

# GREEN Grid

Future Proofing New Zealand's Electricity Supply

## Demand Response in New Zealand

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### What is DR?

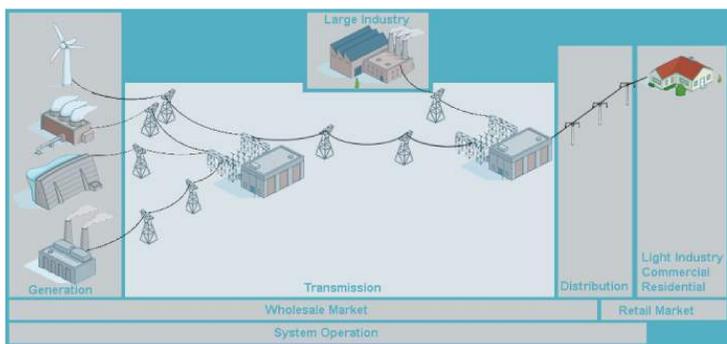
To keep the lights on, especially during peak times, requires:

$$\text{Supply} = \text{Demand}$$

As well as by increasing supply, this balance can also be maintained by *reducing* demand

**Formal definition of Demand Response:** "Changes in electric usage by end-use customers from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized."

### Forms of DR



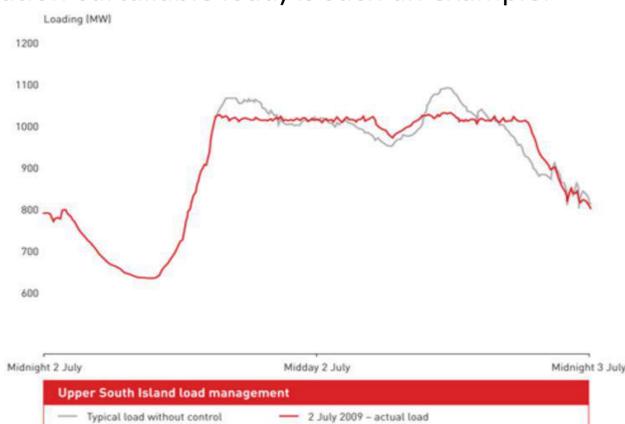
With the exception of the centralized generation sector, DR exists in various forms across all sectors of the NZ power system

### DR at the Retailer

- Load Shifting (retailers contract distribution companies).
- Procurement of Interruptible Load.
- Curtailable Load via an Aggregator (EnerNOC was aggregating for Genesis in the lower North Island).
- Tariff based DR (e.g. Genesis has introduced Advanced Metering Infrastructure with Time of Use tariffs for domestic customers).

### DR at the Distribution Level

- Distribution companies use DR to defer capital expenditure and to maintain security of supply.
- Orion's use of ripple control for various load types (hot-water, irrigation curtailable load) is such an example.



An example of ripple control used to contain the Upper South Island's Winter day peak demand [Source: Orion NZ Ltd].

### DR at the National Grid

#### Nodal Pricing – wholesale energy market

- Nodal pricing in half hourly spot price trading periods.
- At conforming Grid Exit Points (GXP) the demand side does not bid (unless submitting a voluntary difference bid) and load is centrally forecast by the System Operator.
- At non-conforming GXP's, large users must bid load.

#### Demand Side Bidding & Forecasting

- Aims to improve the inputs into the price forecast schedules to improve accuracy. This allows better use of generation & DR capability. It introduced new features to nodal pricing.
- Created two schedules called the Price-Responsive Schedule and Non-Response Schedule, and introduced *difference bids*.

#### Dispatchable Demand

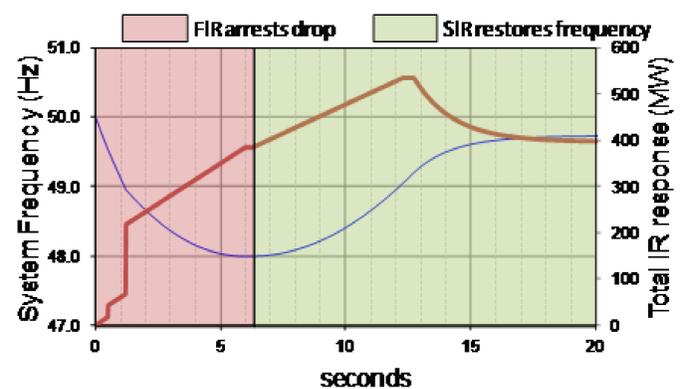
- Allows large end-users at any GXP to submit nominated bids and subject their load to dispatch for every half hour trading period, in a manner similar to a generator.

#### Transpower's Demand Response

- An initiative to defer transmission investment by using DR.
- Operates outside of the wholesale market.
- Participants curtail their demand when called upon, and receive a call payment.

#### Interruptible Load (IL)

- Is a form of Instantaneous Reserve (IR), and is shed automatically by frequency controlled relays when the grid frequency falls below 49.2 Hz.
- IL is provided by industrial and commercial end-users who receive payments either directly or from an aggregator.



Example of IR activation: step changes in capacity response is IL dropping off, and the gradual change is due to spinning reserve changing output [Source: Electricity Authority].

### DR for Domestic Consumers

- Home Energy Management Systems (HEMS) have been defined as any product or service that monitors, controls, or analyzes energy in the home, and may be utility or non-utility based. These are introducing more possibilities for domestic DR.

**Reference:** Richard Strahan, Allan Miller, Quintin Tahau, 'Systems to Implement Demand Response in New Zealand', *EEA Conference & Exhibition 2014*, 18 - 20 June, Auckland

Primary Funder



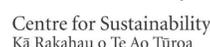
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