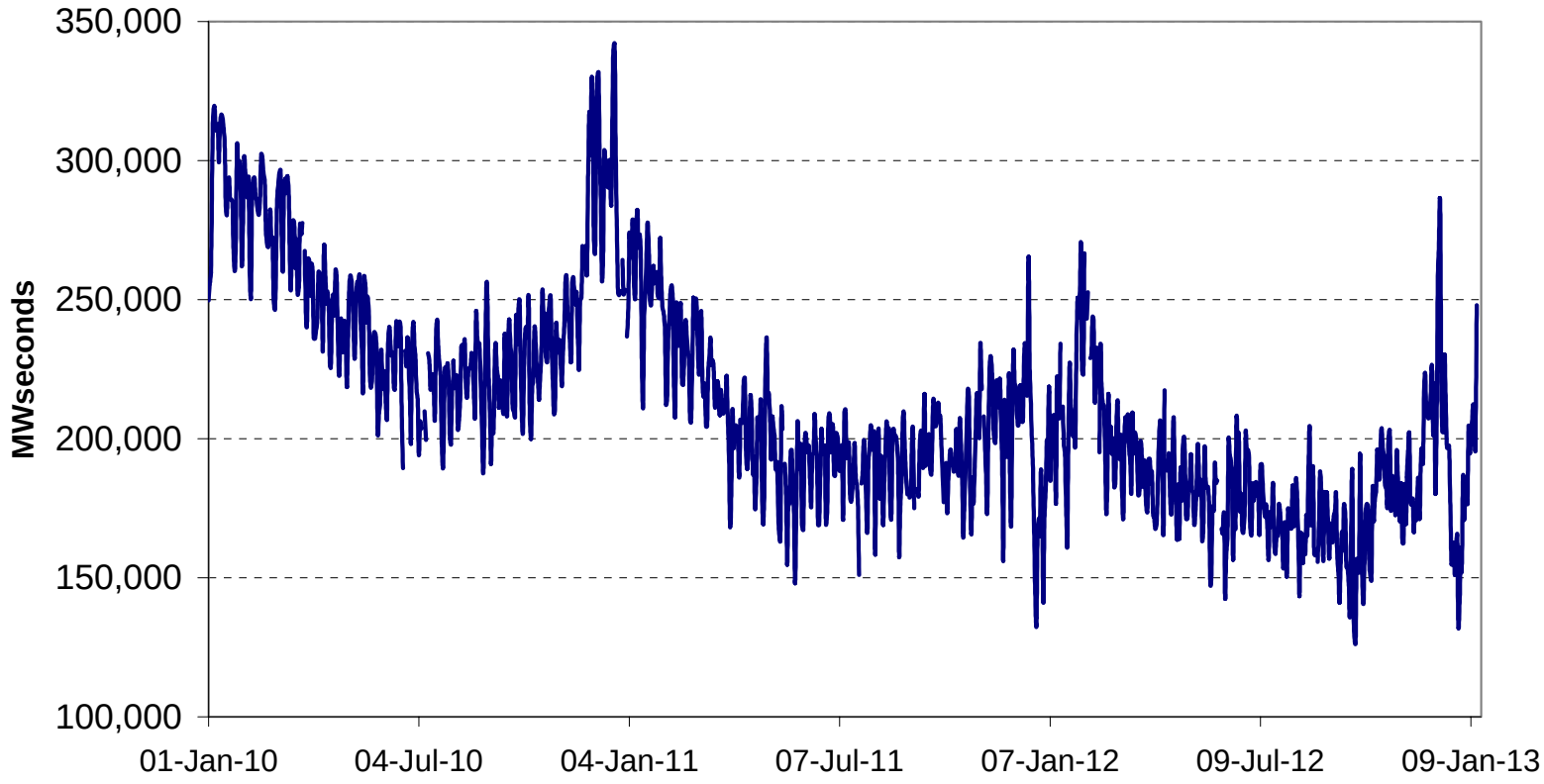
- Technical Background
- Technical Assessments
- Technical Solutions
- Commercial Assessments
- Commercial Solutions
- Timelines

Technical Background

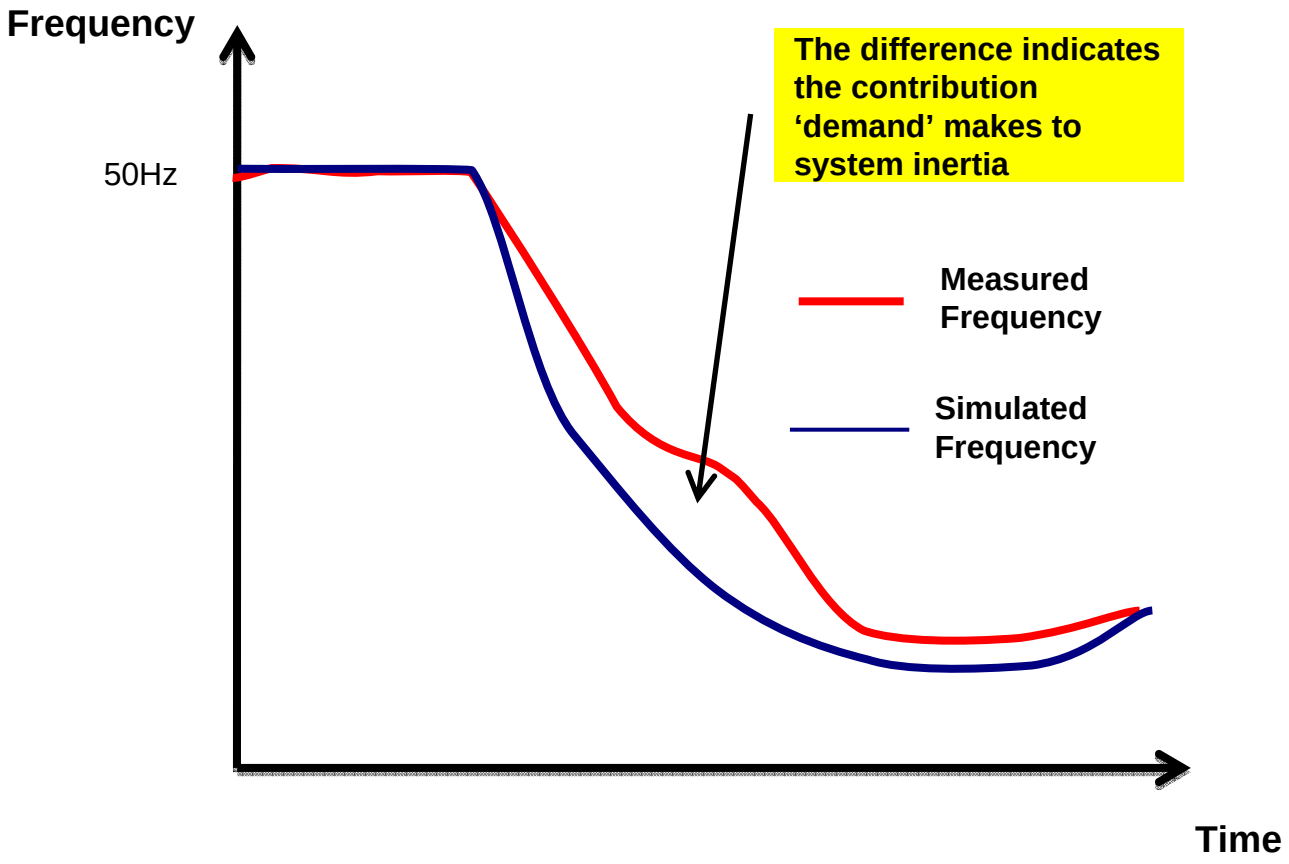


Technical Background

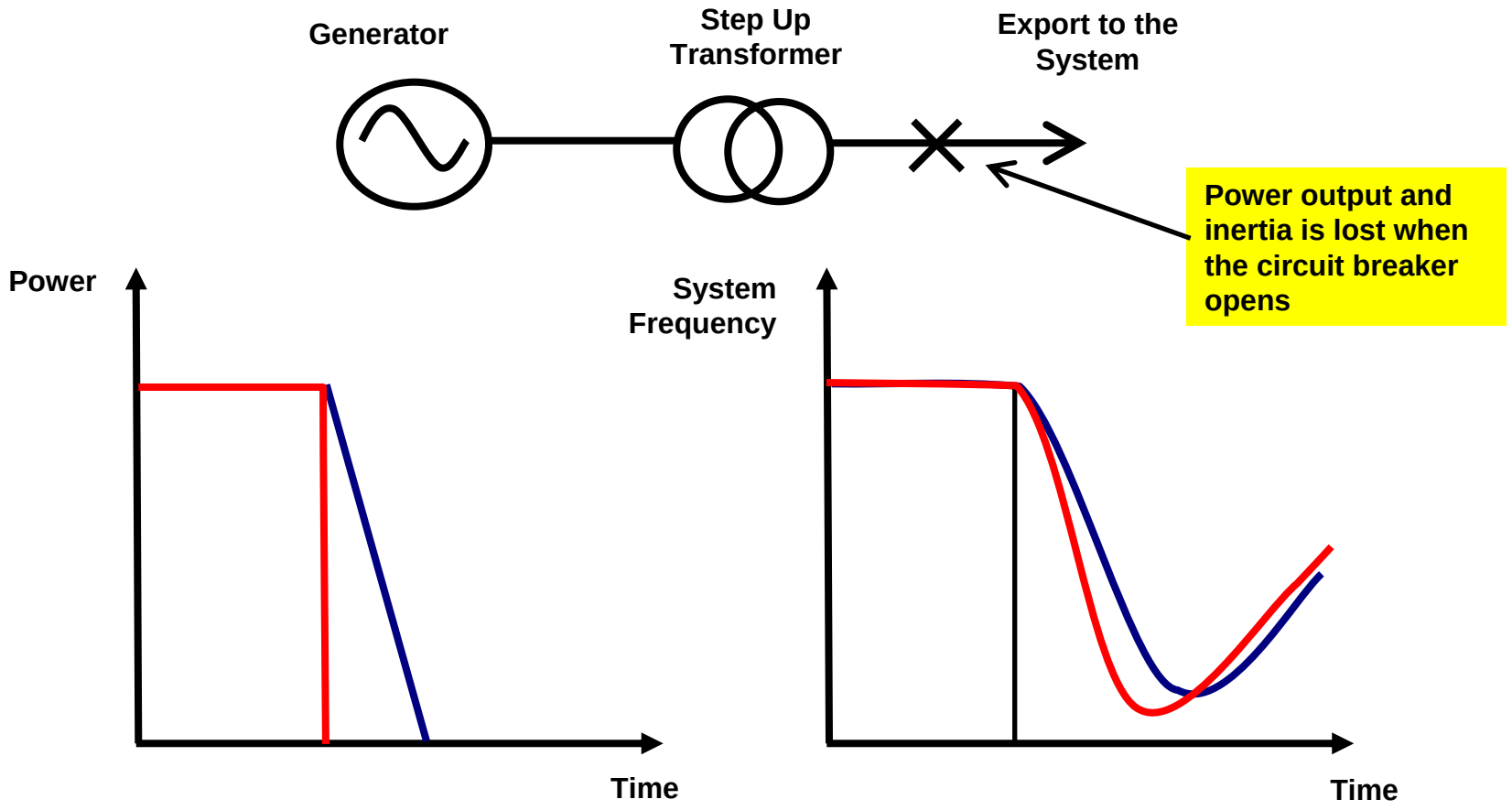
Stored Energy in Transmission Contracted Synchronised Generation for the 1B Cardinal Point (overnight minimum demand period)



Technical Assessment



Technical Assessment



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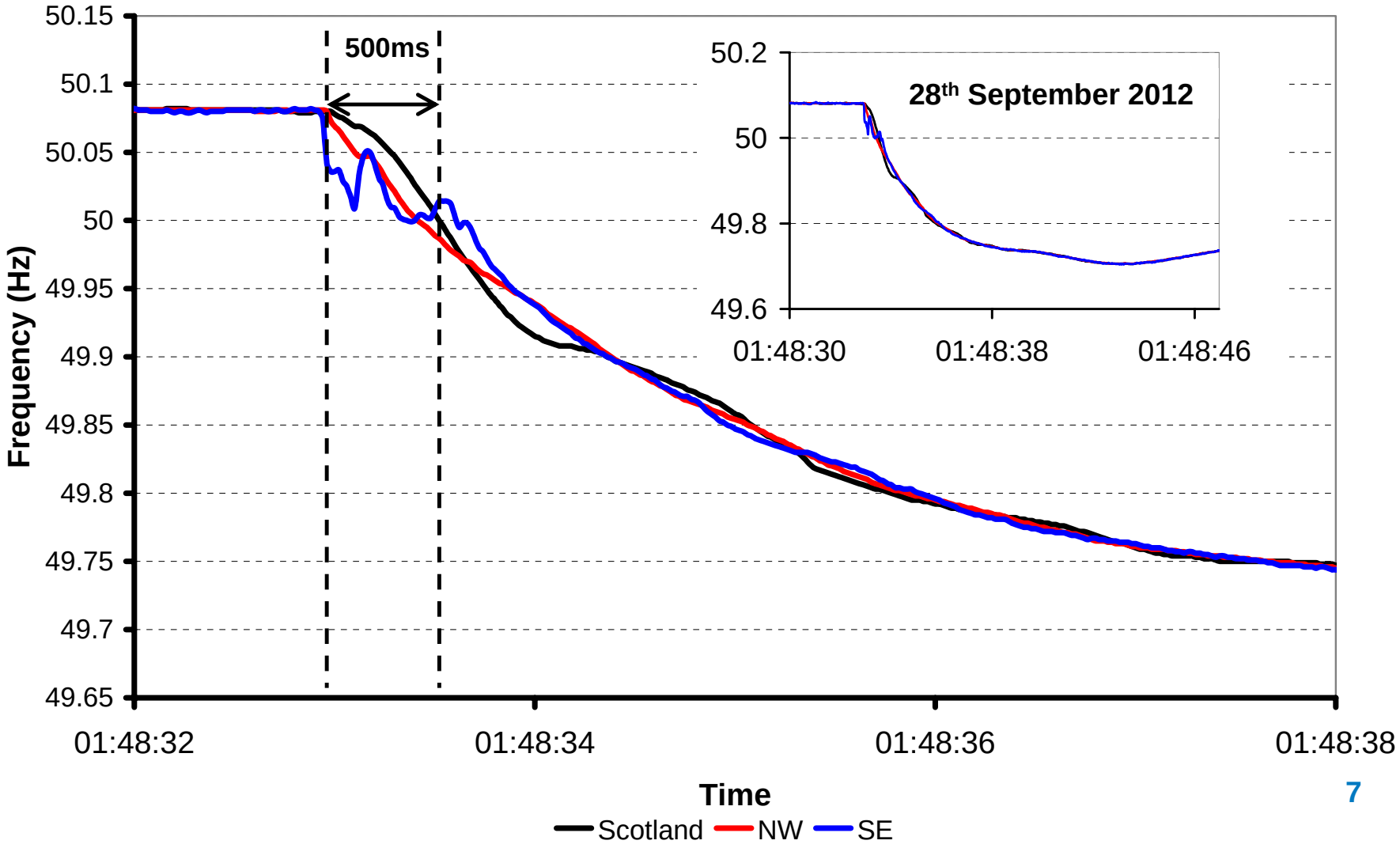
Technical Assessment



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Technical Solutions

- Options for Managing the Risk
  - Limiting the largest loss limits the rate of change
  - Increasing inertia by synchronising additional plant reduces the rate of change
  - Limiting the Rate of Change using automatic action (not currently feasible)
  - Changing or Removing RoCoF based protection

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Commercial Assessment

- The maximum rate of change risk occurs when demand is low and there is a large instantaneous infeed or offtake risk to manage
- The maximum rate of change is rising because
  - Synchronous generation is being displaced by non-synchronous plant – interconnectors and wind
  - There will be larger infeed losses in the future
  - There are trends within consumer demand which are reducing system inertia

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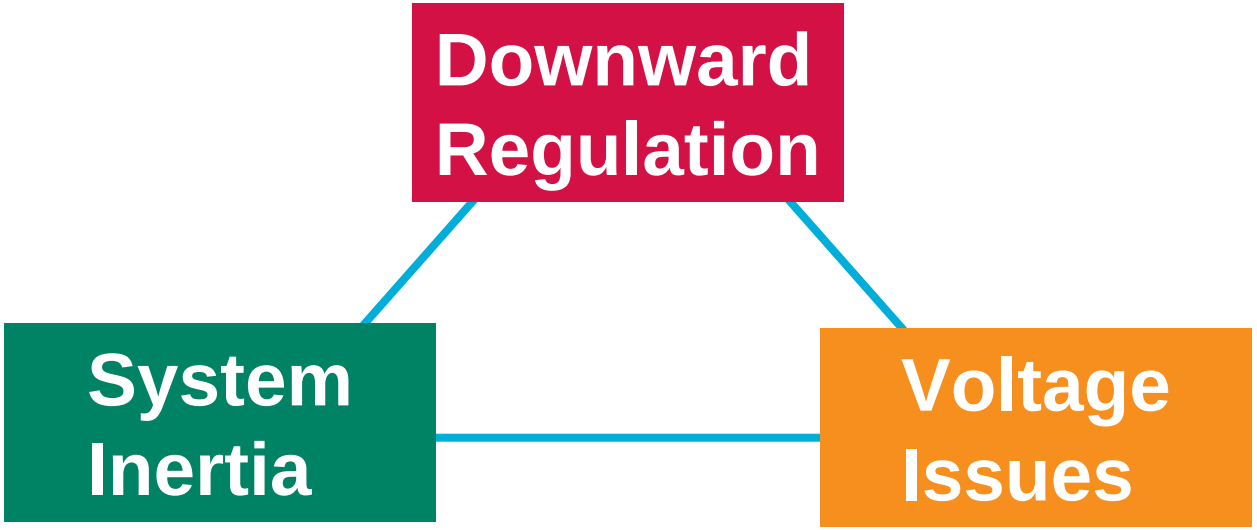
Commercial Assessment

- Interaction with other system issues



- Issues are all most prevalent overnight under high wind/import conditions
- System must be optimised to all three issues concurrently
- Requires a tool to forecast which machines will be on overnight and then enables us to create and optimal solution to all three issues

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Commercial Solutions

- As now, some of these system issues can and will be managed through existing balancing service tools
- However, National Grid will be looking to tender for services across the summer period, that assist in the management of these system issues.
- The nature of the service provisions are likely to consist of;
  - Low power or energy output – to minimise impact on downward regulation
  - High reactive capability – MVAr range and output
  - Provide inertia value – sync comp, or synchronous output with low power output e.g. a low SEL capability

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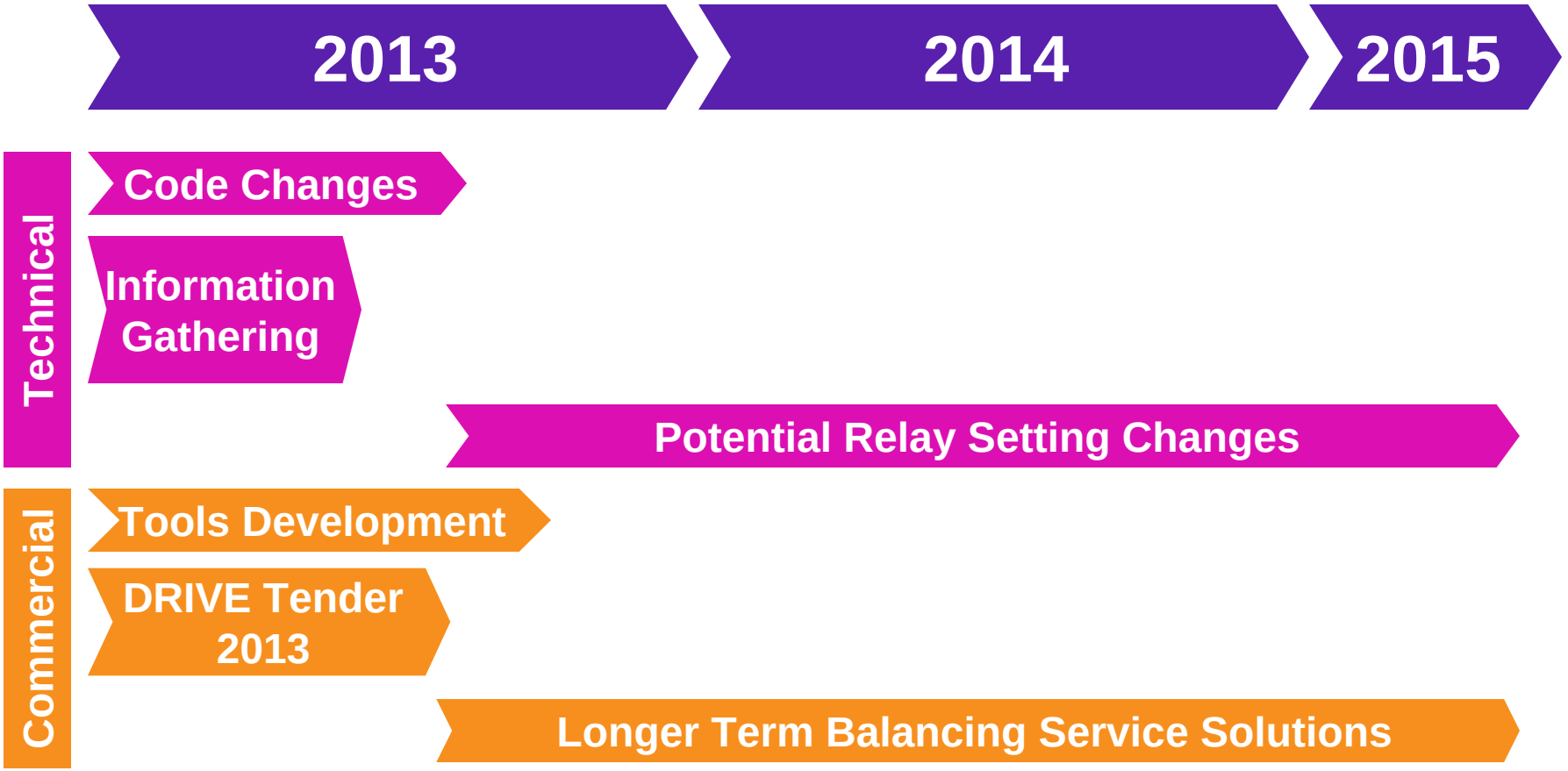
Commercial Solutions

- The issue related to Relays will be reduced in 2014/15 however, Inertia will be a prevalent system issue going forwards
- Longer Term Solutions
  - HF, LF and Dynamic services on Wind
  - Dynamic Frequency Response on Wind
  - De-coupled/Sync Comp Machines
  - Low-load operation

Timelines


2013
2014
2015
Technical
Code Changes
Information Gathering
Potential Relay Setting Changes
Commercial
Tools Development
DRIVE Tender 2013
Longer Term Balancing Service Solutions

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Q&A

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