



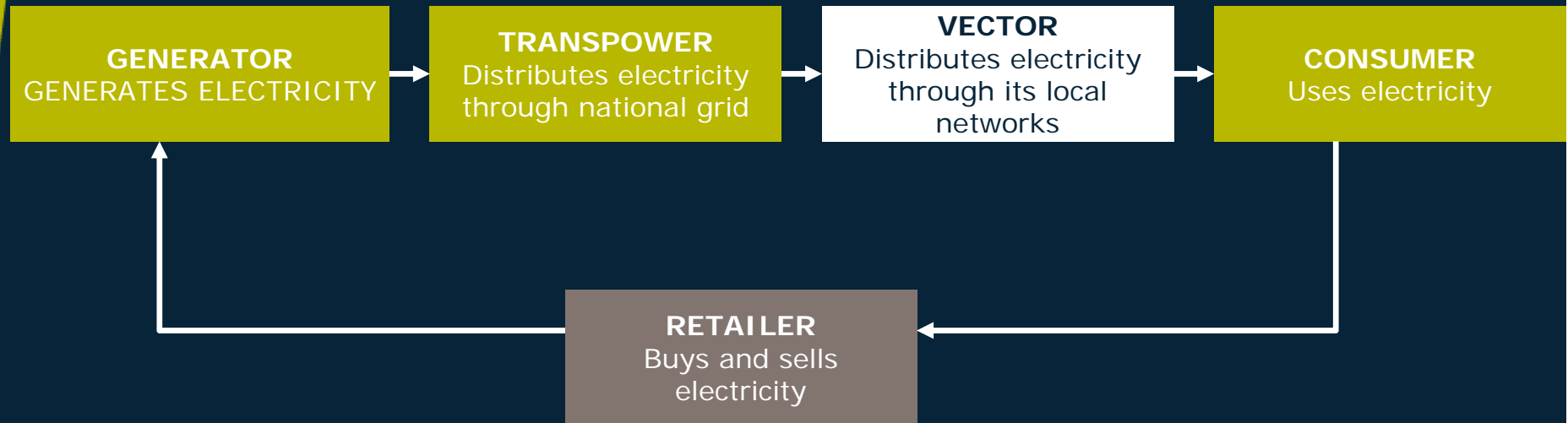
# Auckland load management workshop

## Objectives of the presentation

- Discuss electricity demand growth in an Auckland context
- Cover the implications on the capacity to supply the region
- Discuss load management in the context of supply constraints
- Outline Vector's role in facilitating load management

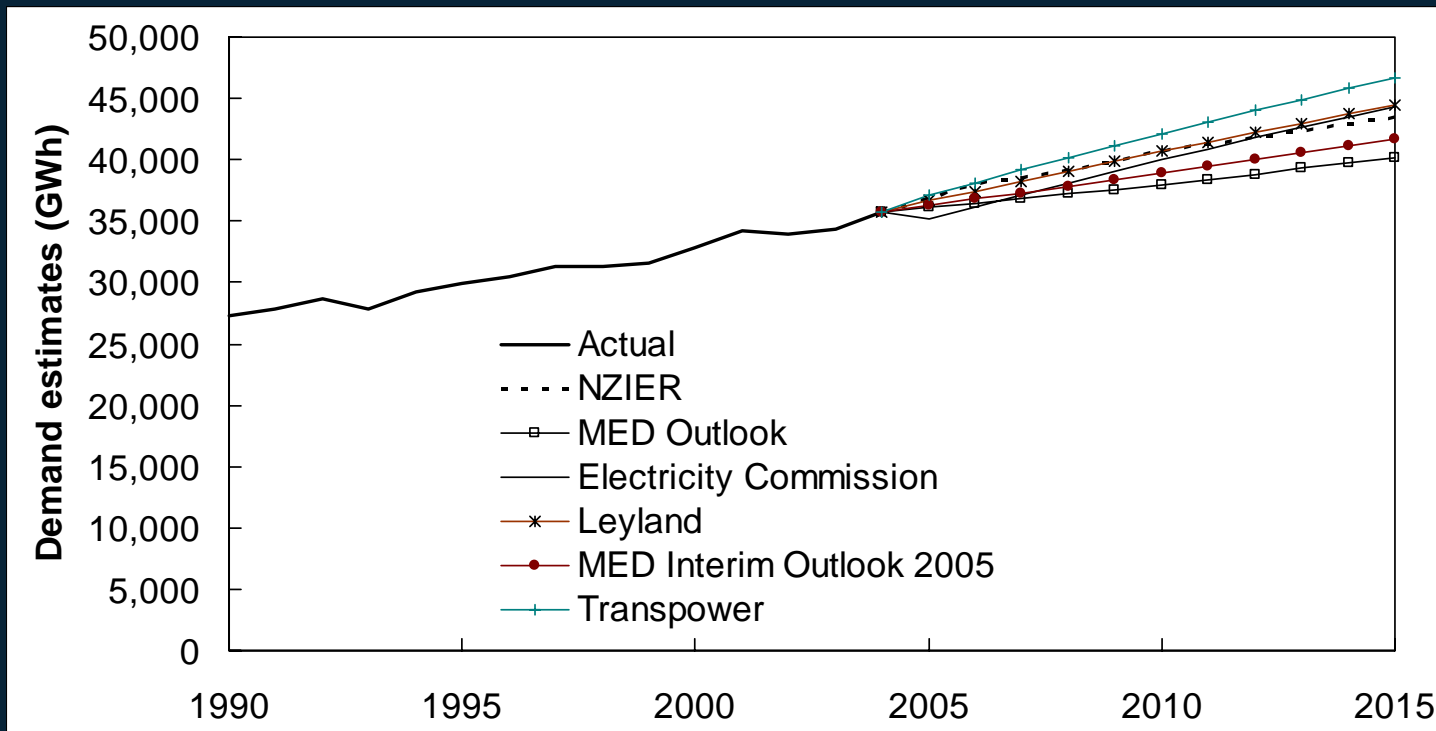
**The aim is to exchange information with small and medium sized enterprises (SMEs) on load management issues**

## The Electricity Industry



## Regional growth in energy demand

- Auckland electricity demand will increase by between 60% and 80% by 2025
- Population and dwelling growth will fuel the growth
- Economic growth is expected to average just over 3% pa

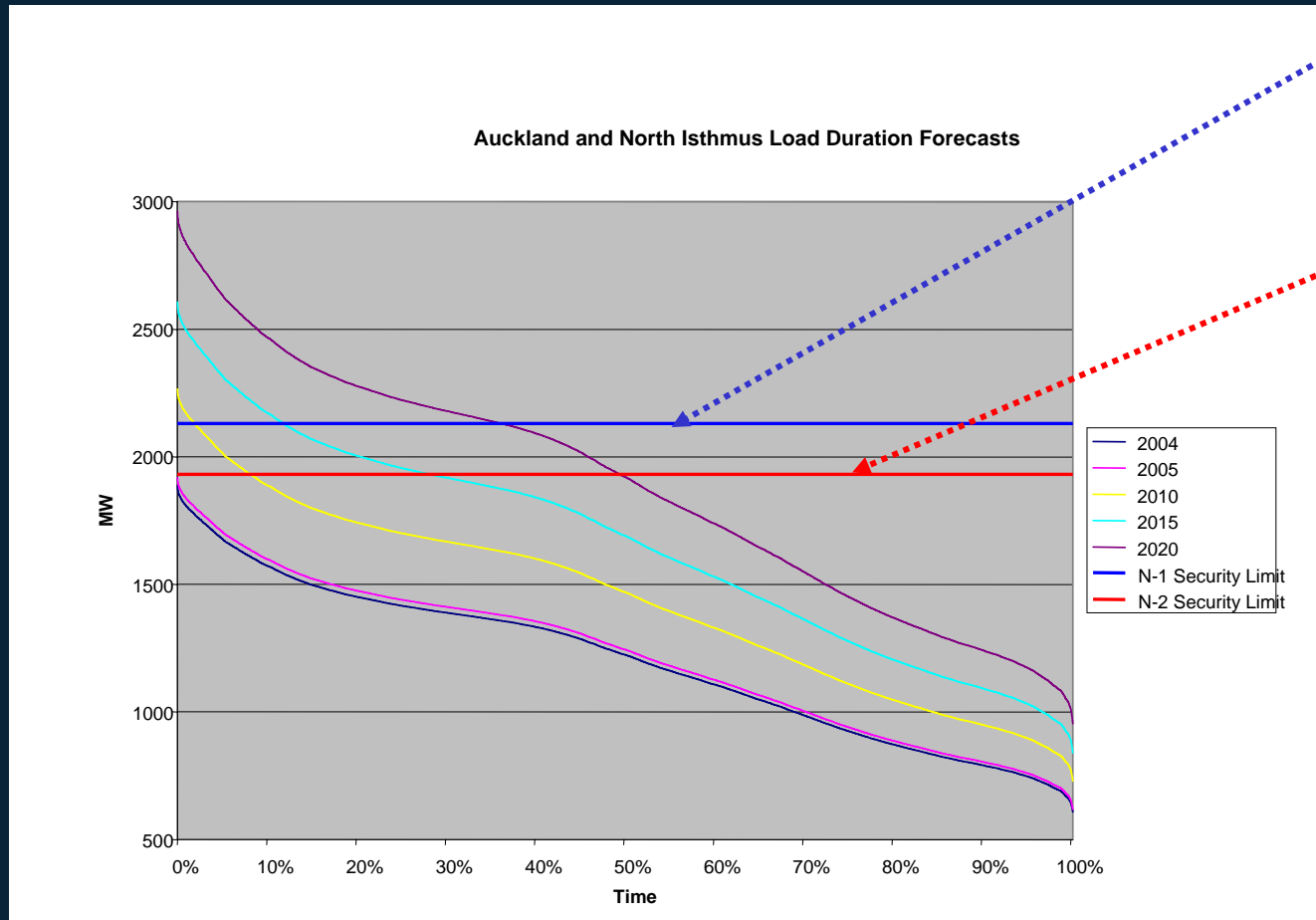


## Energy vs. Demand Growth

- Auckland demand is increasing at a compound rate of 2.5% p.a. (approx. 60 MW)
- Peak demand can be more variable, affected by:
  - Growth and energy intensity of consumers
  - Weather
  - Usage patterns and lifestyle
- Underlying demand growth will be driven by population growth, usage changes, and an associated growth in commercial activity
- A secure supply should be planned around meeting growth and standing up to generation plant or (primarily transmission) line failures

Security of supply into Auckland is more of a demand based issue than it is due to a shortage of energy generation

# Winter demand growth and transmission security into Auckland



Transmission capacity allowing for a single outage

Transmission capacity with Otahuhu B also unavailable

Note: A single major gas line outage could cause multiple failures of electricity generators in the region.

**"If demand growth is in excess of 2.5% per annum or key generators in Auckland are unavailable at times of high system demand, then contingency plans could be required by 2010"**  
 Transpower presentation to ENA Sep 2005

## Actions that can be taken to manage security of supply

- Invest in transmission infrastructure
  - (e.g. 400KV transmission upgrade or alternative) plus national generation
- Invest in distribution infrastructure (remove local transmission constraints)
  - (e.g.. Wairou 110KV reinforcement, Quay Street tunnel)
- Invest in local generation
  - (e.g. Marsden B, Otahuhu C, Kaipara, distributed generation)
- Invest in and incentivise load management
  - Energy efficiency
  - Peak demand reduction
  - Fuel substitution
- It is likely that a combination of the above actions will be required to maintain the required level of electricity supply to Auckland

**Vector's position is that a transmission line upgrade is needed now, measures are needed to cover the risk of outage in the meantime**

## The role of load management

- Load management shapes the regional usage profile, reducing demand peaks
- The bulk of load management currently comes from controllable hot water
- Controllable load can also take the form of:
  - Interrupting supply to an appliance (refrigeration, space heating)
  - Interrupting processes (using storage and spare plant capacity)
  - Reducing load through self generation (stand-by generation)
- Electricity industry incentives for encouraging load control:
  - Reserve cover as insurance against plant failure (such as a power station trip)
  - Reduce a customer's exposure to high prices
  - Short term load reduction to reduce stress on the system.
  - Help manage or defer the need for infrastructure investment.

Load management:

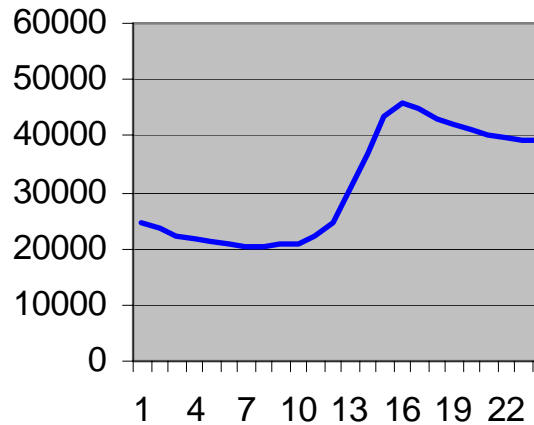
***The wise and efficient use of energy resources  
through interrupting of discretionary load***



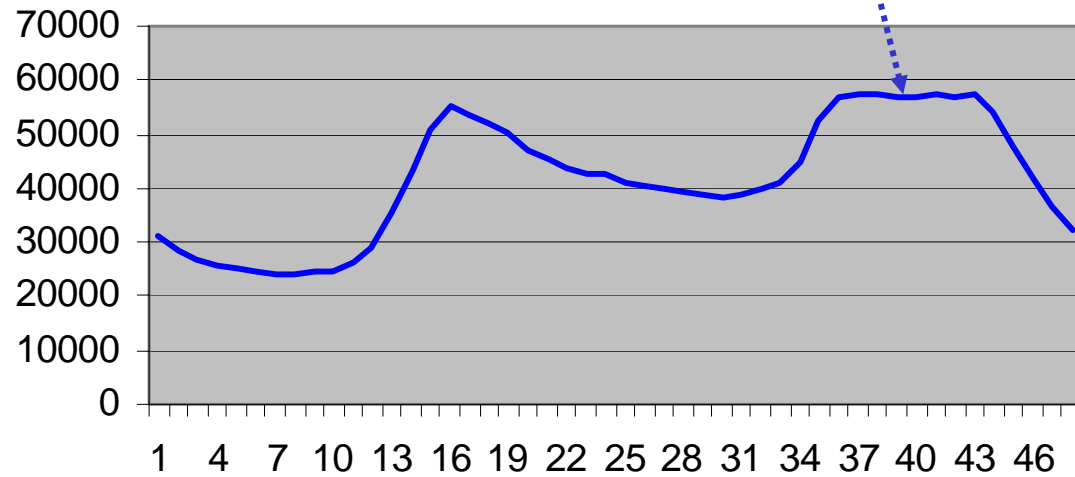
## Examples of load management

Shaping the residential peak through water heating control

**Pakuranga 10 May 2005**



**Pakuranga 8th June 2005**



## The examples of load management

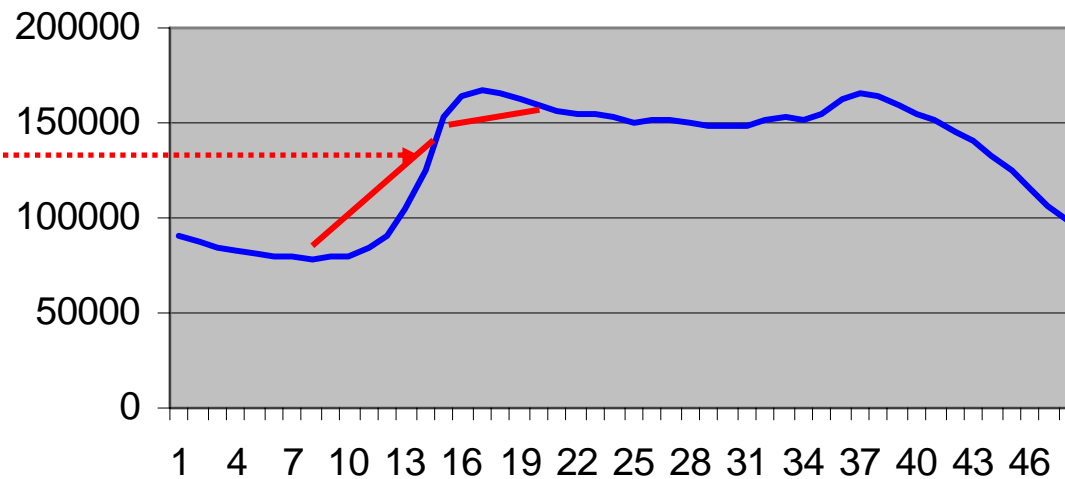


Flat daily profile typical of commercial CBD loads.

Some scope for reducing daily peaks

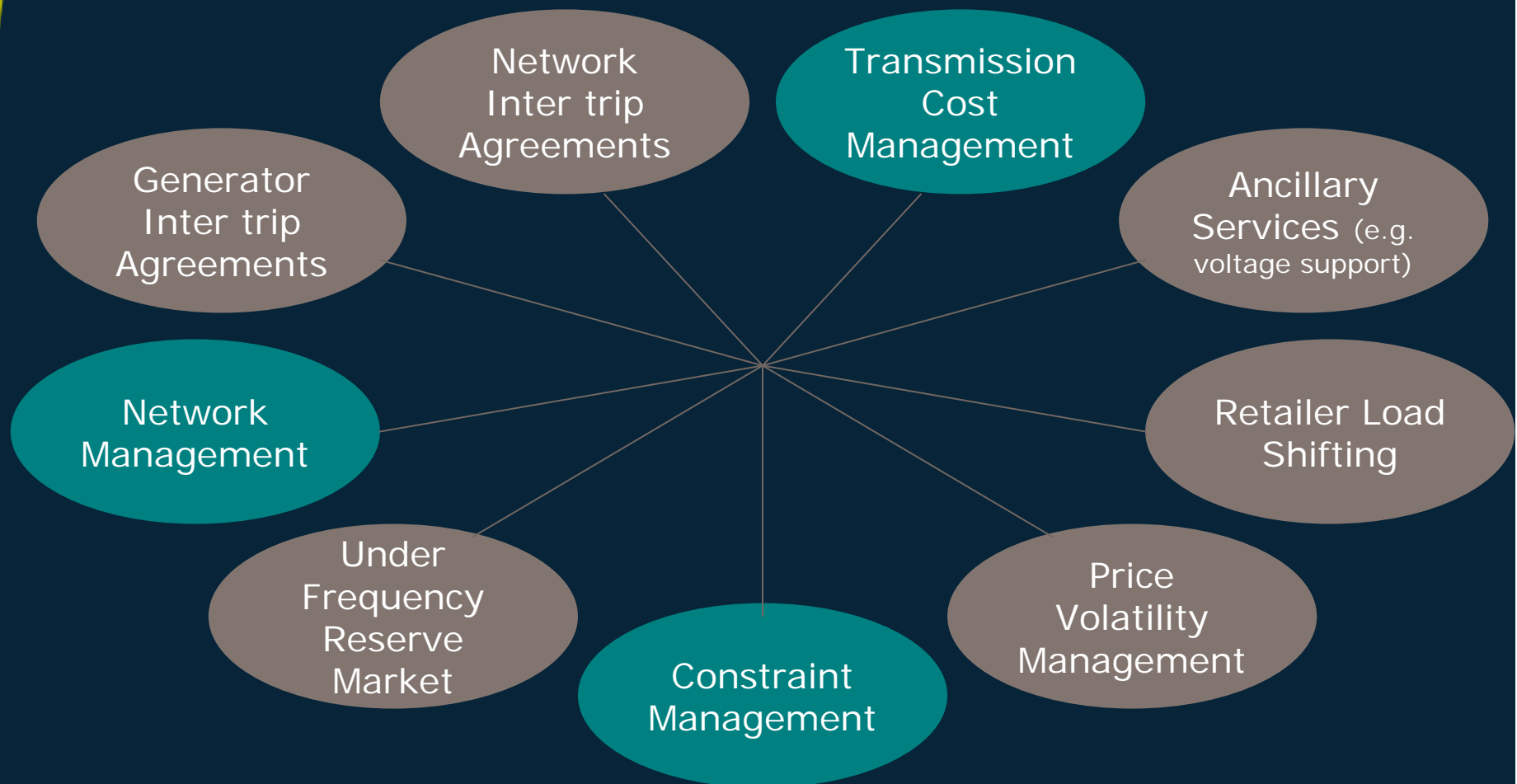
Starting building heating and cooling cycles sooner may reduce early morning peak

Penrose 28 July 2005



Potential to move electricity use into evening, night and morning periods to fill the trough

## What are the Uses of Load Control?



## Load Management Market Development

- The market is young and developing
- Historical perception that controllable load is a free option for electricity industry participants:
  - Grid Operator use for Grid stability
  - Retailer use in dry winters to manage their revenue
  - Locked into distributor price threshold regime
- It has been difficult to shift electricity industry perceptions
  - Load control is a valuable resource with many different uses
  - Incentives need to be made more visible
- The E C work underway is seeking to unlock the value
- The potential value is high
  - Estimate of 1 year 400KV transmission upgrade deferral (\$23million)
  - Possible deferral of \$6million distribution upgrade

**It is difficult for purchasers and sellers of interruptible load to discover the full value of interruptible load**

## Keys to successful load management

- Access to information
  - Real time prices/cost information
  - Real time energy usage information
  - Predictability of pricing
- Show there is a direct benefit, to investor, buyers of load, beneficiaries:
  - Transmission congestion relief benefits
  - Distribution congestion relief benefits
  - Reserves provision incentives
  - Energy price spikes
- Technology
  - Load management systems
  - Energy efficient equipment and techniques
  - Metering and data analysis

**Successful load management is based on providing the customer with a clear and workable incentive to switch discretionary load**

## Barriers to load management

- Insufficient access to information
- Insufficient price incentives and lack of price certainty for customers
- Inappropriate price structures
- Split ownership of load control vehicles and customer relationship
- Market structure imperfections, there are barriers in the rules
  - Transpower pricing
  - Vector's inability to offer in additional ancillary services (such as voltage support) into the market
- Access to technology, knowledge and information
- Lack of incentives on suppliers to market load management

**Barriers are largely structural, but Vector can also improve the situation**

## Vector's Commercial Pricing Development

- Vector is addressing legacy pricing across the three regions
- Commercial pricing will include congestion price signals
  - A peak demand based price to signal the value of control
  - Defined peak periods, predictable to help plan response
- Price structure will aim to reward behaviour changes:
  - A capacity charge – incentives to remove excess capacity
  - An anytime maximum demand charge – a broad energy efficiency signal
  - A peak demand charge in defined time zones at peak times
- The energy price is generally consumption based
- Additionally customers should be able to offer interruptible load to a market – through aggregators like Vector's Demand Exchange

**Prices should offer a predictable price signal, this should be accompanied by a market based trading scheme to give customer choices to interrupt load based on the true value of load control**

## The Demand-Side Exchange Concept

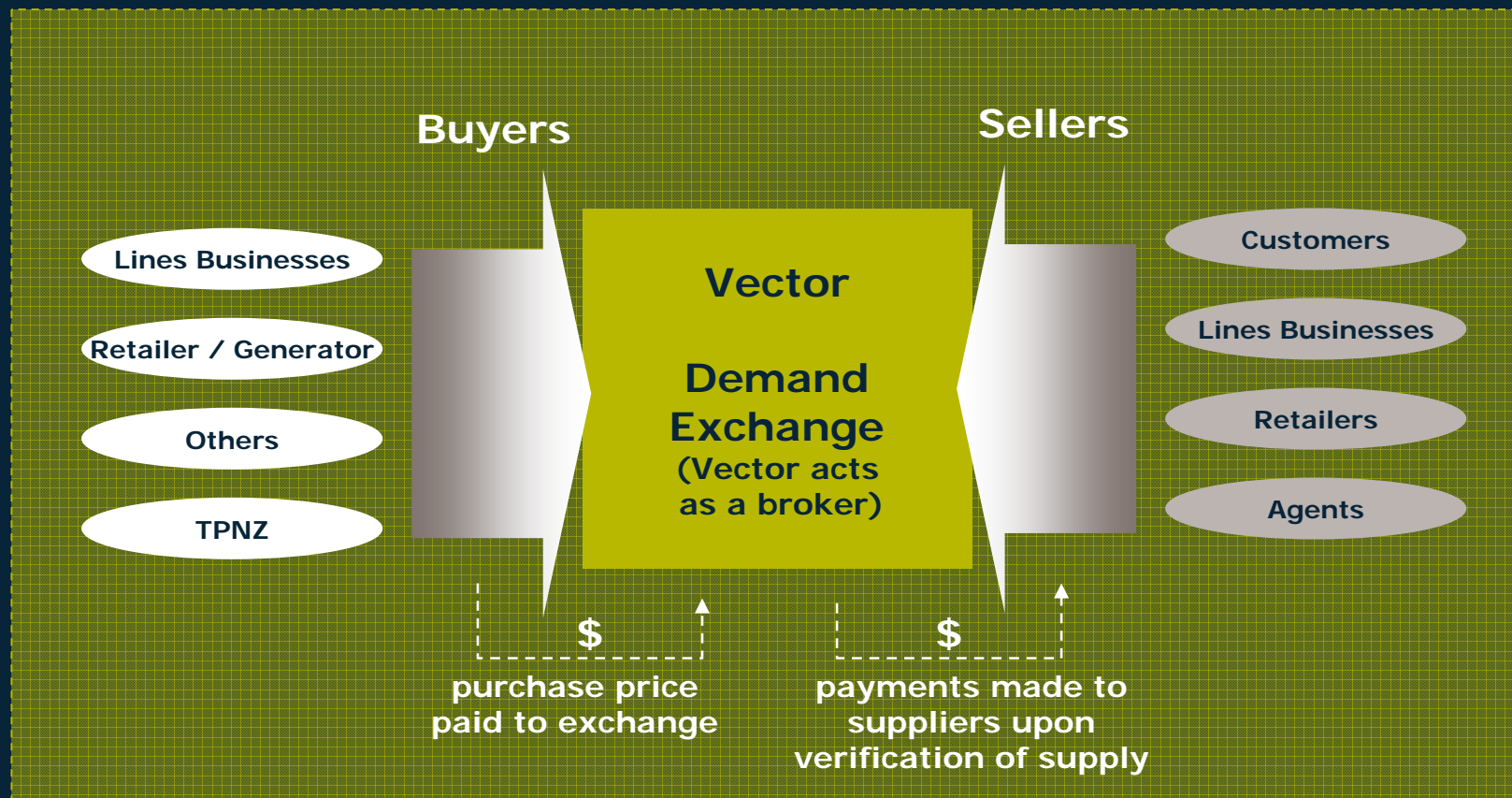
- Enables people with discretionary load to sell this service to buyers (i.e. large commercial customers, lines companies retailers and generators)
- A means of bringing together buyers and sellers under a common contract and compliance structure
- A way of evolving the market for demand-side solutions:
  - To provide access to the market
  - Manages risk by aggregating loads
  - Responsive to different drivers





## Example of the Vector Demand-Side Exchange

Provides buyers and sellers with trading forum that will evolve to meet New Zealand users' needs



## Learnings to Date

- Vector introduced the exchange to show how the demand-side could help shape the market
- Vector's system is highly manual, an automated system would provide more flexibility
- Needs commitment from buyers
- Market rules limits the value to sellers of demand

## Summary

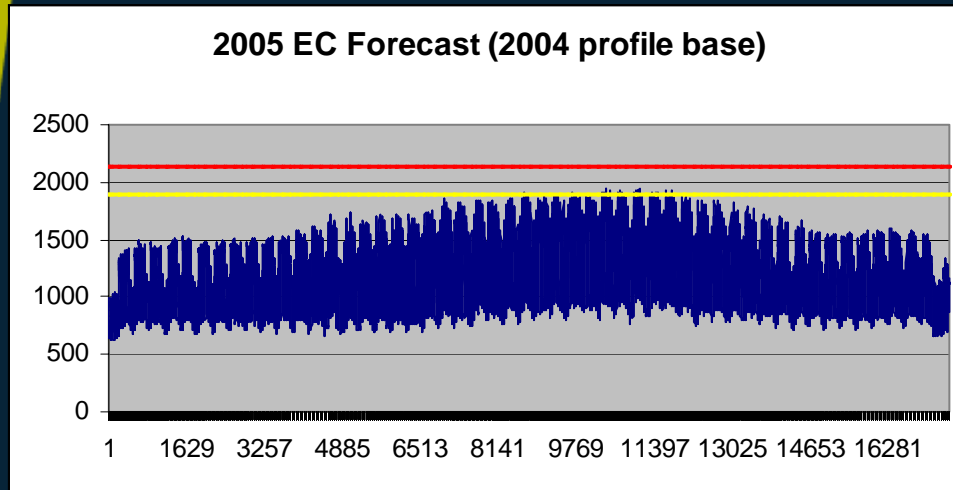
- Demand growth in Auckland is largely population driven, and continues unabated
- New transmission and distribution investment is necessary to maintain supply security
- But load management can play an important part in ensuring a secure supply
- The value of load control is not easily apparent
  - Incentives must become more transparent
  - Access to information will enable intelligent response
  - Industry and market structures need to be reviewed
- Smart metering and Demand Exchange facilities will allow interactive load management.

**The key to successful load management is to provide customers with choice and the ability to make informed decisions**



Questions?

## Effect of demand growth on capacity



Different capacity limits apply in summer and winter.

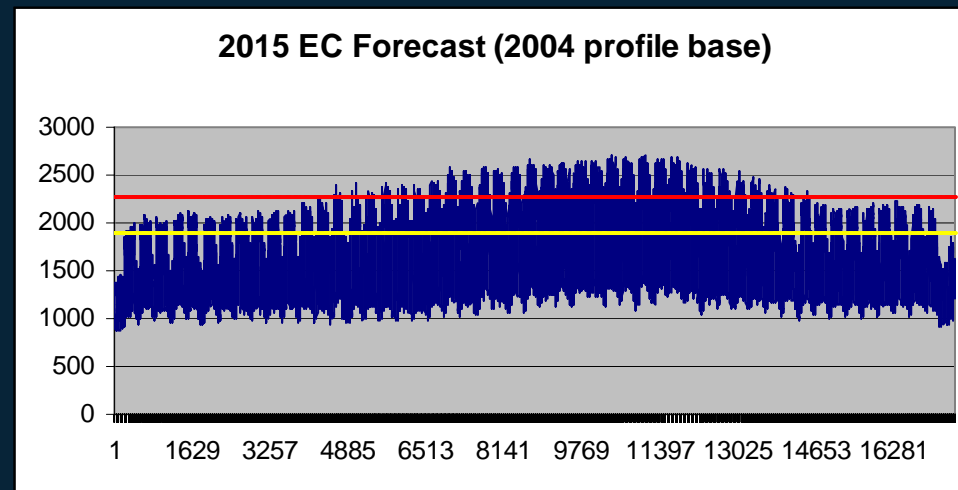
Winter capacity is expected to increase around 2006/7

— Winter capacity limit

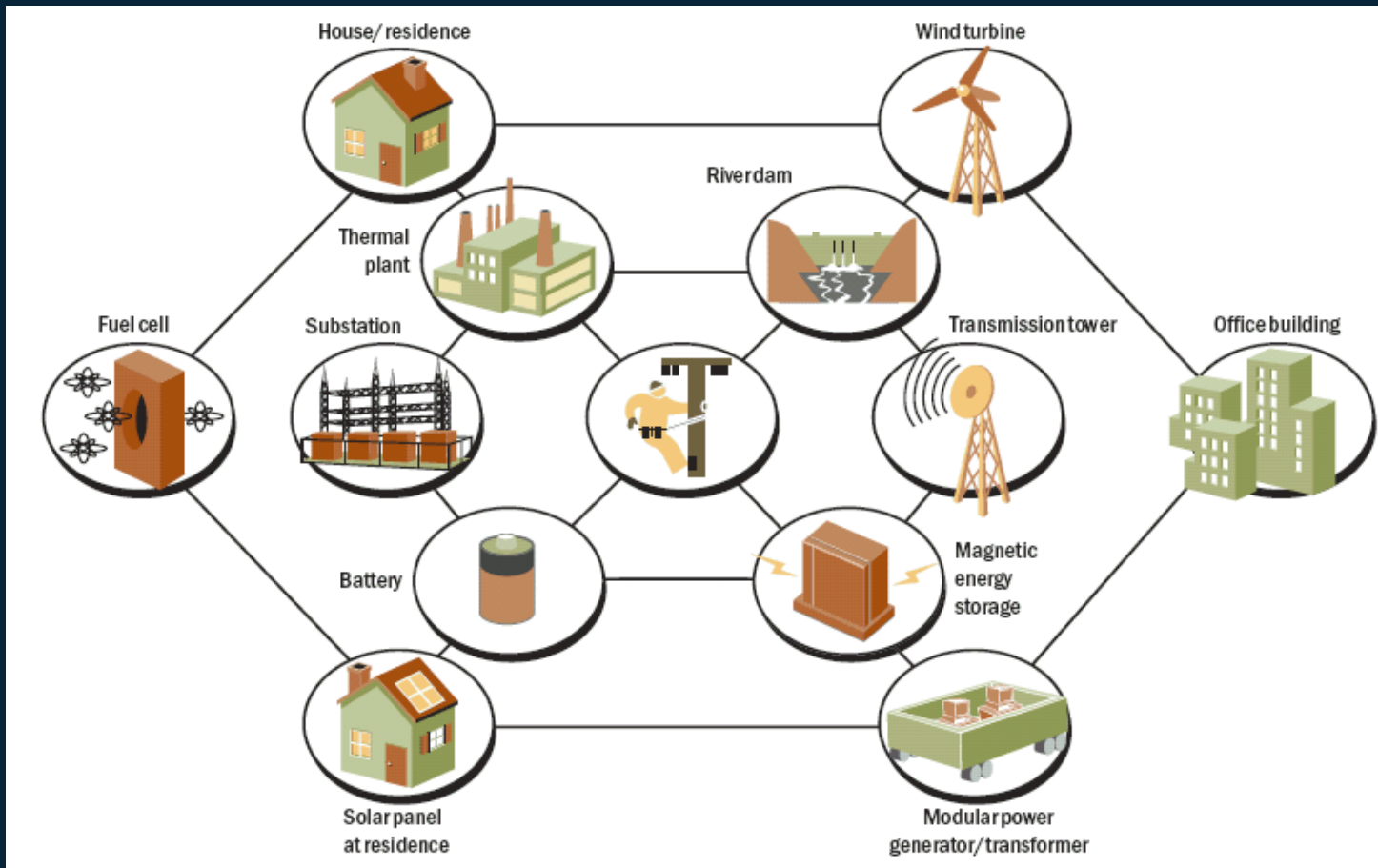
— Summer capacity limit

As demand grows the ability  
For the system to meet all  
Customers needs decreases.

Action/s must be taken  
to avoid periodic unplanned cuts  
in supply for some customers.



The trend is for increasing integration –  
with an intelligent network



Customers will be able to increasingly choose how and when they purchase electricity – making capacity optimisation much more critical for all

## The examples of load management

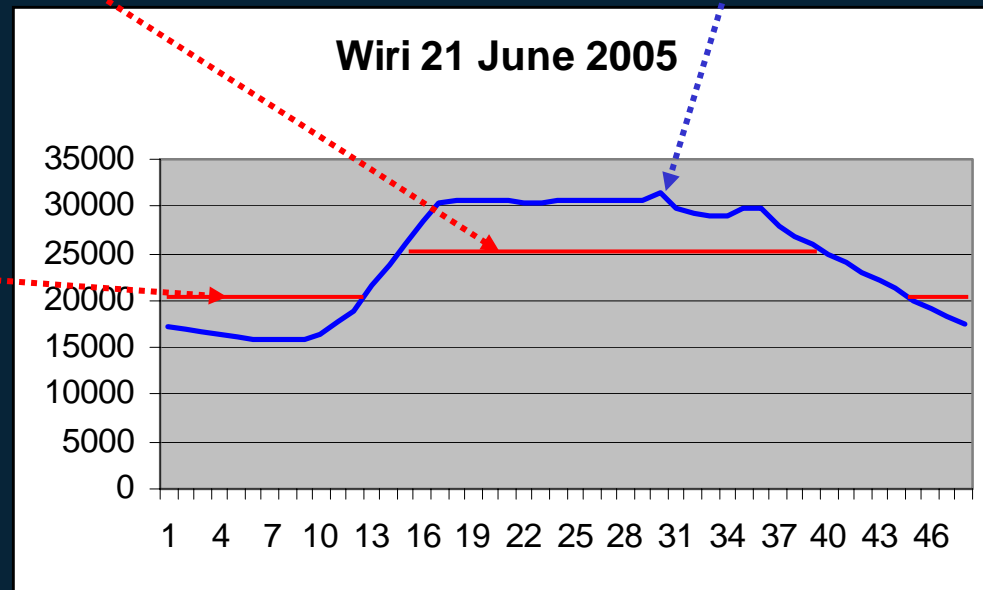
Energy efficiency has the potential to reduce daily base load demand

Flat daily profile typical of industrial loads.

Customer's load management systems probably responding automatically to price incentives.

Not much scope for reducing daily peaks

Potential to move electricity use into evening, night and morning periods to fill the trough



## Vector's load management initiatives

- Information technology
- Data management
- Smart metering
  - Stream
  - NGC metering
- The Demand-Side Exchange
- Constraint pricing
- Managing water heating load control in the reserves market