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

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Achieving balance through securing our options

- 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

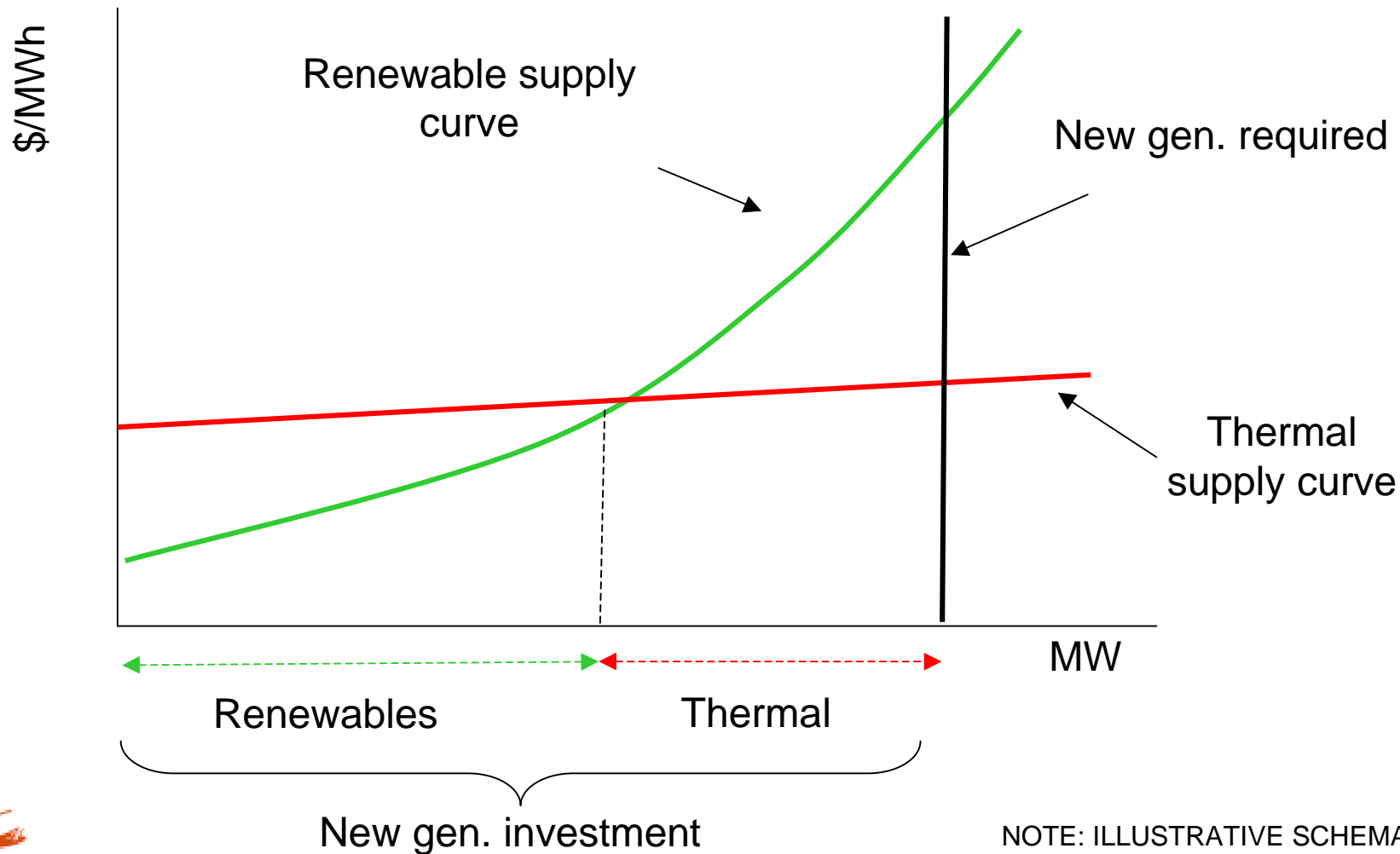
**Are renewables or thermals the answer to New Zealand's
energy future?**

Renewables *or* thermals is the wrong question

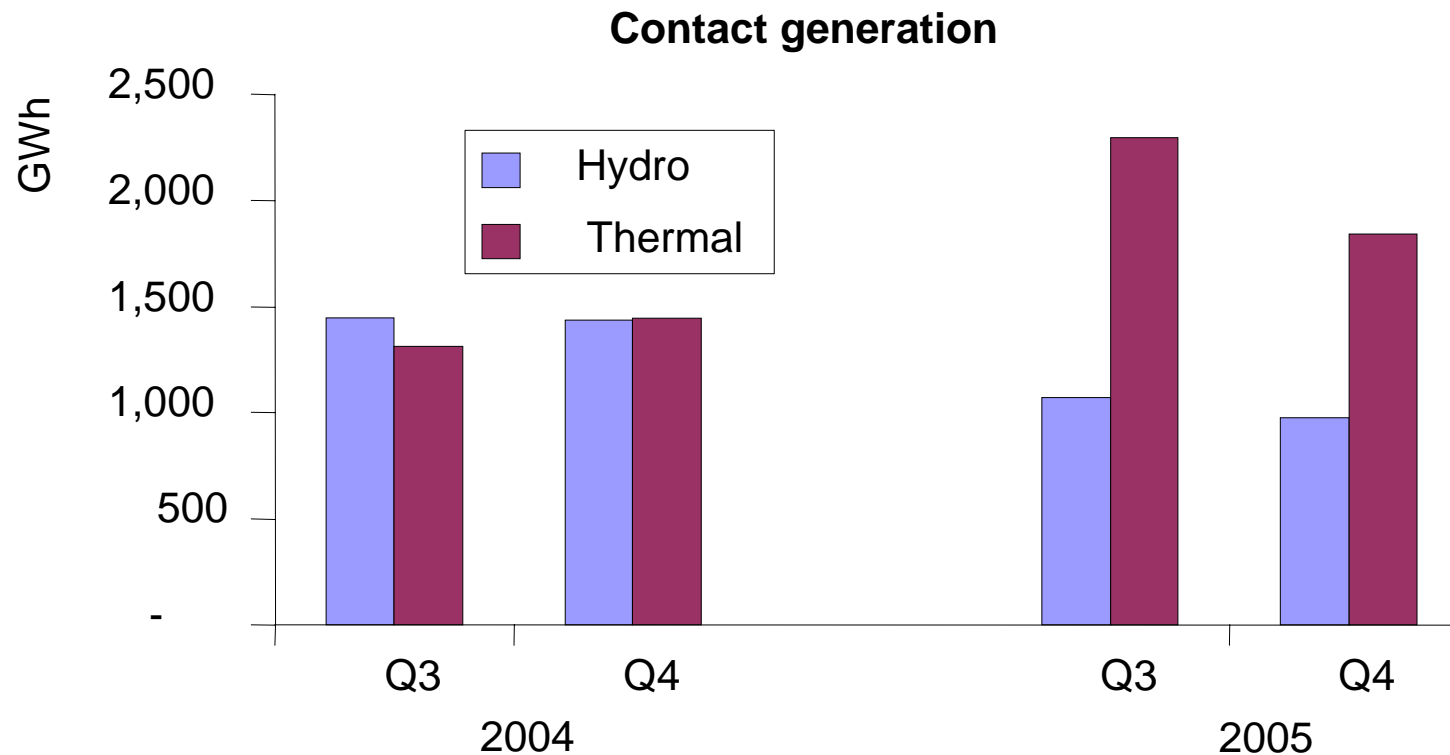
- The right question, and one much harder to answer, is what is the optimal *balance*...
- For the short- to medium-term at least, New Zealand will need new renewable and thermal investments to meet its energy needs, for two reasons
 - Cost of renewables
 - Renewable variability and volatility

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



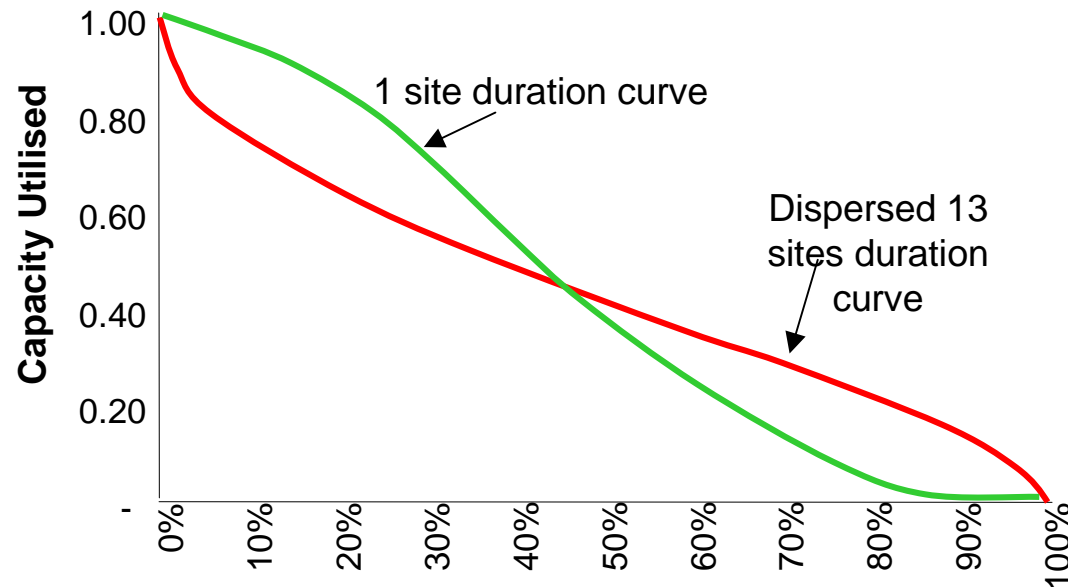
Historically thermal stations have provided an important balancing role for yearly hydro volatility



- 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

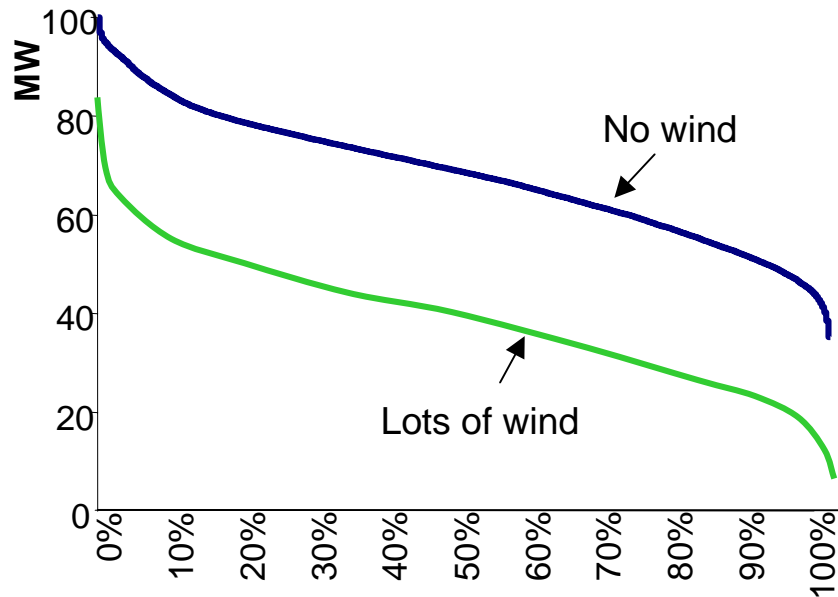
Wind generation is intermittent - can be compensated by site diversity and hydro....

- 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

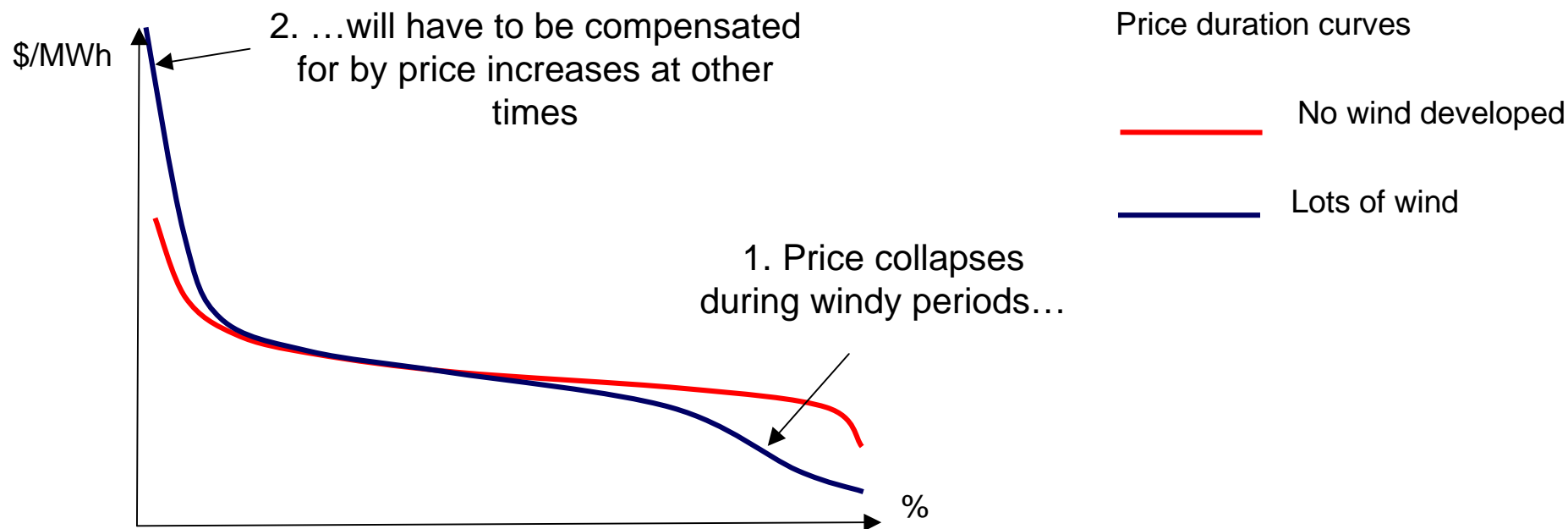


- Less requirement for thermal GWh; but
- Little change in required thermal MW
- Also, if hydro can't balance perfectly, thermals could face a more "jagged" real-time operating profile, requiring more flexible operation

- 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

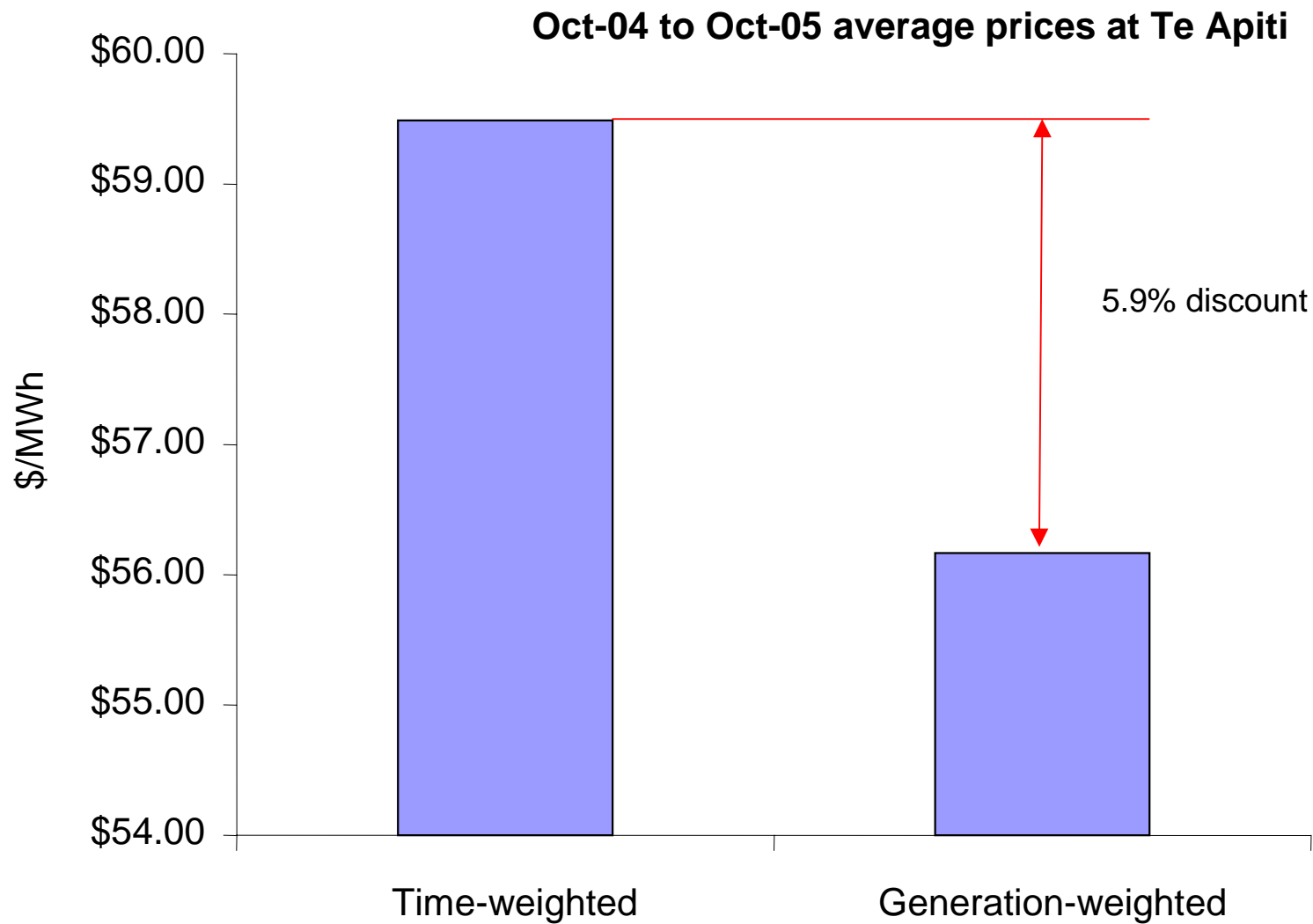
Significant wind development is likely to impact on the shape of prices

- 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

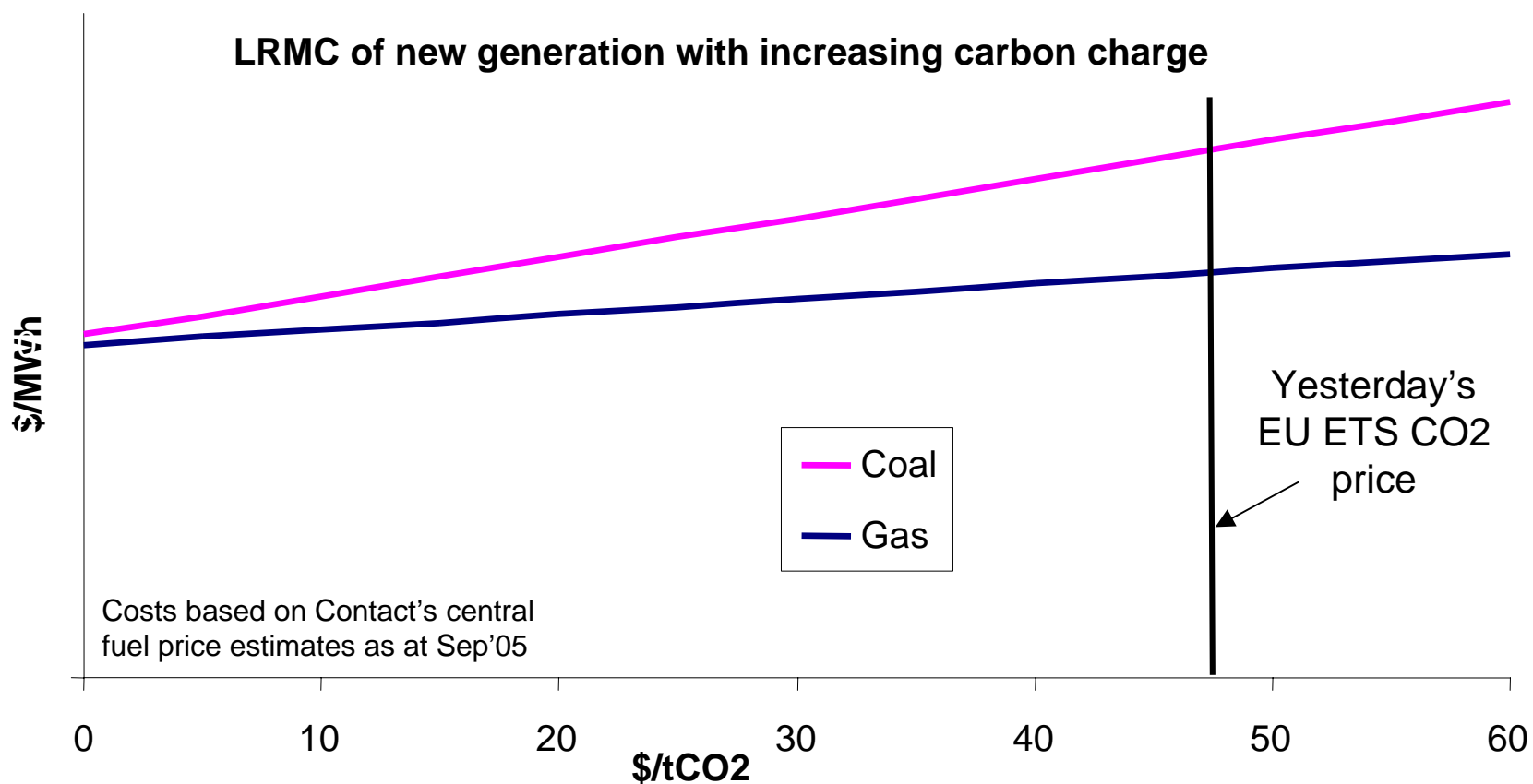
Price patterns already appear to be changing



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

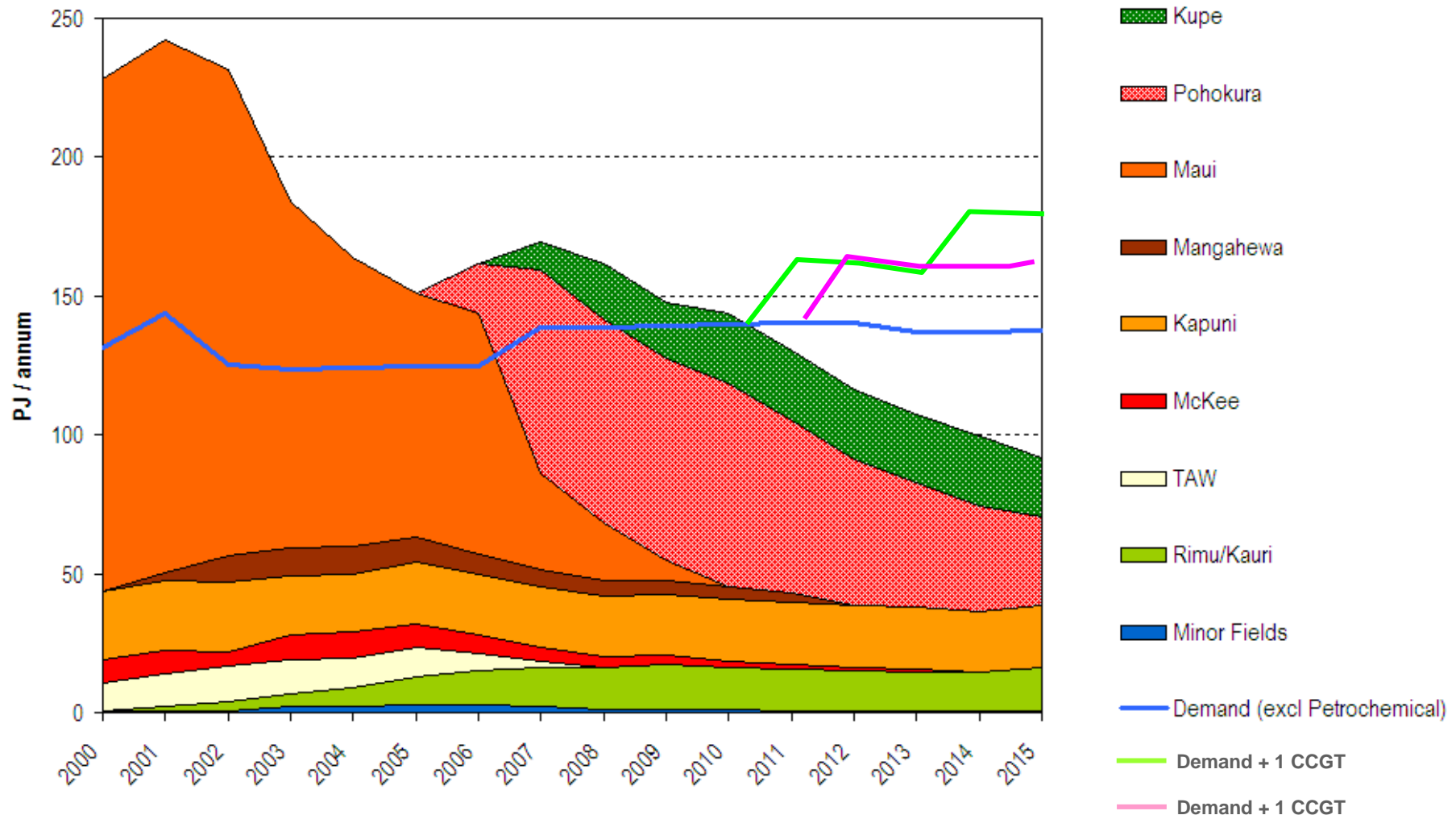
Carbon is likely to be the deciding factor in the gas versus coal choice

- 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

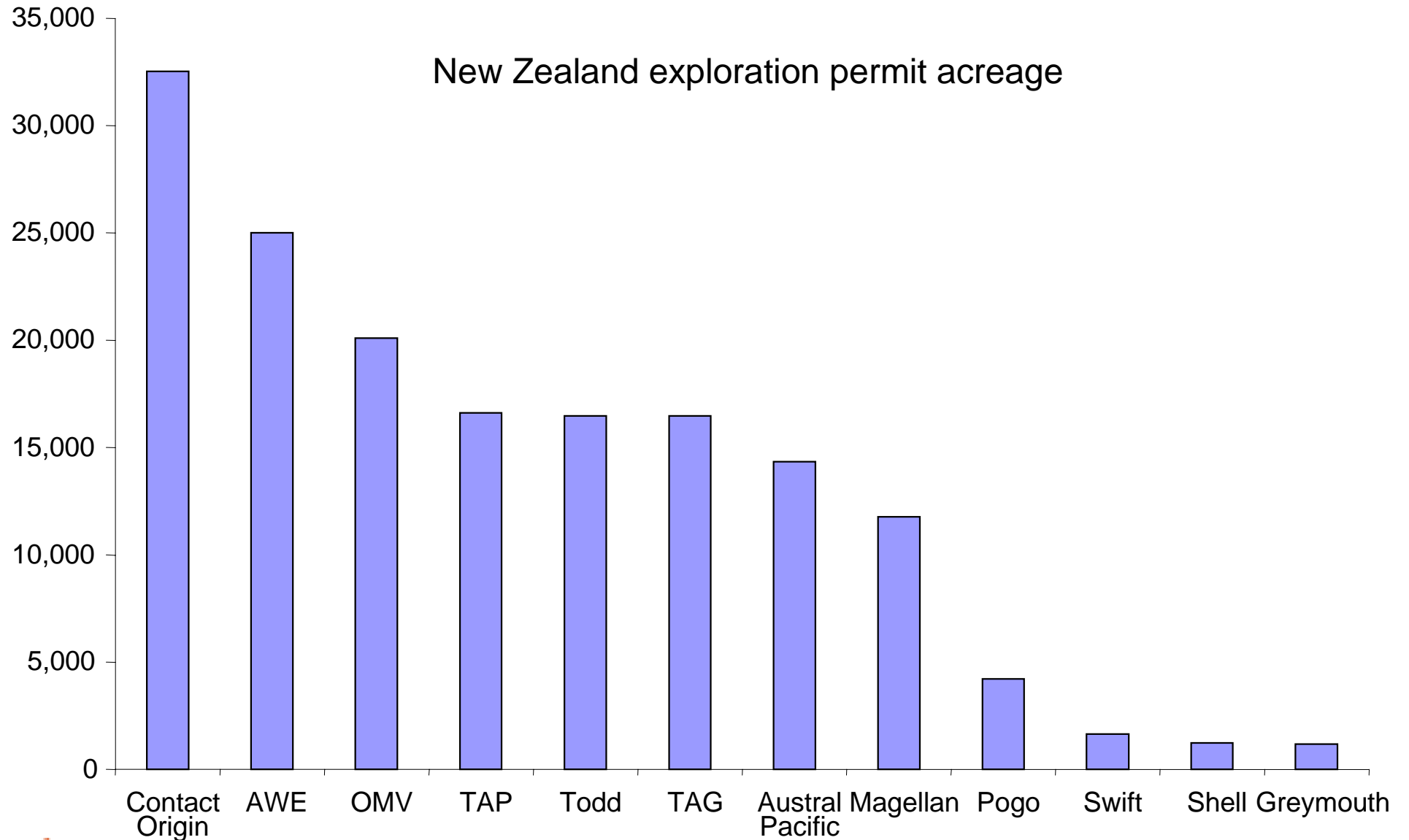


NZ's proven gas reserves are insufficient to meet existing demand much beyond the end of decade, let alone fuel new CCGTs

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

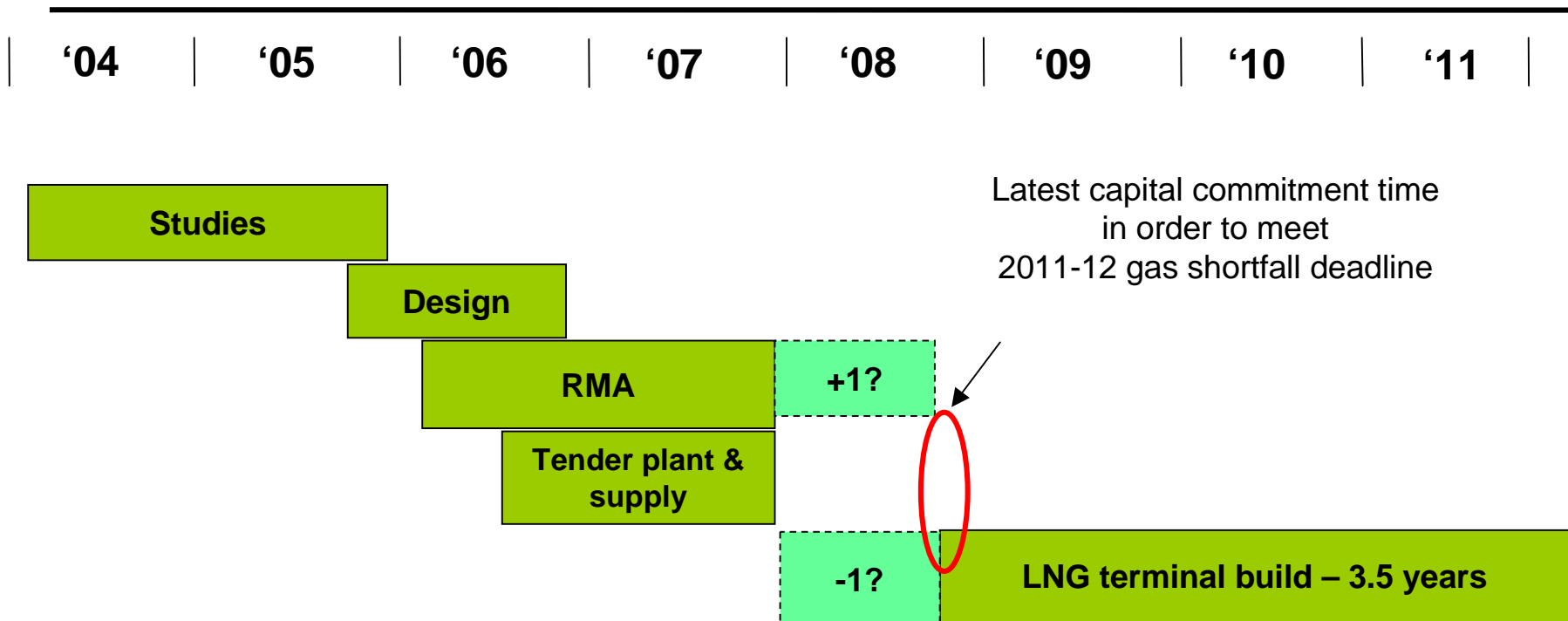


While there has been an upswing in exploration effort, there is no assurance that NZ will be able to rely entirely on domestic gas sources



Source: Origin

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



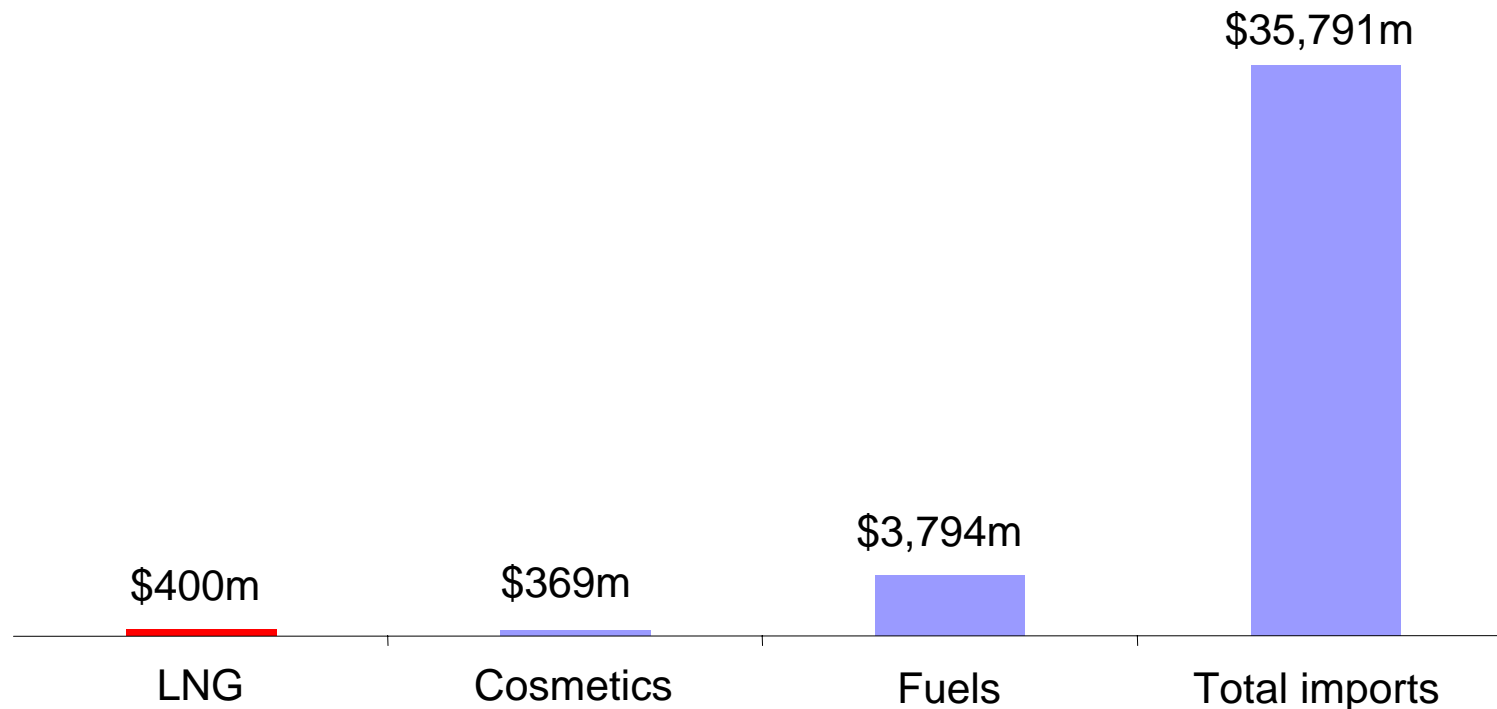
- The long lead times associated with developing LNG mean that we need to pursue development of this option now in case we don't find domestic gas
- CNG appears to have similar lead times

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

- 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?

- 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

- 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

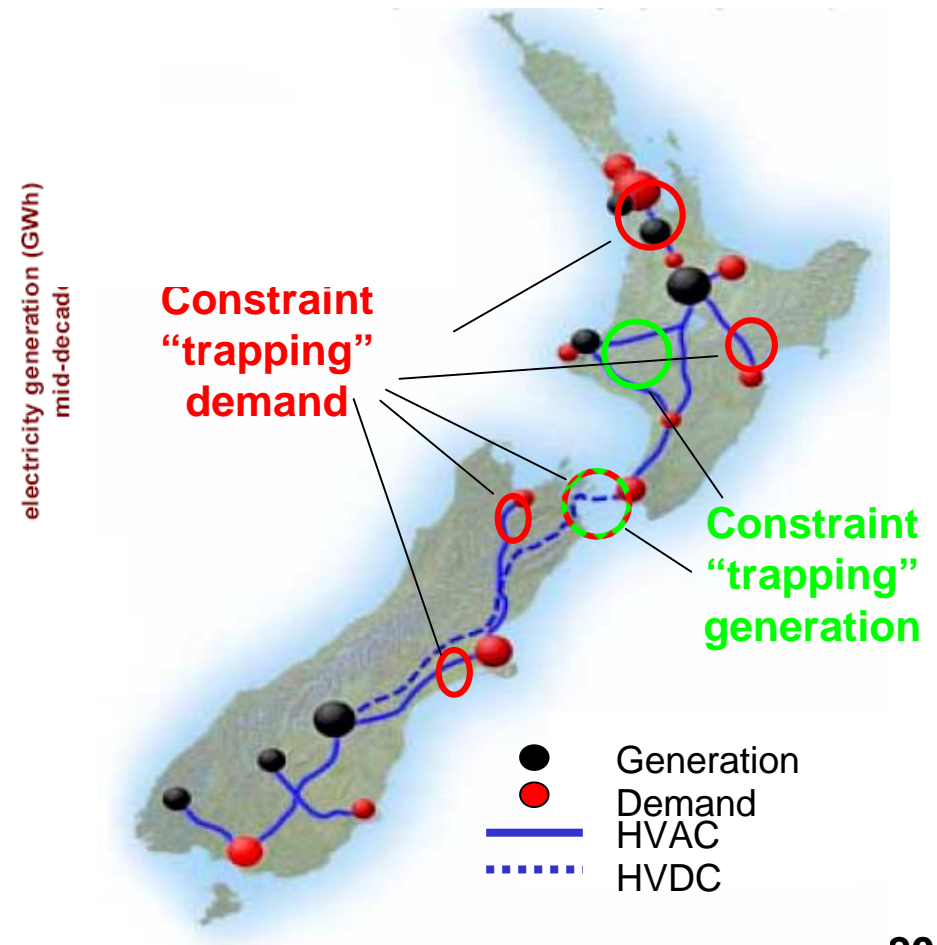
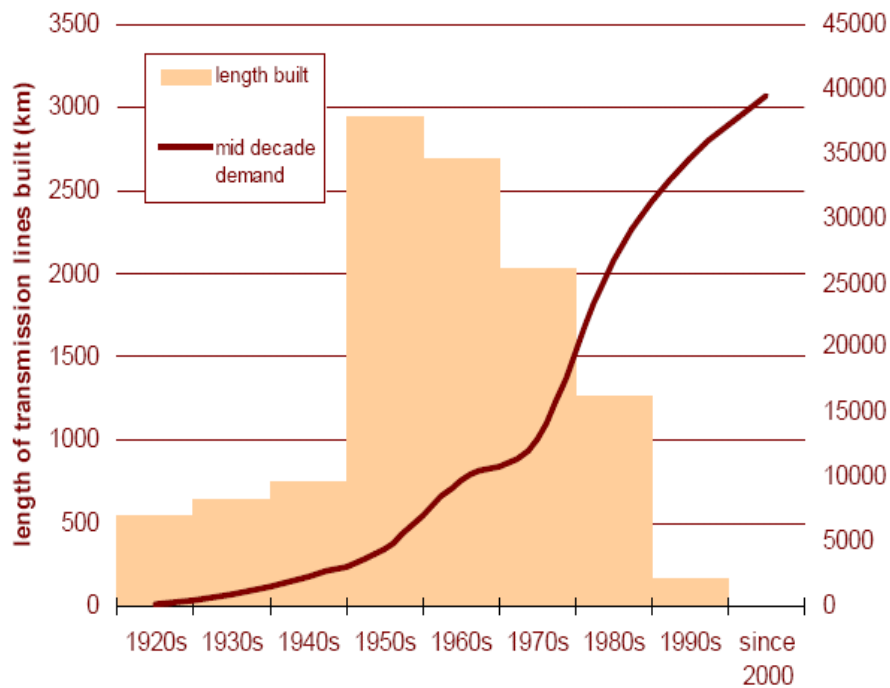


Transmission

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

- 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

Conclusion

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

- 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