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# **Securing best outcomes for security of supply, price and the environment**

**David Hunt  
CEO, Contact Energy**



National Power New Zealand  
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## Achieving balance through securing our options

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- The energy sector faces many significant uncertainties (fuel prices, technology change, economic growth, climate change)
- Each of the different energy choices (coal, gas, renewables etc.) has different price, security and environmental consequences
- How do we make the right choices?



- This presentation covers:
  - Thermals versus renewables
  - Domestic versus imported gas
  - The role of the national grid

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**Are renewables or thermals the answer to New Zealand's  
energy future?**

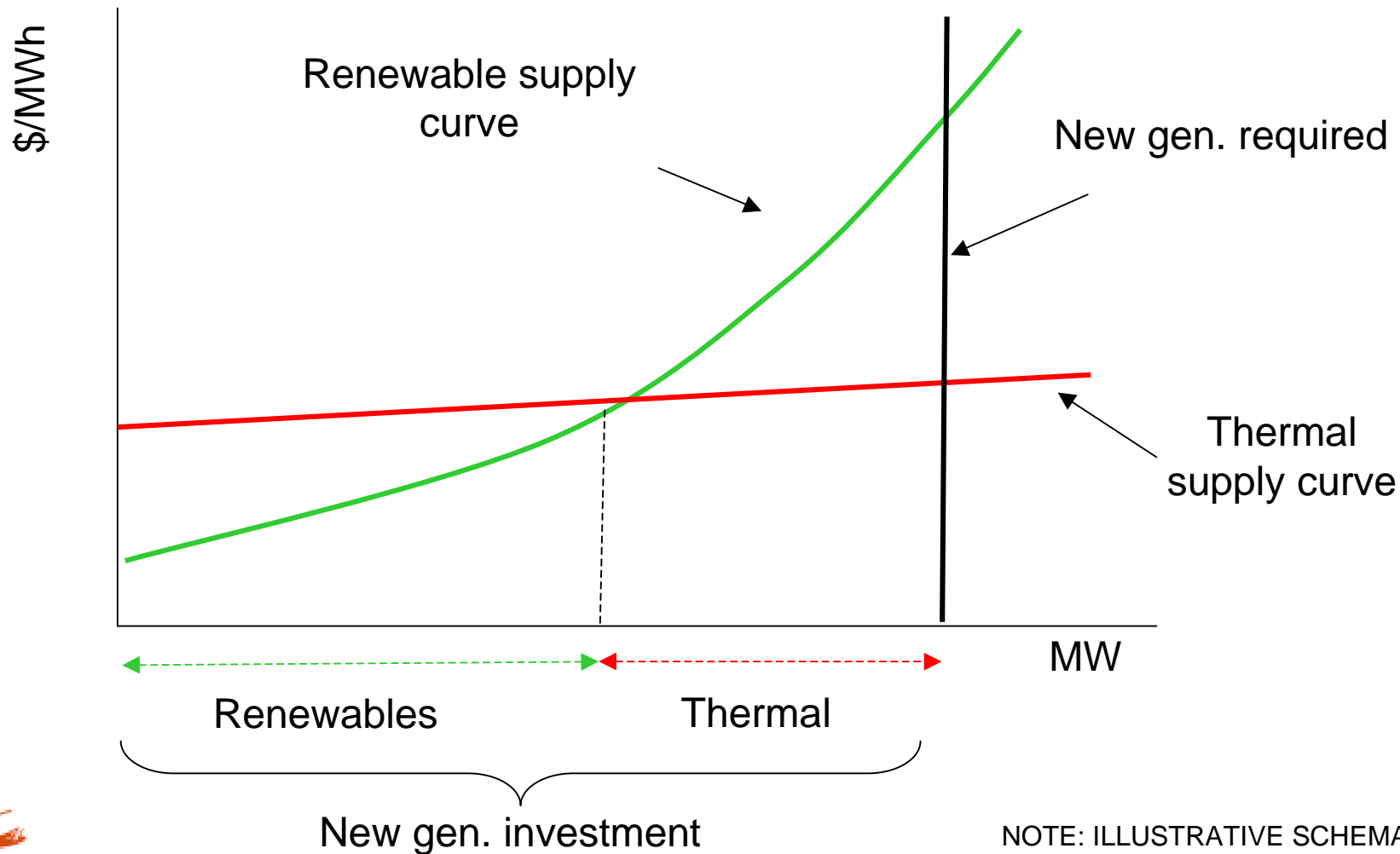
## Renewables or thermals is the wrong question

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- The right question, and one much harder to answer, is what is the optimal *balance*...
- For the short- to medium-term at least, New Zealand will need new renewable and thermal investments to meet its energy needs, for two reasons
  - Cost of renewables
  - Renewable variability and volatility

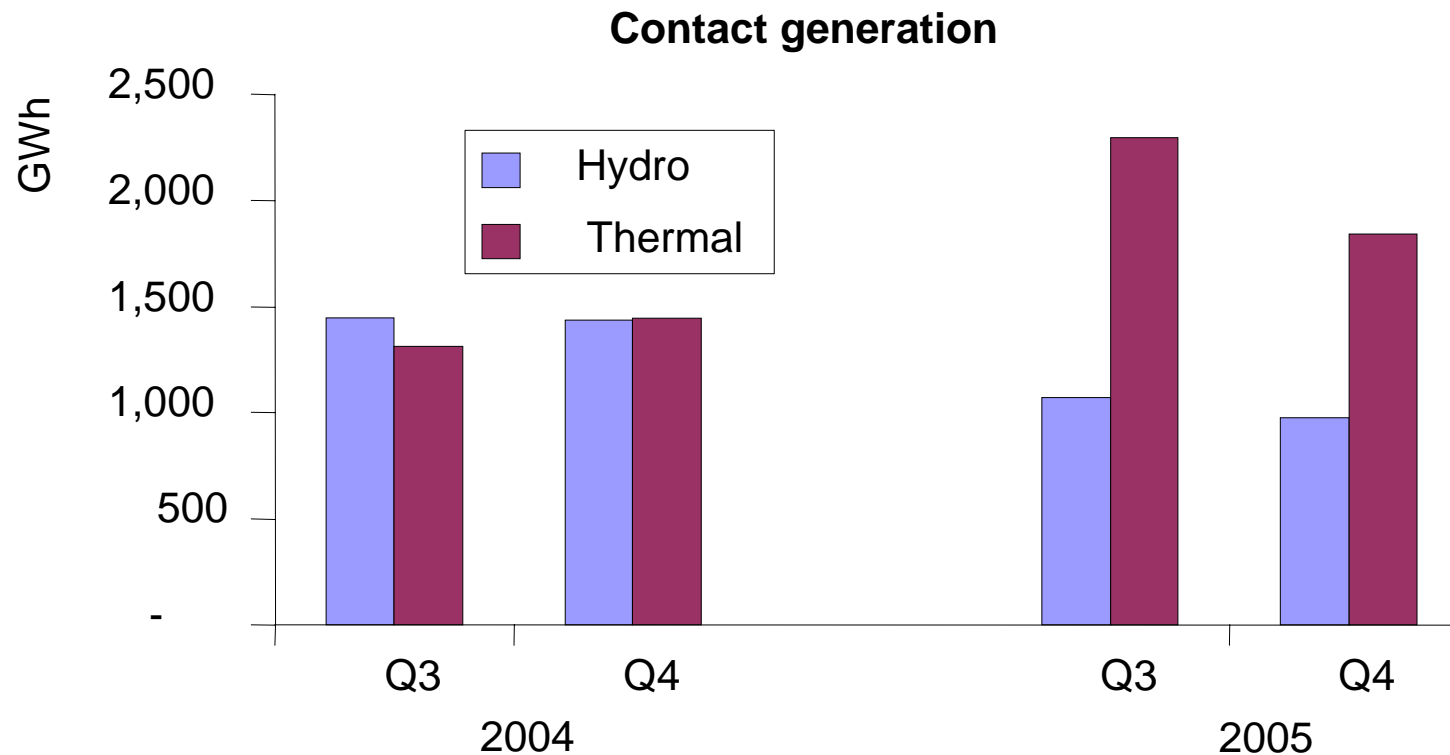
## There are some very cost effective renewable projects, but currently not enough to meet demand

- For the short- to medium-term, the quantity of economic new renewables are likely to be insufficient to meet demand growth



## Historically thermal stations have provided an important balancing role for yearly hydro volatility

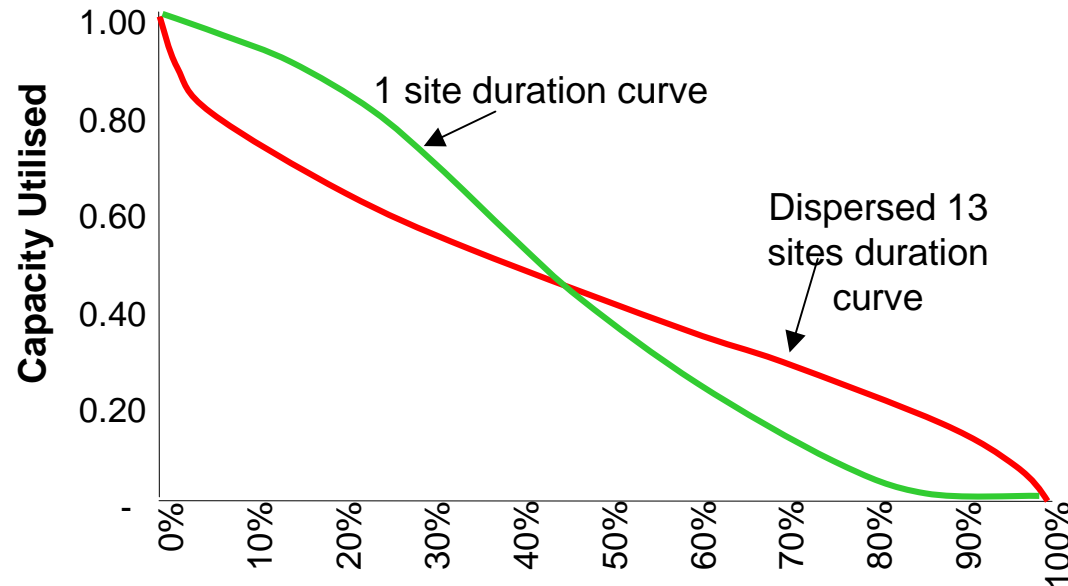
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- Year-on-year hydro volatility has been balanced by major swings in thermal generation
- Even with large amounts of wind, there will still be a need for such hydro-firming thermals – we can't expect the wind to blow harder in a dry year
- Indeed, large quantities of wind may exacerbate New Zealand's dry year risk if there is a chance we may have a "calm" year coinciding with a "dry" year

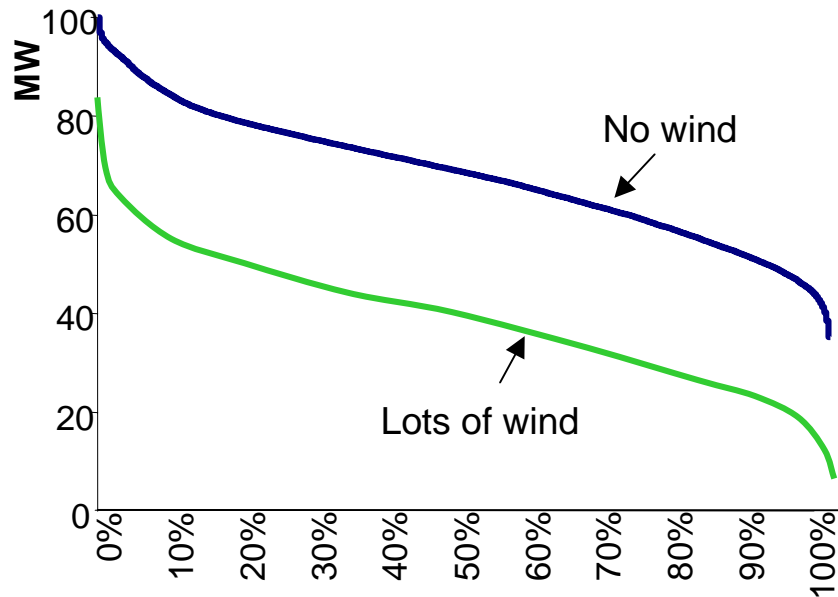
## Wind generation is intermittent - can be compensated by site diversity and hydro....

- EC and Transpower are undertaking work to examine the costs of *real time* wind volatility
- The diversity benefit of geographically dispersed wind-farms will make wind “firmer” on an *hourly / daily* scale



- Further, there is significant potential for hydro to act in a balancing role
  - Although there are likely to be growing restrictions from resource consent renewals process – The “RMA ratchet”
- However, there are likely to be limits to hydro-wind balancing and wind diversity benefits ...

## Lots of wind, will change the economics of thermal stations

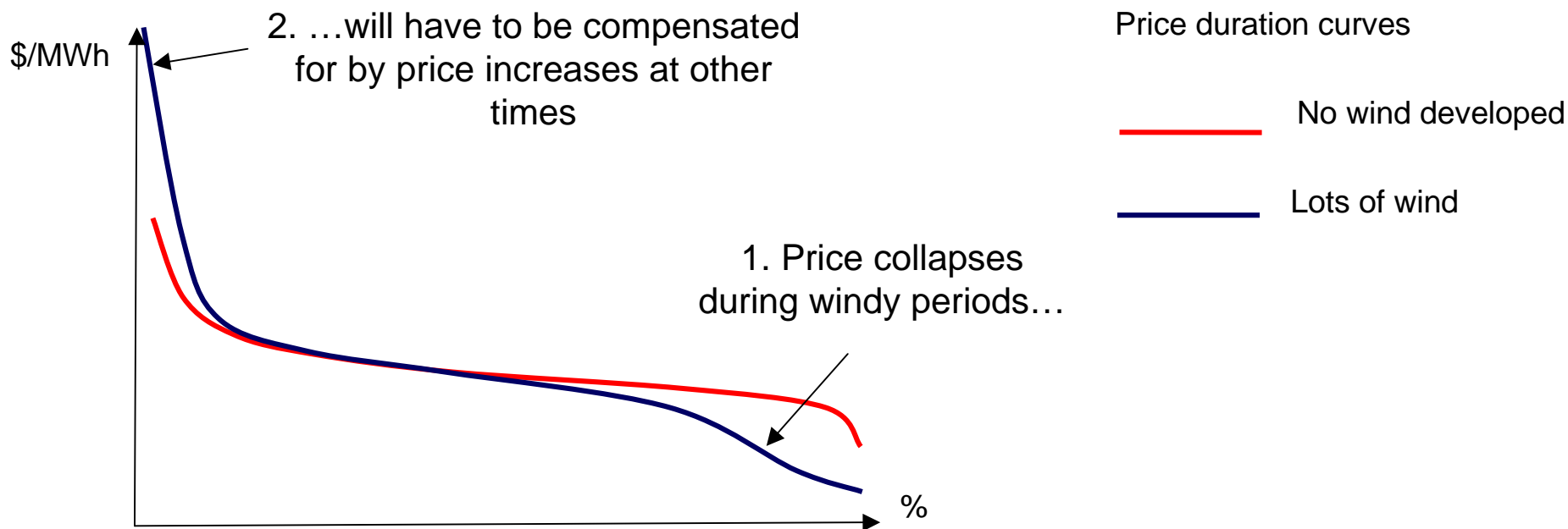


- Less requirement for thermal GWh; but
- Little change in required thermal MW
- Also, if hydro can't balance perfectly, thermals could face a more "jagged" real-time operating profile, requiring more flexible operation

- Things could get particularly difficult at night
  - Currently geothermal and thermal plant are brought down to their min gen levels
  - Hydro units are often close to their resource consent-determined lower levels of operation
  - If large amounts of wind come on at night we could have a lot of "must-run" supply exceeding demand

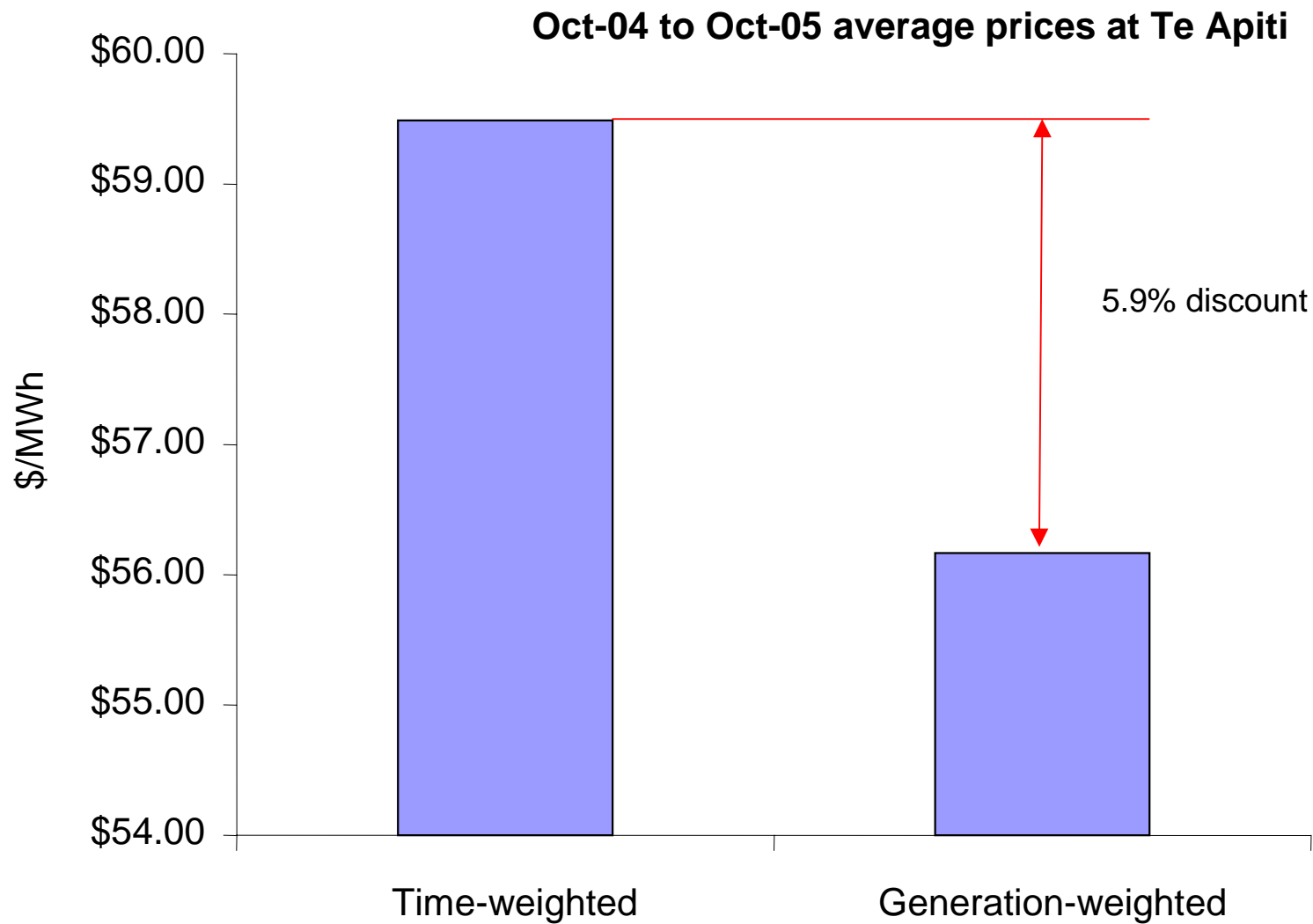
# Significant wind development is likely to impact on the shape of prices

- During windy periods, prices are likely to drop
- During calm and/or peak periods, prices will have to rise in order to contribute to the fixed and capital costs of keeping flexible / firm thermal capacity on the system



- However, the current energy-only market design may not provide sufficient signal to incentivise provision of required flexible / firm thermal capacity
- Consideration should be given towards development of a capacity mechanism

## Price patterns already appear to be changing

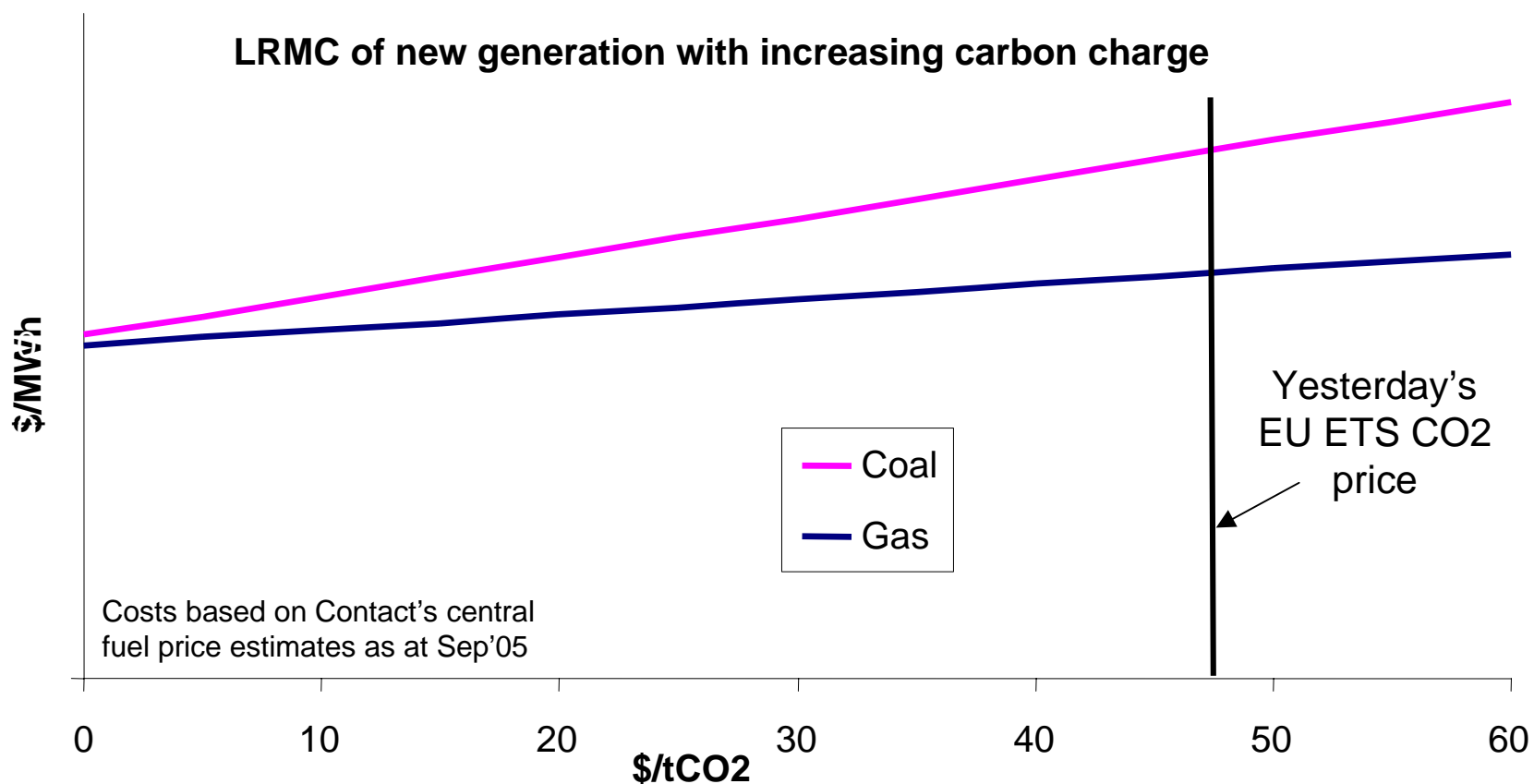


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**How do we fuel the thermal stations required to  
complement renewables?**

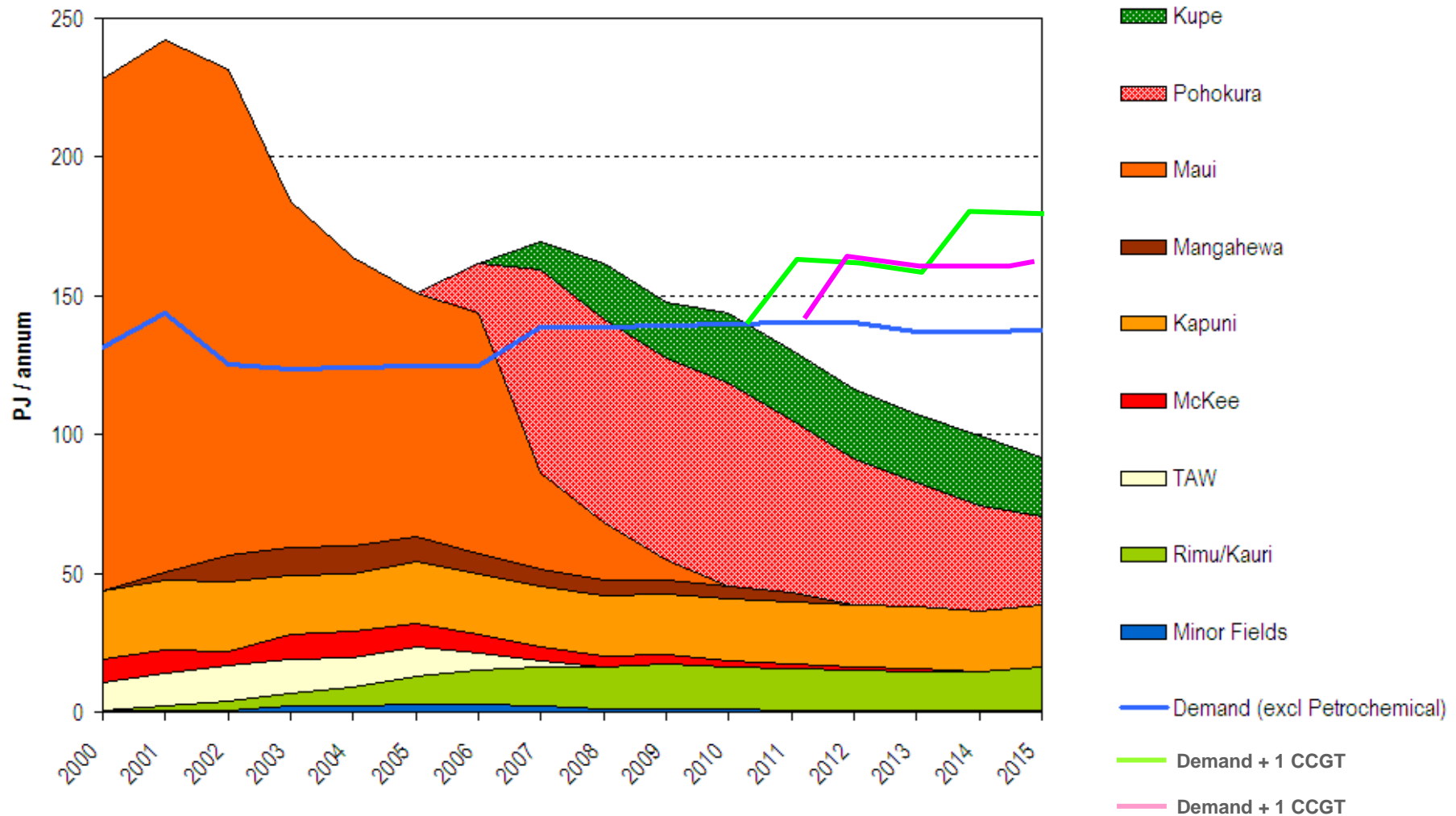
## Carbon is likely to be the deciding factor in the gas versus coal choice

- Analysis of possible fuel and CO2 price futures indicates that high-efficiency gas is likely to be the best thermal option for New Zealand
- However, to deliver the required investment in such long-lived assets requires a durable policy framework that delivers long-term carbon cost signals

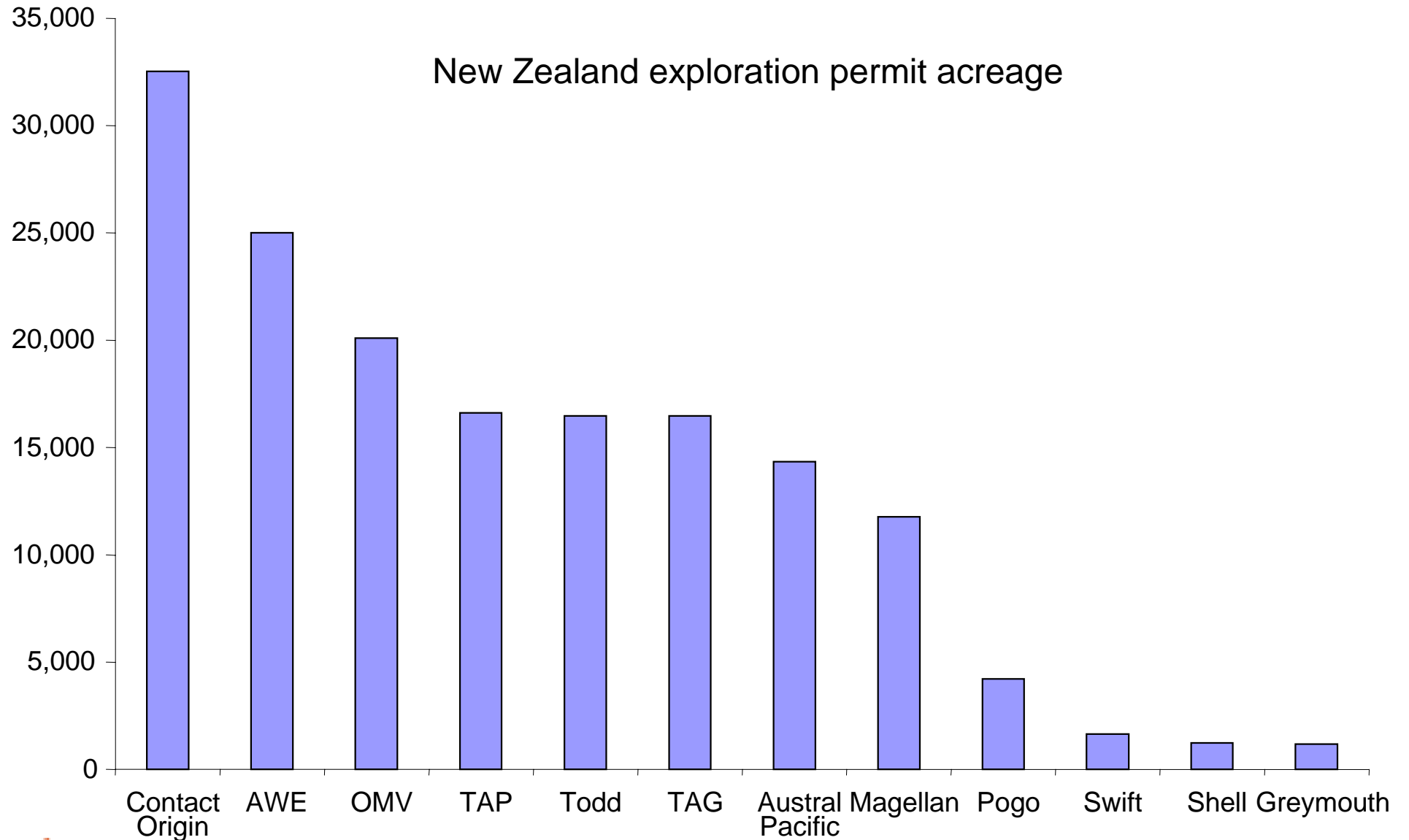


# NZ's proven gas reserves are insufficient to meet existing demand much beyond the end of decade, let alone fuel new CCGTs

NZ Gas Supply/Demand Potential - PUBLIC DATA May'05

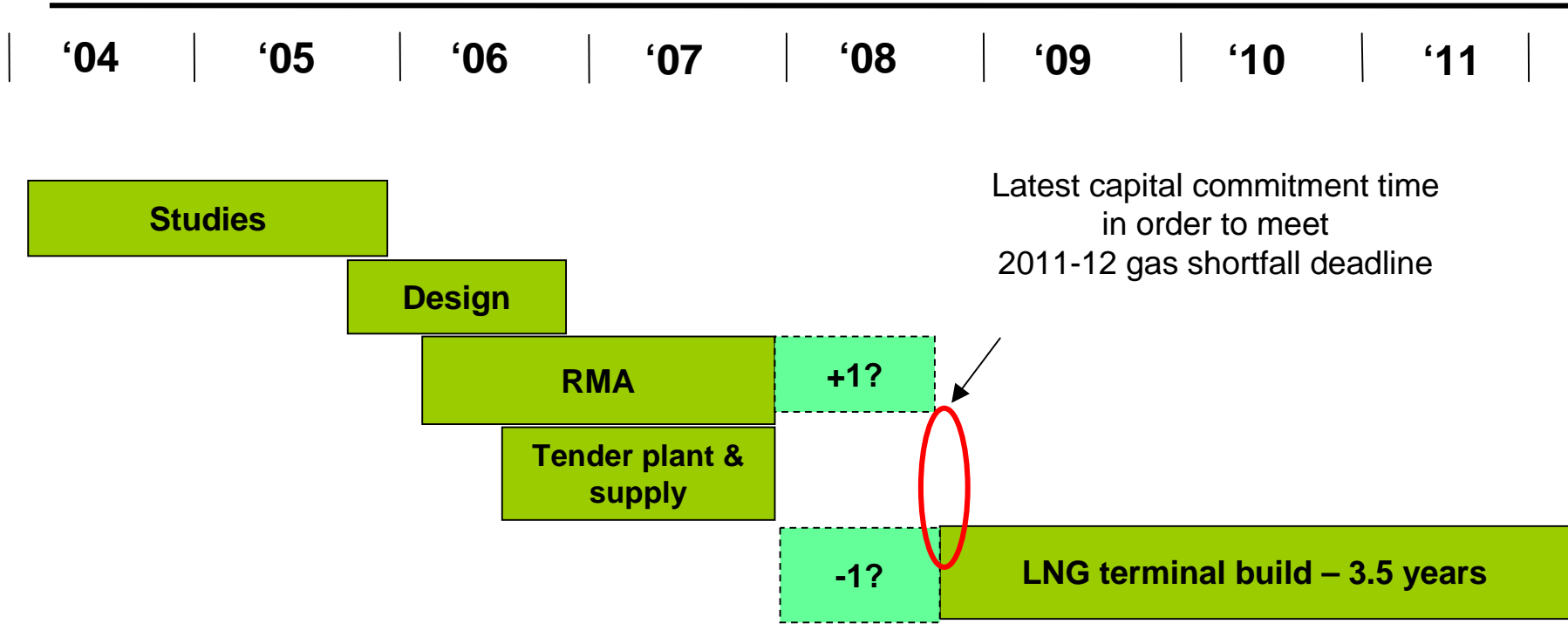


## While there has been an upswing in exploration effort, there is no assurance that NZ will be able to rely entirely on domestic gas sources



Source: Origin

# It is prudent to prepare now for the eventuality that insufficient new domestic gas will be found to entirely meet demand



- The long lead times associated with developing LNG mean that we need to pursue development of this option now in case we don't find domestic gas
- CNG appears to have similar lead times

## In a world with sufficient domestic gas, what would happen to electricity prices if imported gas is not available?

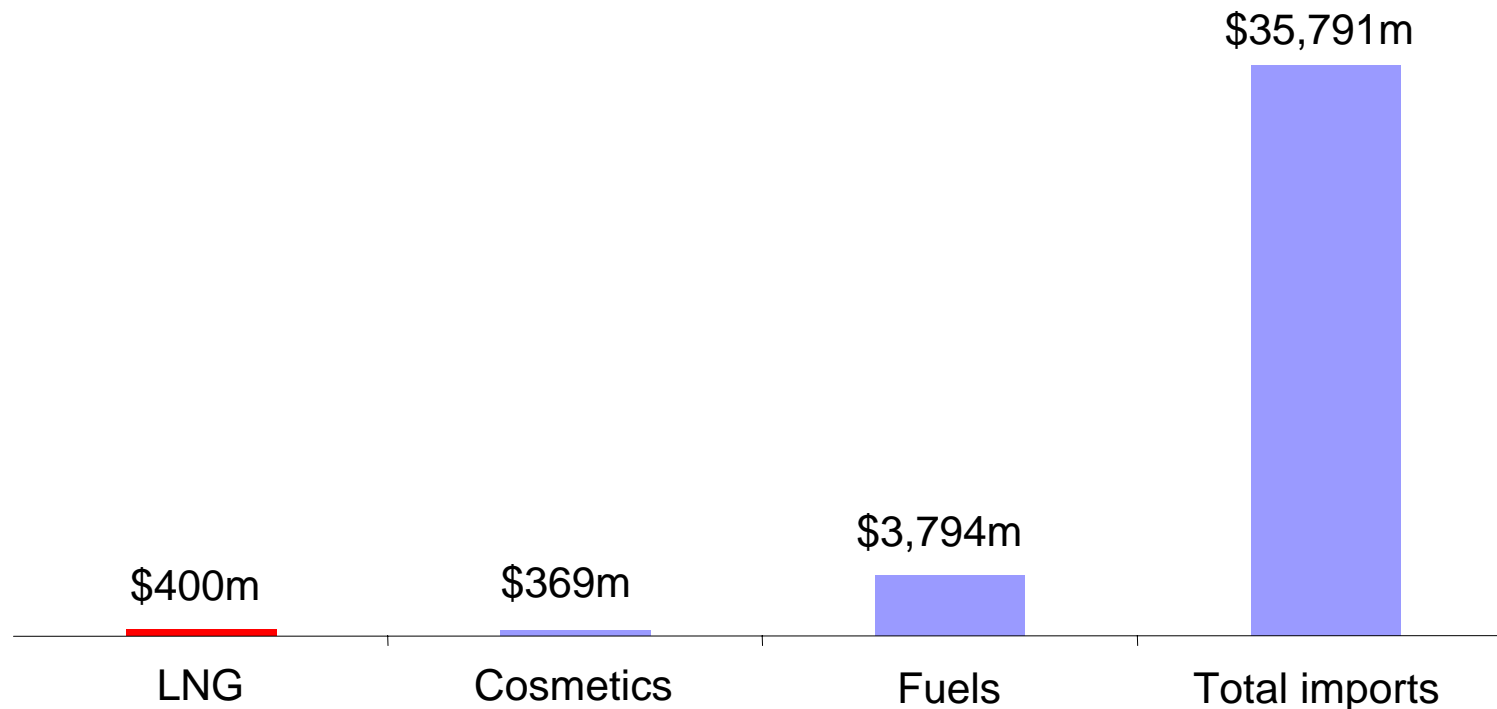
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- Gas and electricity prices are likely to be even higher
- LNG/CNG and associated new CCGTs will only proceed if there are cost effective against alternatives
  - If someone can build cheaper generation options to undercut LNG/CNG, they will still be able to do so
- If sufficient domestic gas isn't found and LNG/CNG doesn't go ahead, New Zealand is likely to face even higher electricity prices due to:
  - Building more expensive alternative plant to meet growing demand; and
  - Re-powering existing gas-fired power stations to burn imported liquid fuel, and/or completely replacing them with new plant

## In a world without domestic gas, what would happen to NZ's balance of payments if we don't proceed with importing gas?

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- The alternative options to not importing gas are likely to have similar, if not greater, impacts on our current account deficit – i.e. importing liquid fuel or coal
- Further, the scale of LNG/CNG imports is relatively modest compared with NZ's current total imports and fuel imports



## Imported gas should be able to co-exist with domestic gas production

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- Without an assurance of long term security, NZ is likely to see a dwindling gas market because new investment in gas-consuming plant will not occur
- Creating a viable gas importation option would provide long term security for gas market - and facilitate new investment in gas using plant
- If NZ does move to import some gas and a gas find in NZ occurs, would expect imported gas to be displaced:
  - local gas will undercut imports if it is cost effective (as with other industries)
  - imported gas by its nature can be redeployed to other markets - especially as new find is likely to have considerable lead time before becoming available

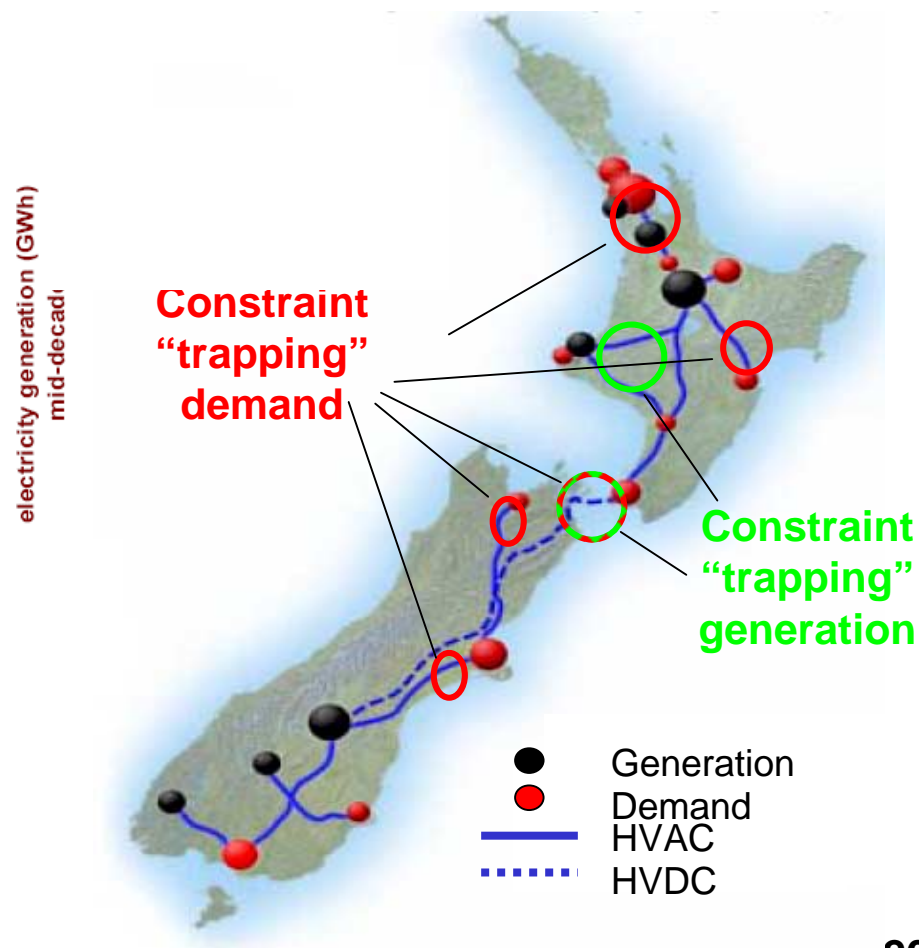
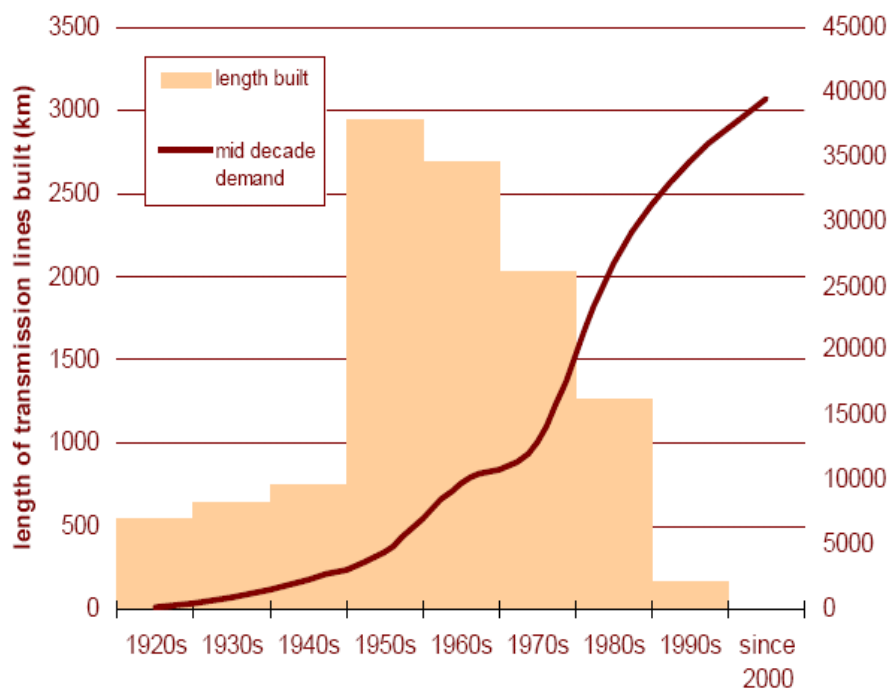


# Transmission

# New Zealand's electricity "backbone" has seen steady growth

15+ years of growth...

...has brought the grid close to its limits



## As well as bringing challenges today, an overstretched grid will close off options for tomorrow

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- Lowers supply security (e.g. Auckland)
- Less efficient dispatch of power stations, including potential “stranding” of some stations
- Prevents the full benefits of the market being realised:
  - increases the potential for intermittent local generation market power; and
  - retards the development of a competitive retail and hedge market
- In particular, a lack of a strong grid may hinder some future generation options being developed
- Renewable development especially likely to be hindered by a weak grid due to
  - renewable resources being distant from load; and
  - the diversity benefits from multiple wind farms only being realised if such wind farms are not trapped behind constraints

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## Conclusion

## Achievement of the best future balance between price, security and the environment requires work now to maximise our future options

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- The best future outcome for New Zealand requires:
  - a balance of renewables and thermals
  - strong efforts to identify new domestic gas sources, backed by viable option to imported gas if required to cover any shortfall
- The “right” balance will depend on future domestic gas finds, fuel prices, technology change, and CO2 prices among other factors
- Important areas of focus:
  - Ensuring market design appropriately recognises any costs from variable generation and rewards firm / flexible generation
  - Investing in securing the option to proceed with importing gas if domestic gas is not found
  - Developing a transmission grid that is strong enough to enable a range of possible new generation investment futures and facilitate competition