2017 Wind Energy Workshop

Electricity Supply Resilience

13 April 2017, Wellington

Who is going to build the very fast response reserves?

Stephen Drew

What I will cover:

- **Recent experience**
- **Where we are in 2017**
- **The problem statement**
- **Is our resilience changing?**
- **The role for wind**

Recent experience

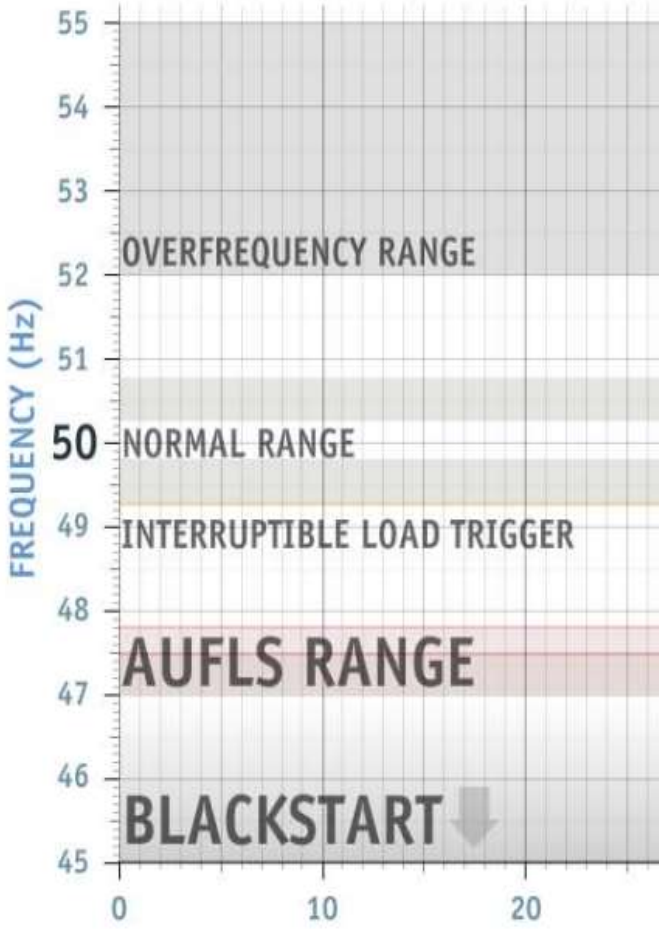
Our electricity infrastructure needs to react very fast if there is a large event on our grid to prevent cascade failure, viz:

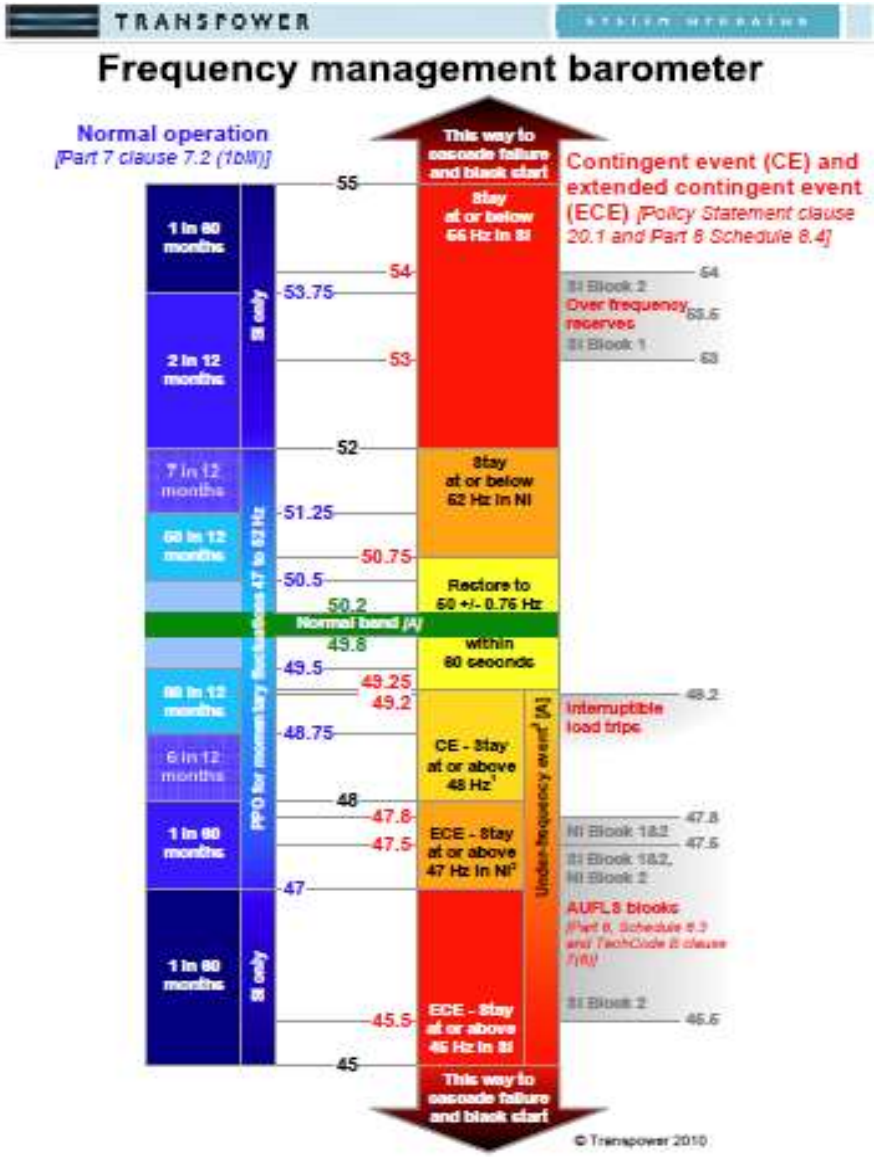
2011 – Huntly - 850MW
2013 – HVDC - 950MW
2017 – Twizel - 410MW

These AUFLS events have worked well to prevent a cascade failure but the lights have gone out for customers in both the North and South Islands for several hours.

Are we investing enough in this resilience?

Grid frequency





Instantaneous Reserve

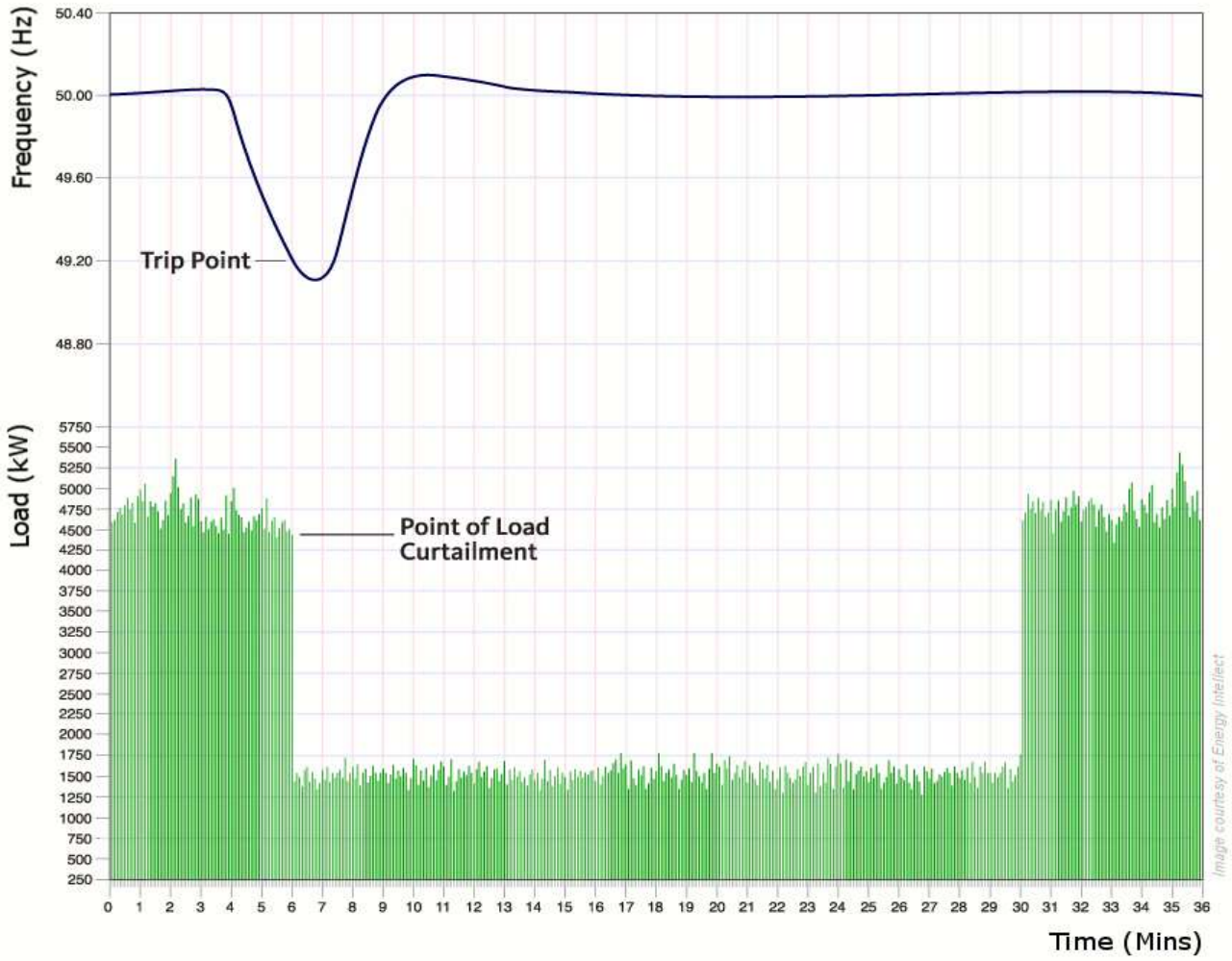
Reserve	=	Spinning reserve (generation assets in < 6 seconds)	+	Interruptible Load (IL) (industrial loads in <1 second and hot water)

WHY IS IL IMPORTANT ?

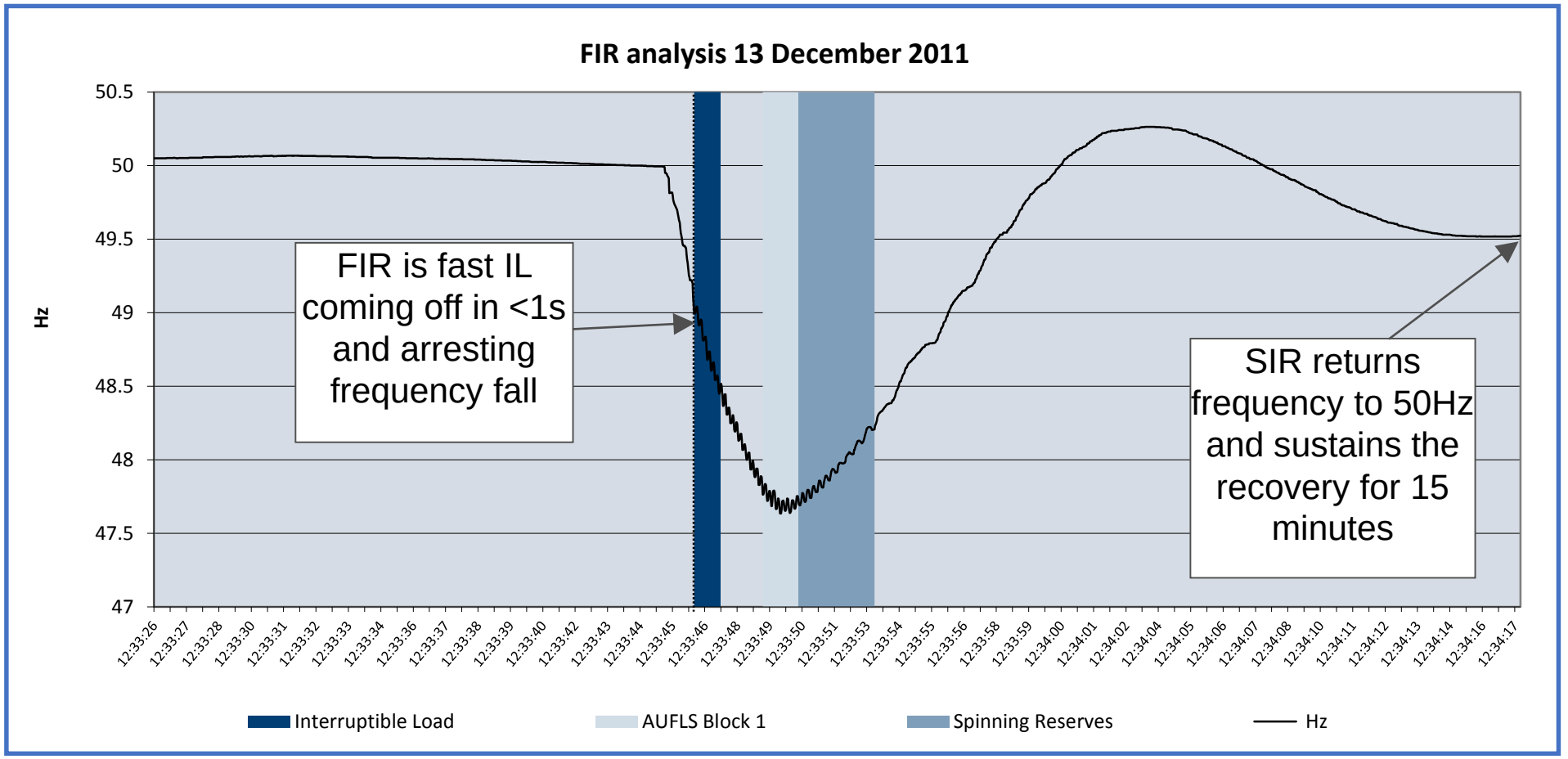
•System Analogy

- Avoid cascade failure
- Post vs Pre event load shedding
- IL can be faster than other reserve
- IL can free up other resources

IL responds at 49.20Hz



FIR – IL can help arrest the frequency fall



EnerNOC has built a 200 MW IL portfolio

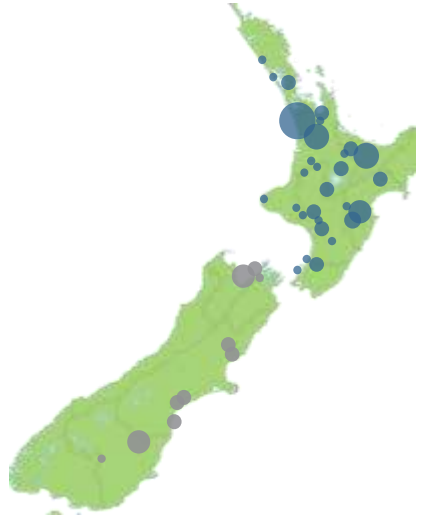
2007

We started with a **0.2MW** pilot at Wellington Port Coldstore – use of process storage

2009

Our technology was commercialised as our Smart Grid Terminals.

2017



EnerNOC's **200+MW** FIR and SIR portfolio represents most of the total cleared reserves

Where we are with our resilience in 2017

- FIR – IL helps arrest the frequency fall at 49.2Hz
- Most of the FIR – IL comes from major industry like steel and pulp&paper
- We have very little FIR-IL in Auckland, Wellington and Christchurch
- There are 1 million smart meters in homes without any under-frequency relays
- Our HVDC at high transfers is constrained by the tight reserve stack and the lack of reserves
- It takes time, many years to build and test FIR – IL and to bring it to market. This takes longer if investment is also needed in new energy storage.

The problem statement

Who is going to build the very fast response reserve, our FIR – IL for our smart grid future using more renewable generation including wind?

Why is there a problem for resilience?

- No-one is monitoring and reporting the lack of FIR-IL being built
- Extended reserves (AUFLS) relies on the concept of VoLL which is going to come under increased scrutiny if we have any more frequent events
- The NMIR (new National Market for IR) is making good use of the reserve sharing capabilities on the HVDC and the costs of procurement will go down. Some FIR-IL will get built and armed in the SI. Less FIR – IL overall will be dispatched and some capability will leave the market.
- New build from sources like smart hot water, other thermal energy storage, batteries, V2G in vehicles is hard to justify in an increasing tight market.

Role for Wind

- *To be able to stay on as long as possible before tripping off*

- **To support the new build for FIR-IL as part of energy storage investment to help provide more resilience on our renewable grid to manage major events.**

Thank you

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