

Interruptible Load

the direction for smart grids of the future

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What we will cover

- Where we have come from
- Interruptible Load
- The Interruptible Load project - our innovation through partnership, technology and aggregation
- Smart grids and the future

Where we have come from

We have a proud history in New Zealand in integrating the demand-side to help us maximise our use of our renewable generation.

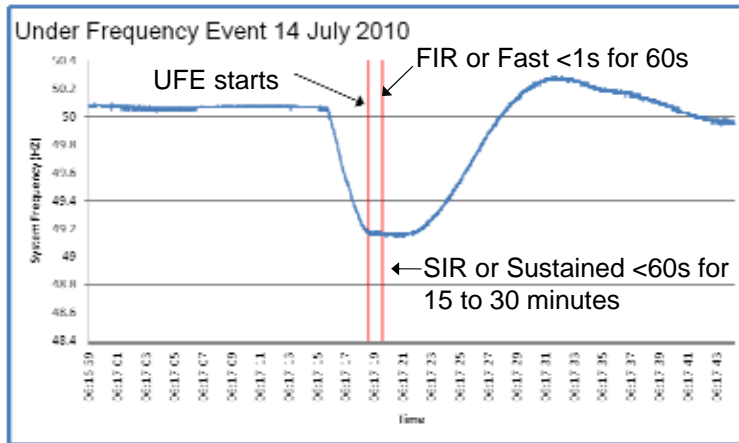


What is Interruptible Load or IL

- IL is part of the Instantaneous Reserves (IR) market in the North Island to avoid cascade failure.
- IL and spinning reserve provide the reserve for a contingent event.
- IL can come from large industrial sites or from hot water ripple systems.
- IL can be faster than other reserve.
- IL can free up other resources.



What is Interruptible Load or IL



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Why is more IL needed

- Reserve in 2009 became very tight.
- FIR and SIR prices were high and volatile
- Periods of additional risk, eg both generation and transmission have to be commissioned in next 3 years
- Increasing wind generation is anticipated on the grid

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Our IL project

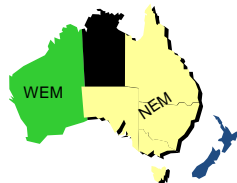
- Launched in October 2009.
- Innovation through our partnership, our technology and our aggregation.
- Presented for the first time at the EEA conference in June 2010



Our partnership

Collaboration between three unique energy industry participants:

- **Energy for Industry** – 10 years of industrial and electricity sector experience
- **Energy Intellect** – 15 years of metering and control technology
- **Energy Response** – 5 years in aggregating demand-side loads in the New Zealand and Australian electricity markets:



Block ER-2 of 10MW achieved a 100% reliability in the DSP Trial



Our technology is the VM Smart Grid Terminal

- Remote real-time remote terminal device
- IP connected communications
- Highly accurate and market compliant measurement systems
- FIR and SIR curtailment measurement and management algorithms
- Dynamic frequency responsive capabilities for FIR, SIR and AUFLS
- Over the air configurable and programmable



VM-SGT
SMART GRID TERMINAL
Fresh Thinking in Intelligent Demand Side Solutions



Our aggregation

In terms of Interruptible Load (IL)

- Firm capacity has to be built and tested to meet compliance
- From **one site** – with its own variability and uncertainty, to **multiple sites** distributed across the grid at different GXP's.
- Aggregation can manage the risks of this variability



Our aggregation

In terms of Interruptible Load (IL)

The benefits of an aggregated offer across numerous (several 100) different industrial loads from different sectors are:

- Diversity
- Robustness
- More certainty

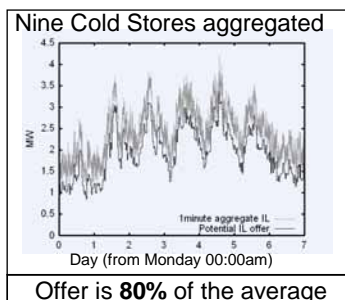
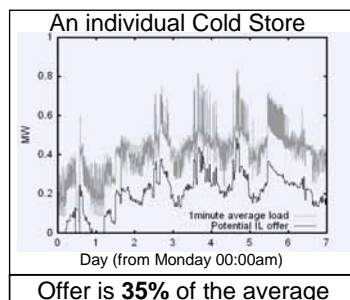
which is essential as IL is a security product.



Our aggregation

Cold stores make a good example

This is where it started in 2007 and was expanded in 2008



Our aggregation

Cold stores are not the only sector

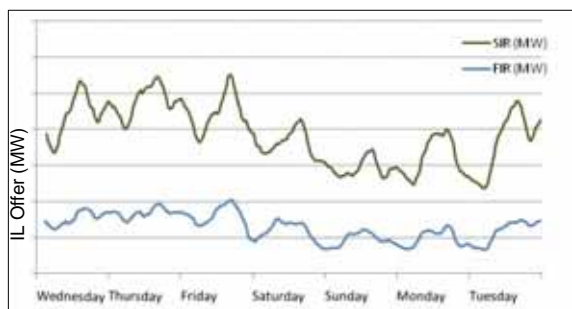
- Cold stores and cool stores
- Water and water treatment
- Pulp and paper
- Forestry
- Dairy
- Meat
- Data centres/pools/HVAC



Our aggregation

The shape of our offer will change each week

- Wednesday to Tuesday profile



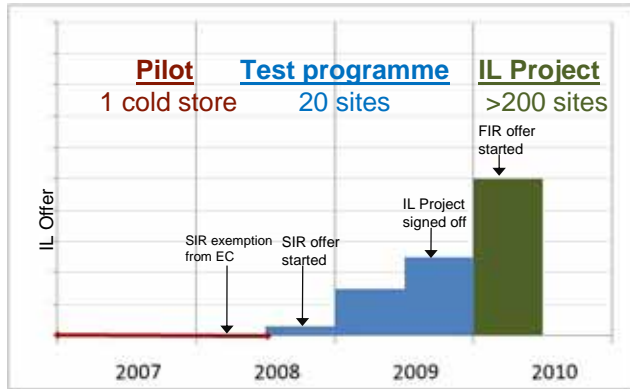
FIR and SIR offers change depending on industrial load profiles

This shape will change seasonally



Our aggregation

Our progress and milestones



- This is a new concept
- Load testing
- Takes time
- Has to be accepted by all partners

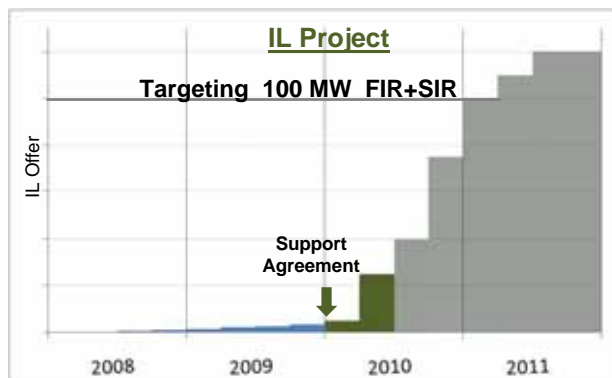
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Our aggregation

Acceleration by Transpower (the Grid Owner)



We are determined to give this acceleration our best shot

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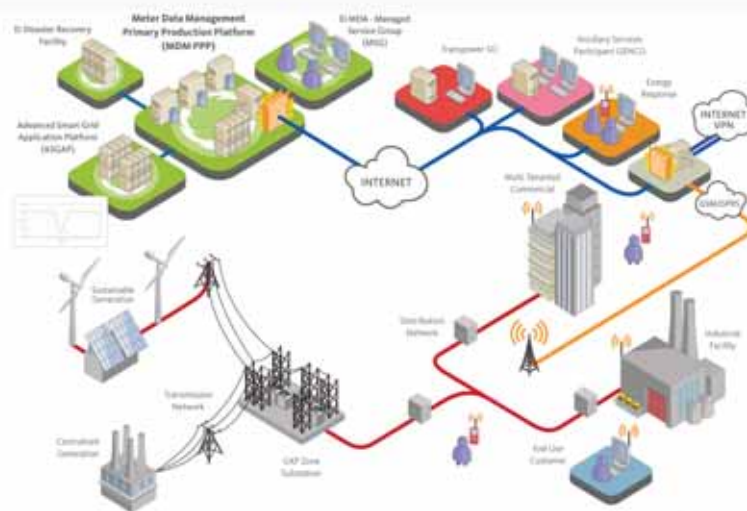
Our innovation in aggregation

- We believe this is the first time such a wide aggregation for IL has been attempted.
- We are developing the engineering knowledge behind the fast response of different industrial operations.
- The integration of the response of these fast industrial loads (less than 1 second) with a grid provides insights into how Smart Grids of the future may operate.

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Where we are going

The integration of demand-side loads with energy storage or small distributed generation as (n-1) back-up will deliver [MW] blocks that will offer a **fast response, firm capacity, reliability** and **diversity**.



Where we are going

Advanced **wind firming** using the demand-side will become a reality in our smart grids of the future.

