



Forecasting New Zealand's gas sector in 2050

(Accurate to two decimal places...)

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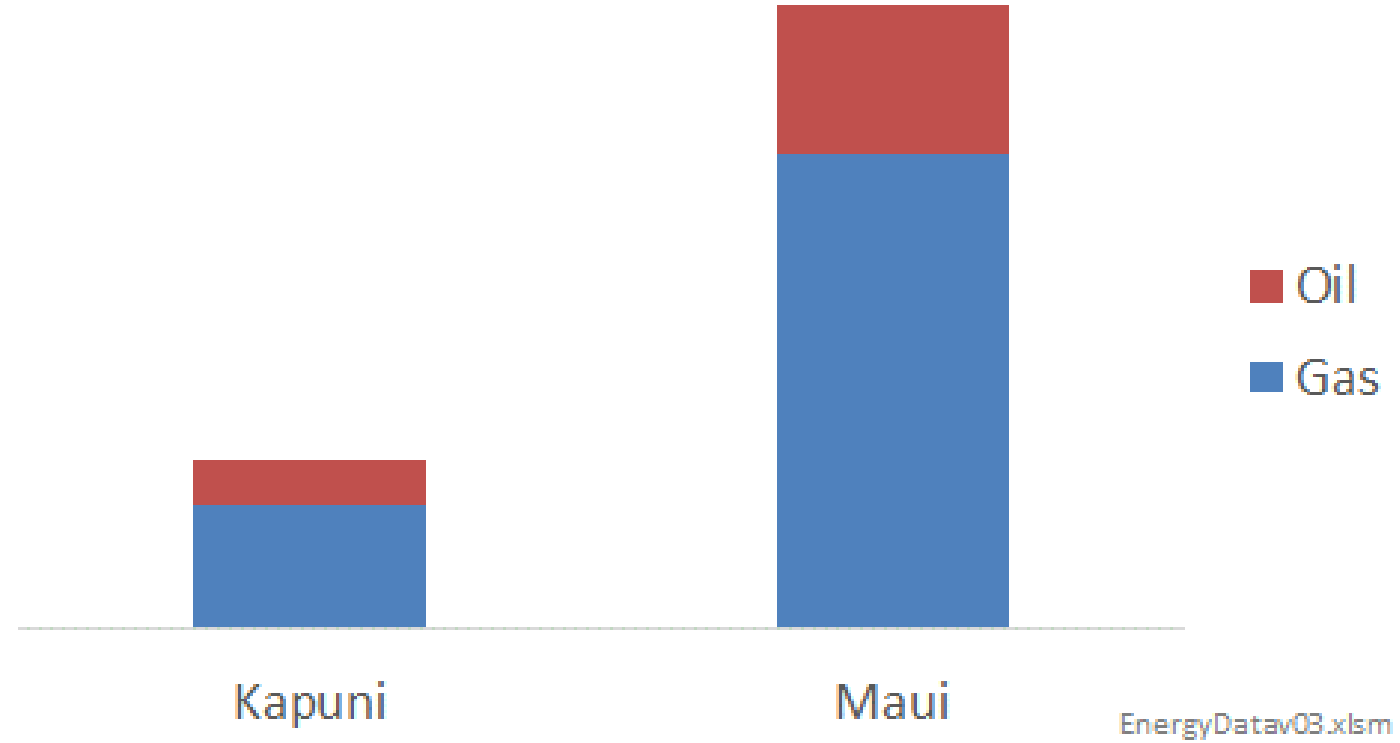
“But first, a history lesson”



In the 1960s and '70s we found oil



But, the oil we found was quite gassy



- In order to produce the oil, we also needed to produce a lot of gas



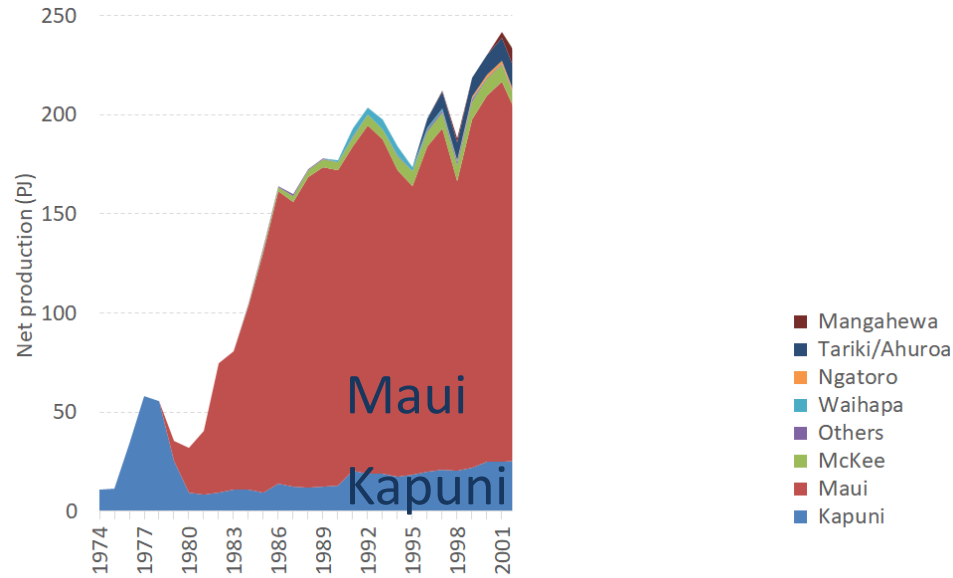
- With no connection to the rest of the world, how do we sell our gas?

THINK BIG!

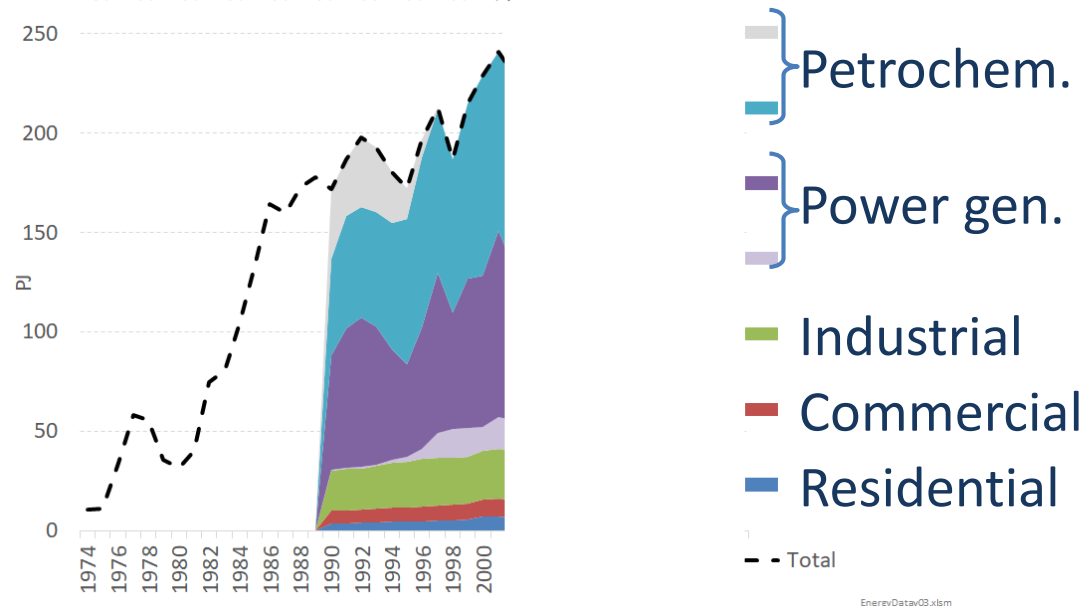
- Methanol and synthetic fuel production
- Power generation
- Industrial process heat
- Replacement of town gas

For a long while, Maui (and Kapuni) were the only shows in town

Supply



Demand



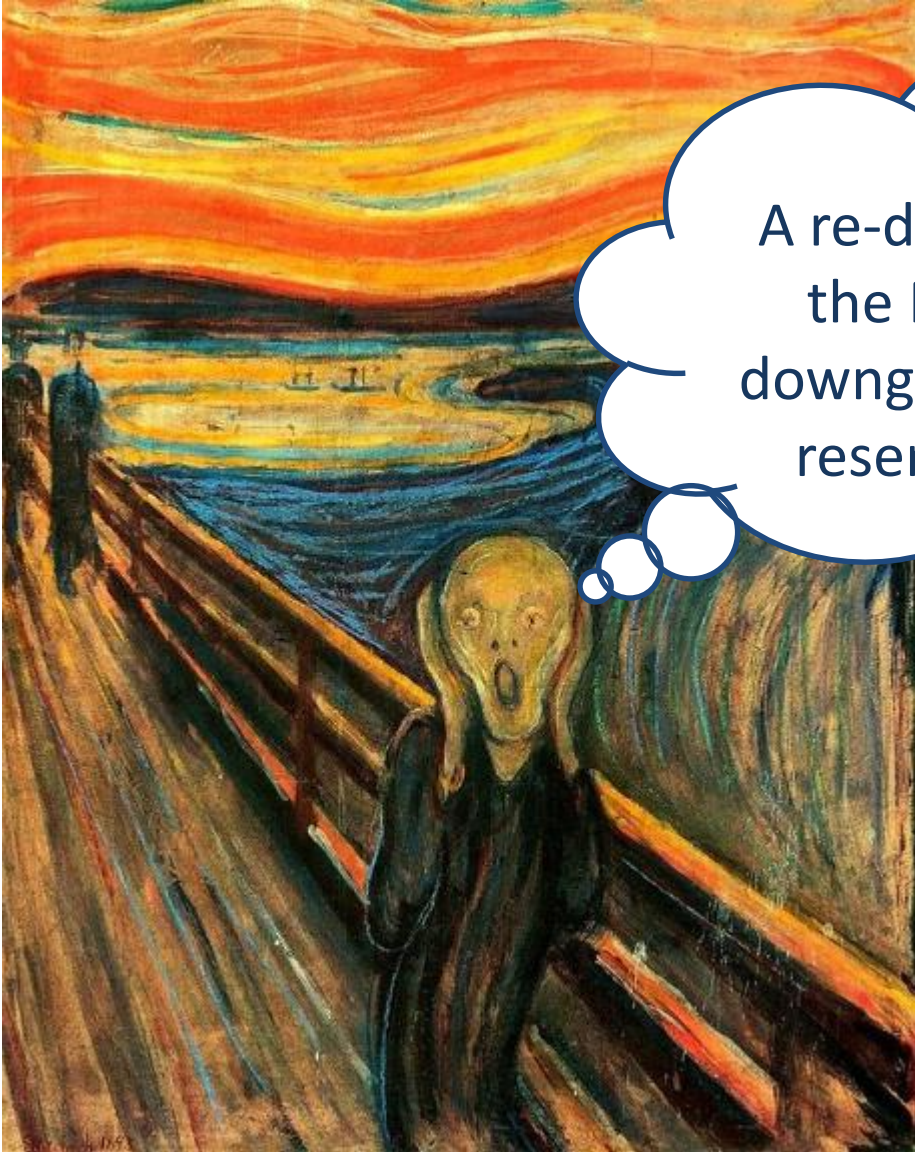
- Little further exploration as demand was ‘full-up’ with Maui & Kapuni gas

- What exploration there was, focused on the search for oil

“If we’re lucky we’ll find oil

If we’re unlucky we won’t find anything

If we’re really unlucky we’ll find gas”



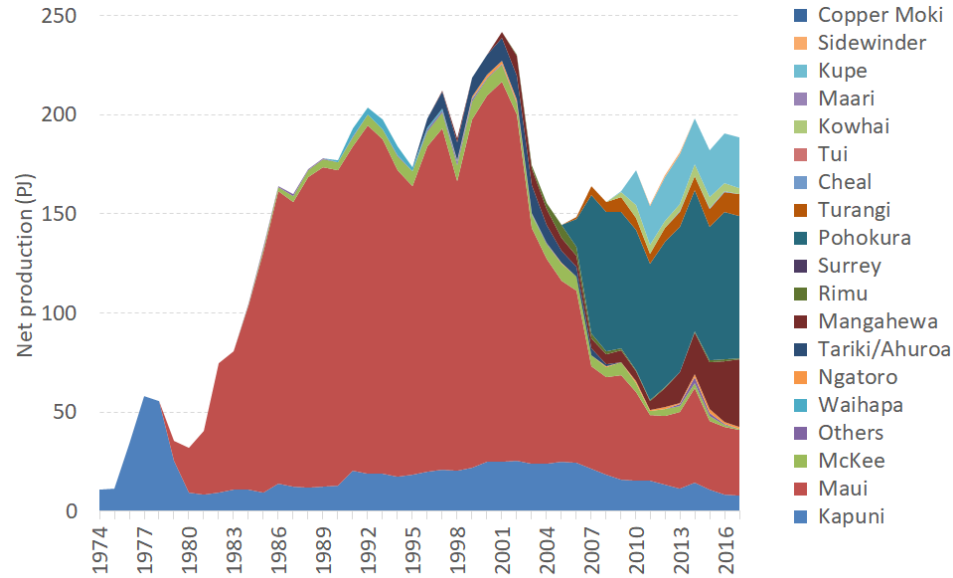
OMG!
A re-determination of
the Maui field has
downgraded remaining
reserves by 400 PJ!

- All of a sudden

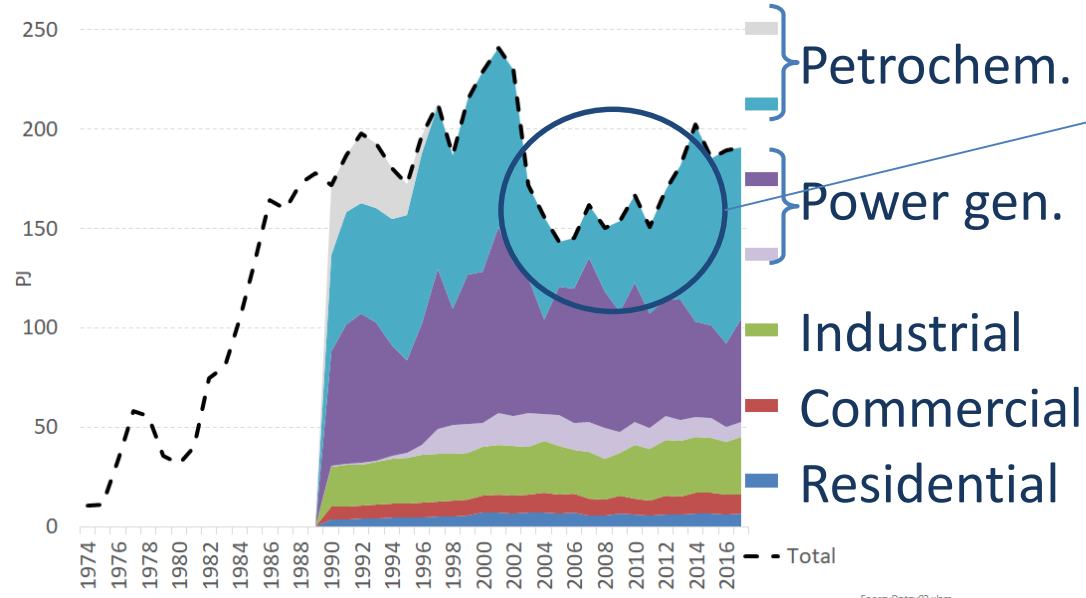
**New Zealand was
running out of gas!**

Except we weren't

Supply

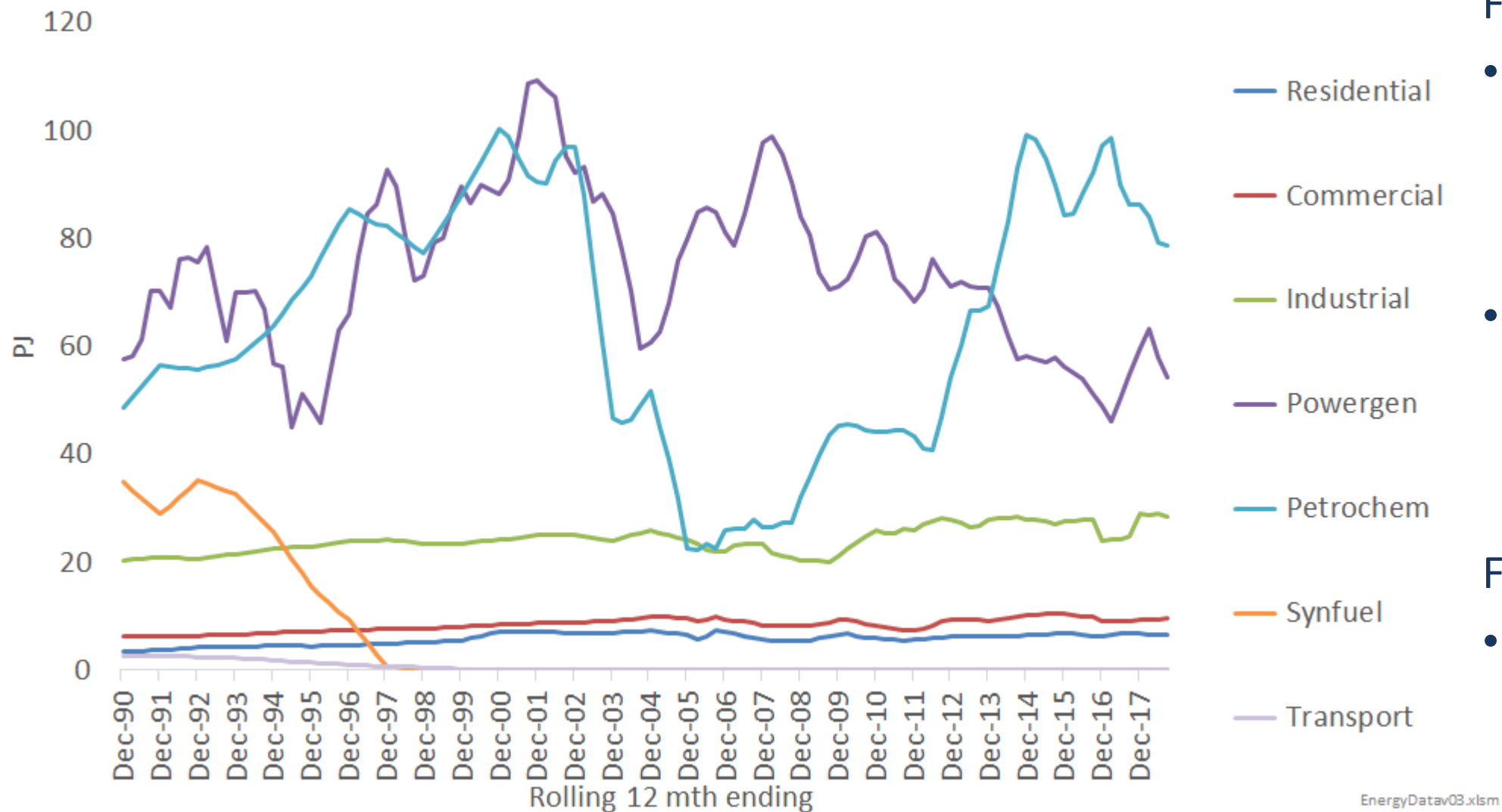


Demand



During the years of tightness, petrochemical production (i.e. Methanex) significantly scaled back

Methanex has been a critical enabler of the gas market



For upstream:

- Underpinned the ongoing development of existing fields
- Provided confidence for the development of new fields

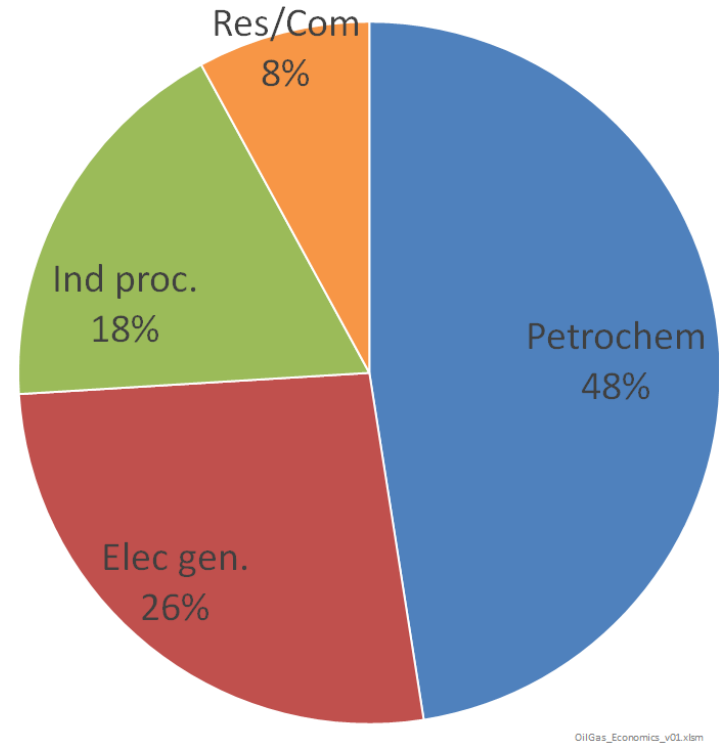
For downstream:

- Scaled back at times of scarcity, “rationing” gas for higher-value users

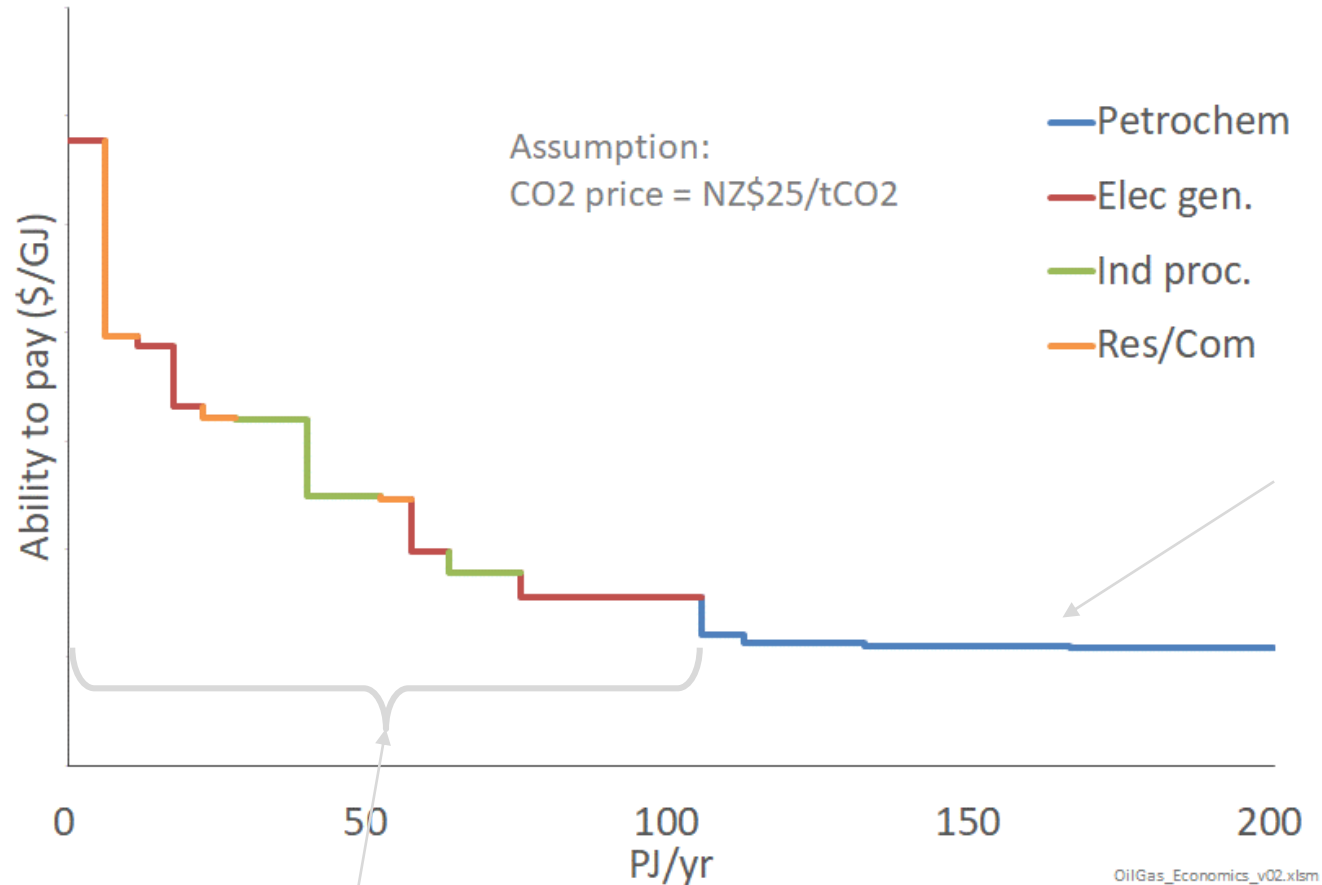
EnergyData03.xlsm

Why does Methanex play this critical market balancer role?

It is very large



It is price-sensitive

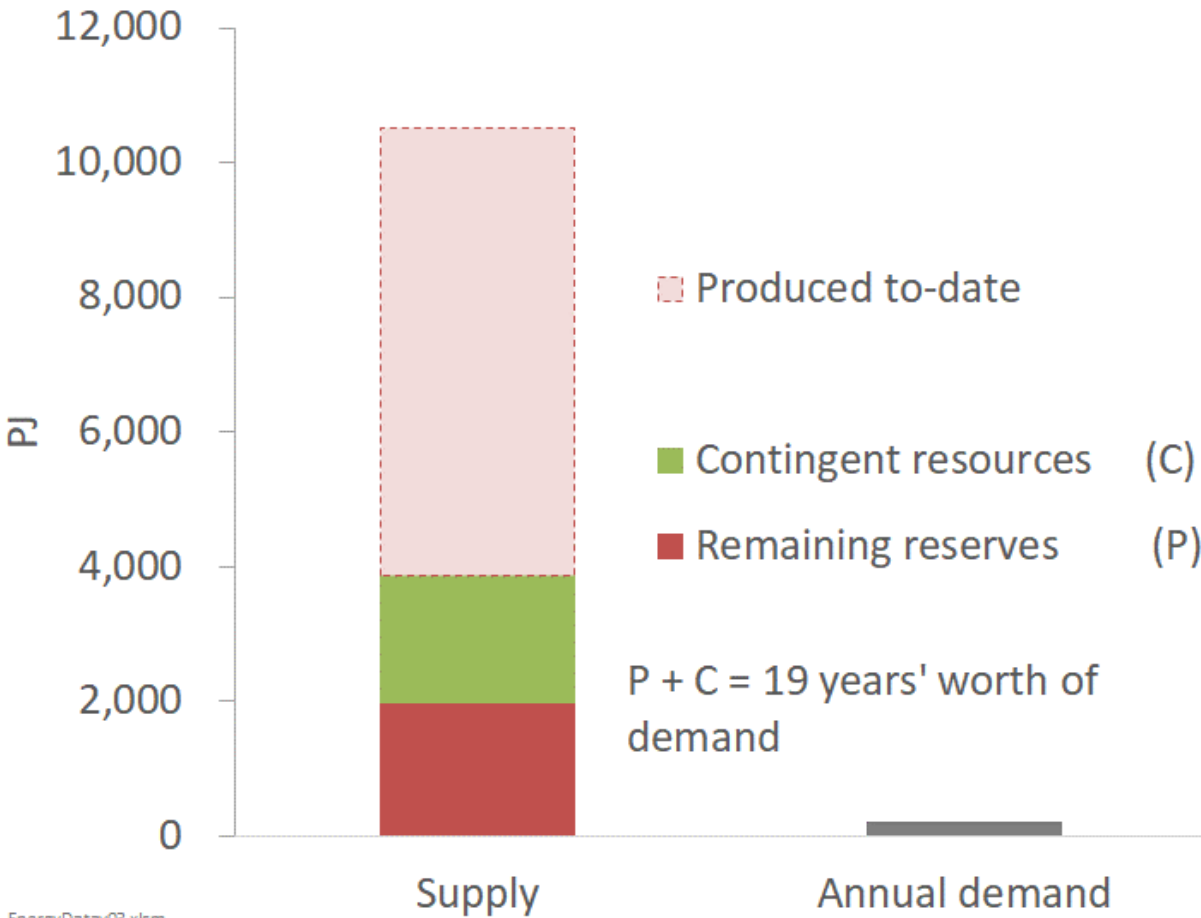


Ability-to-pay = opportunity cost of producing overseas

Ability-to-pay = cost of fuel switching

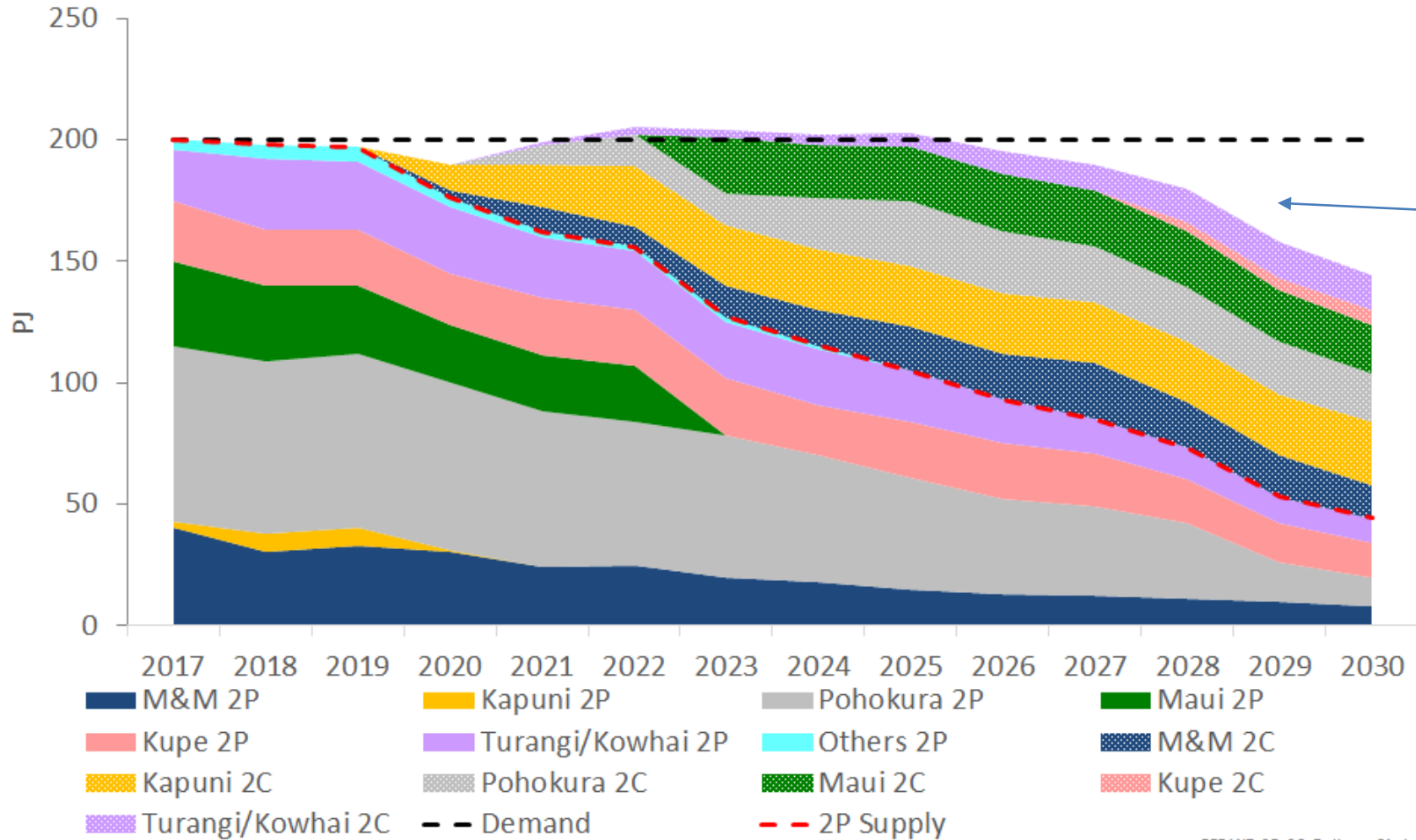


Our existing fields have a fair bit of life left in them



- Although we 'only' have 10 years' worth of reported *reserves*
- We have the same again in reported *contingent resources* from existing fields

But we will need to find and develop new gas much sooner than 19 years

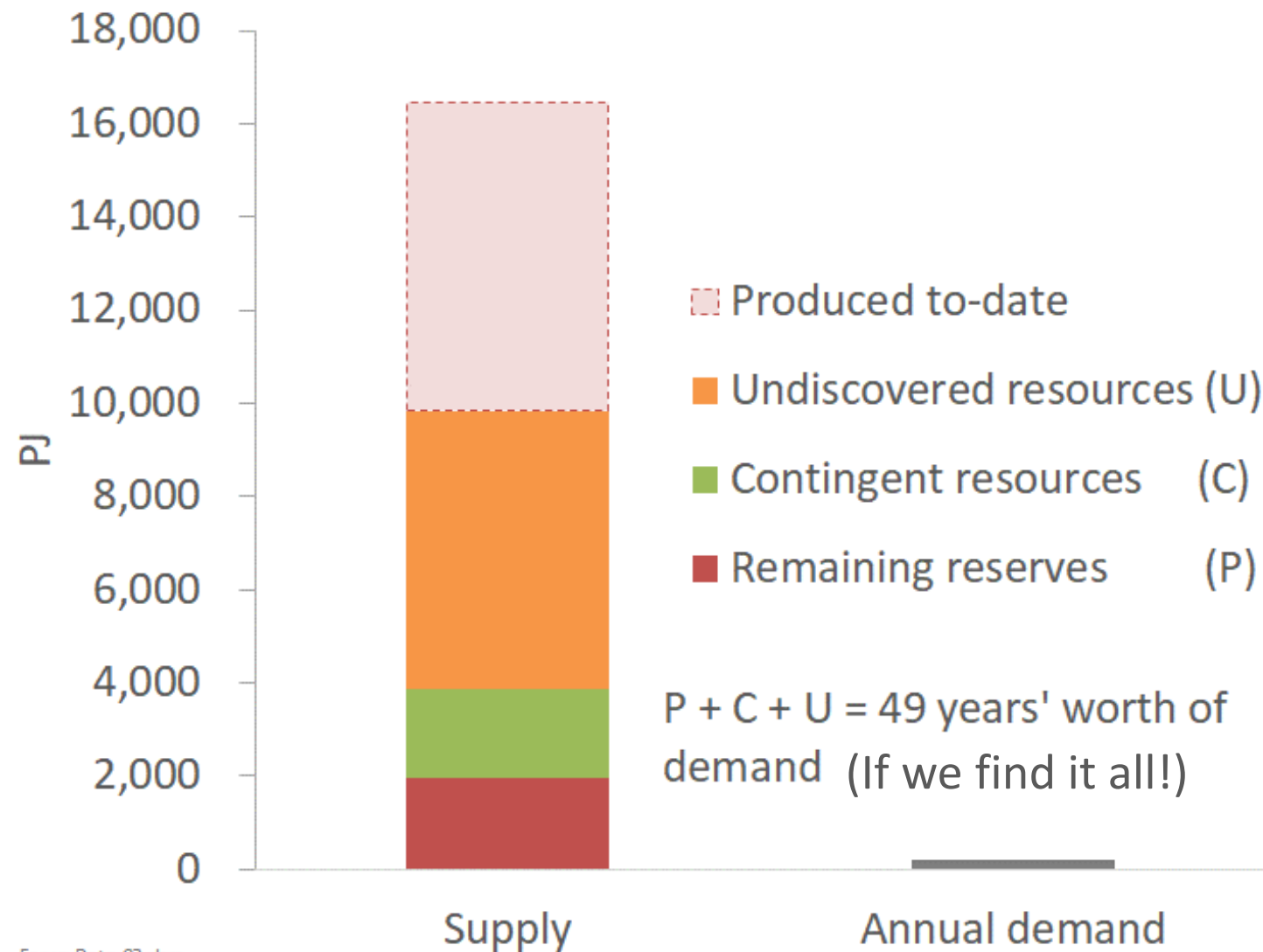


Less than 10 years to find and develop new gas...
 ... if we want to maintain current gas demand

PEPANZ_2P_2C_Deliver_v01.xlsm

Source: PEPANZ

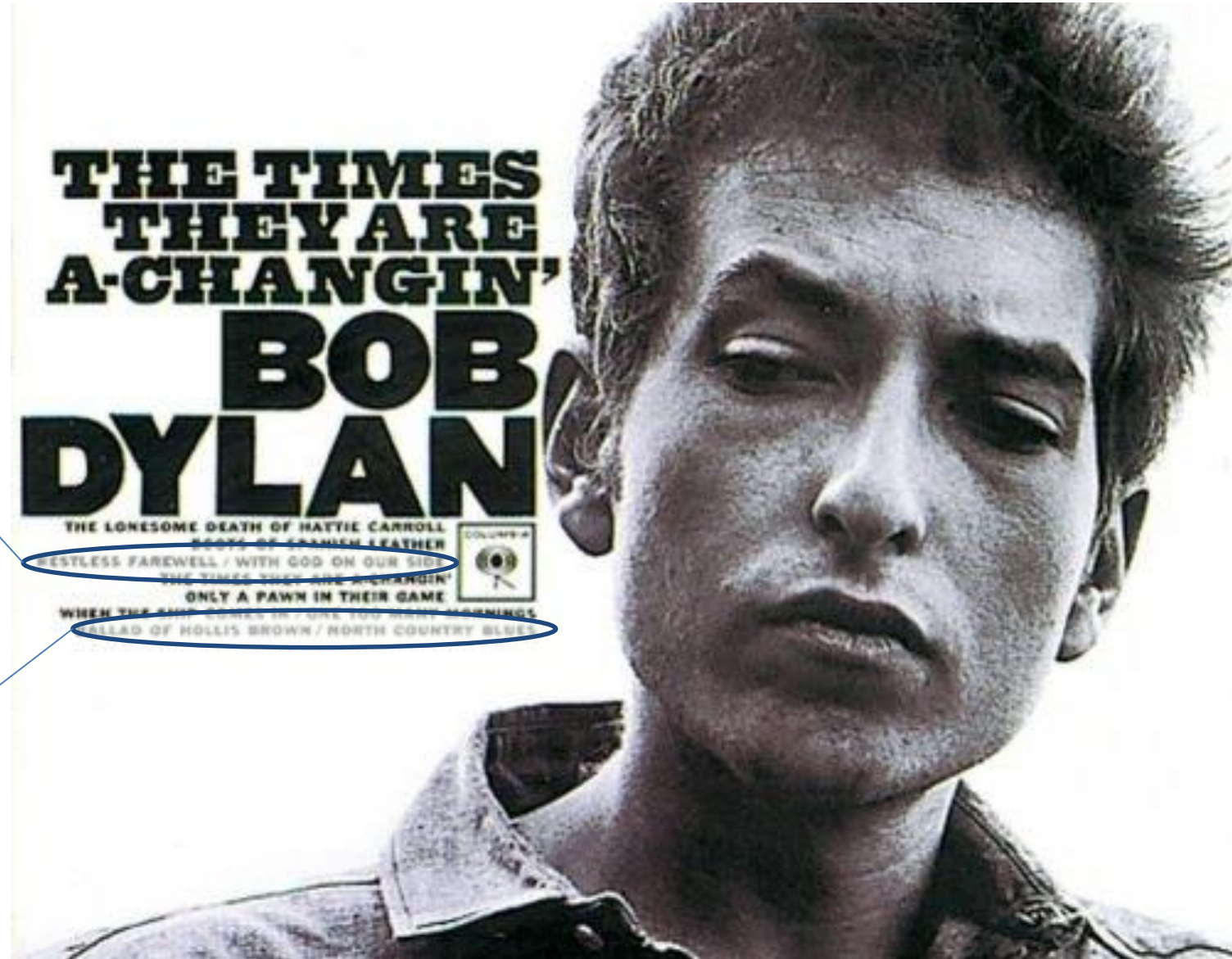
The Taranaki basin has sufficient undiscovered gas to meet demand for a long while yet



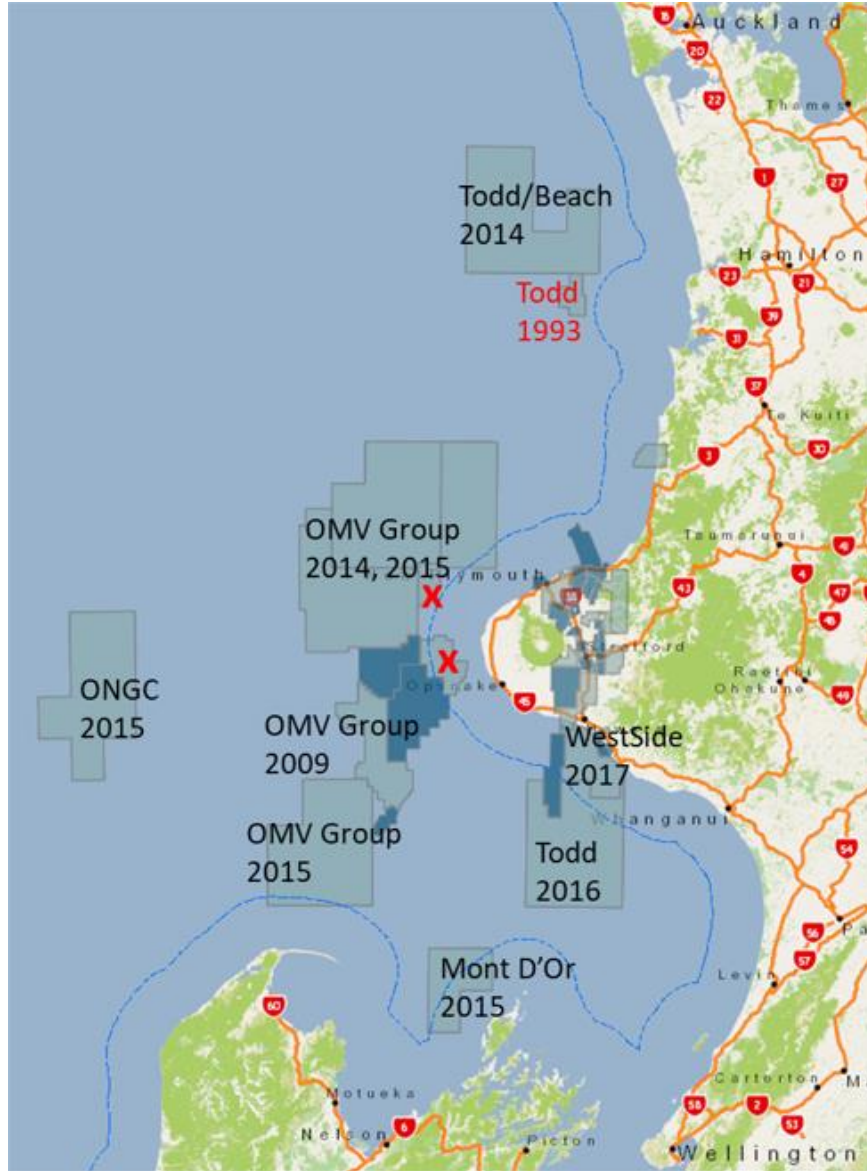
- As of 1 January 2018, New Zealand's gas sector looked fairly robust
- However...

**The price of
CO₂'s a-risin'
(while my
deliverability's
a-fallin')**

**Can't get me none
of them offshore
exploration
permits no more**

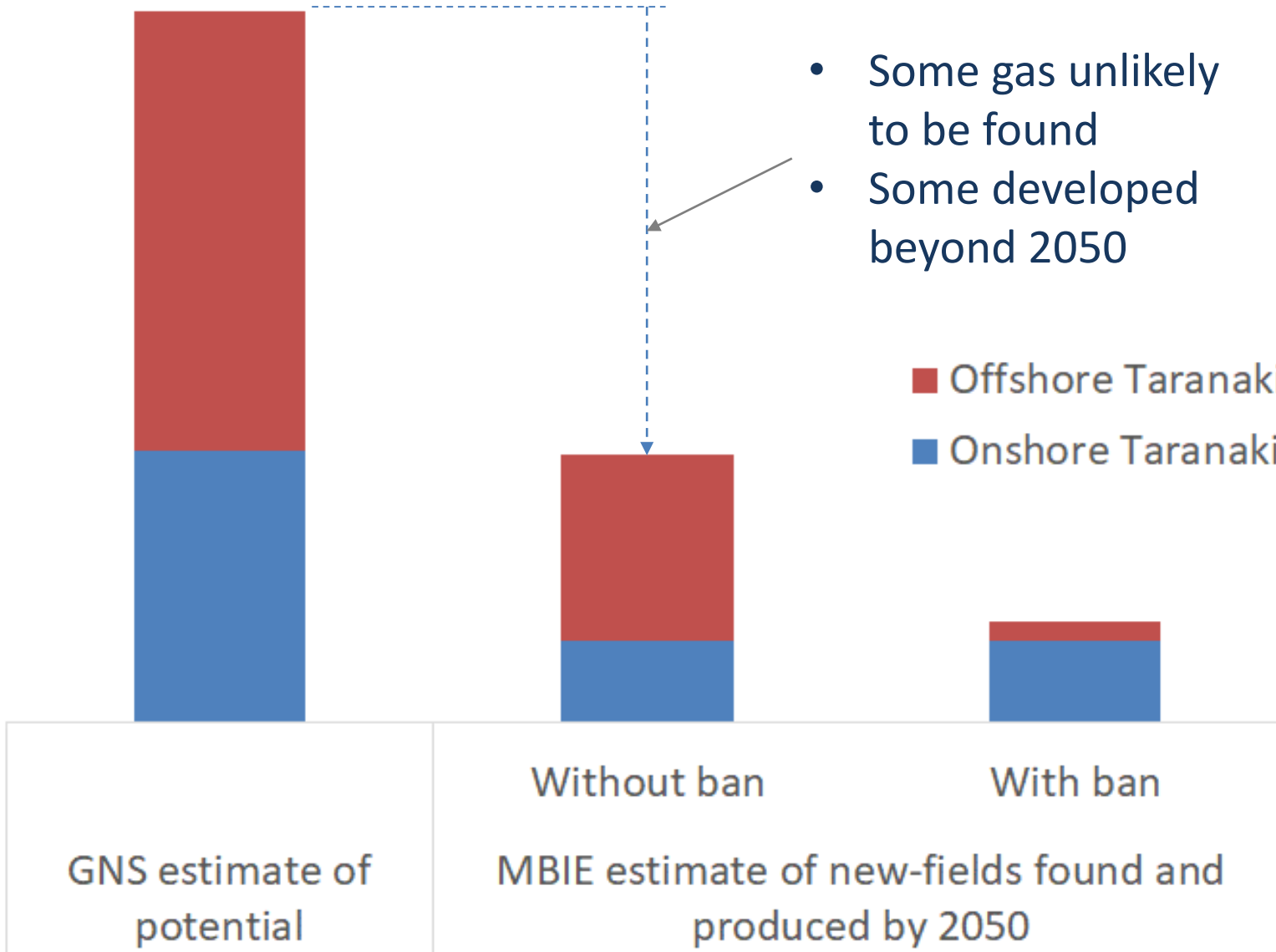


What is this exploration 'ban'?



- No new offshore exploration permits to be issued
- Existing offshore exploration permits will remain valid
- New exploration permits allowed for *onshore* Taranaki

What is the likely effect of the 'ban' on future gas developments?



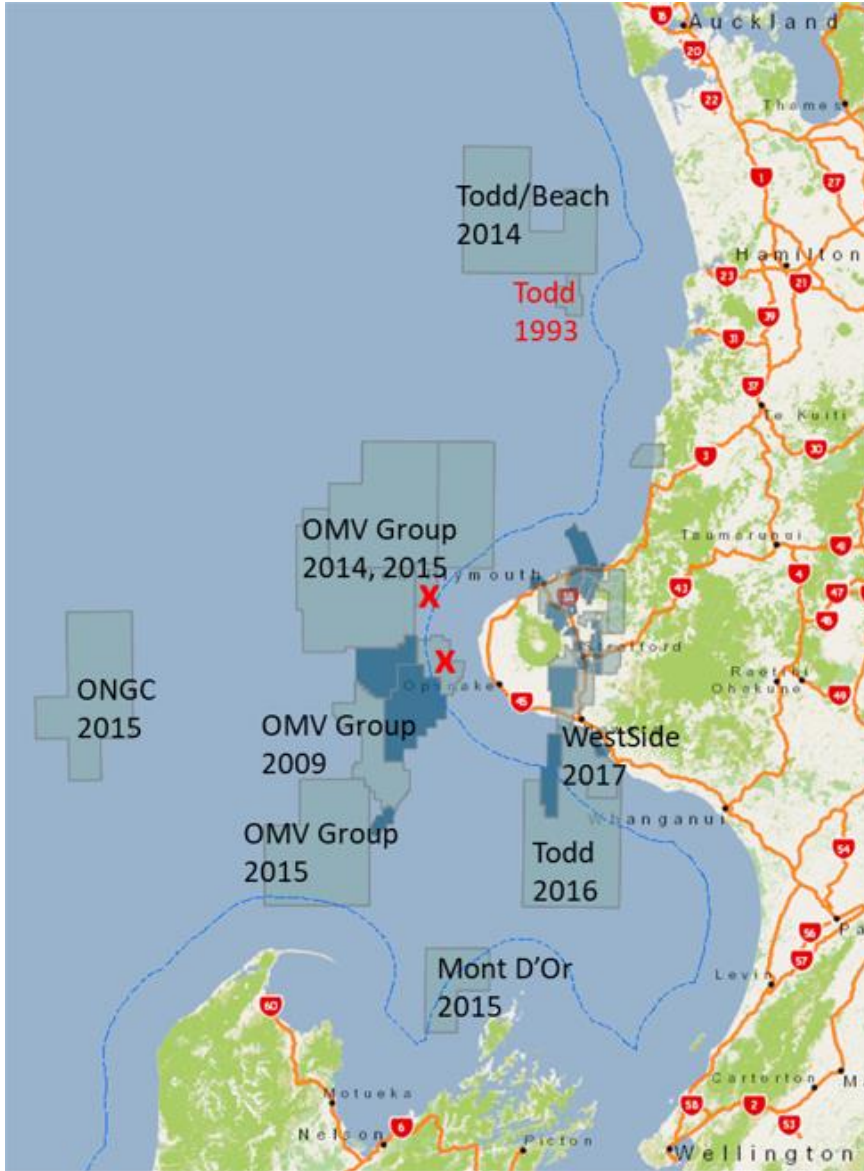
- Some gas unlikely to be found
- Some developed beyond 2050

- What?
- Hardly any new offshore gas?
- But existing permits cover oodles of acreage?
- How can this be?

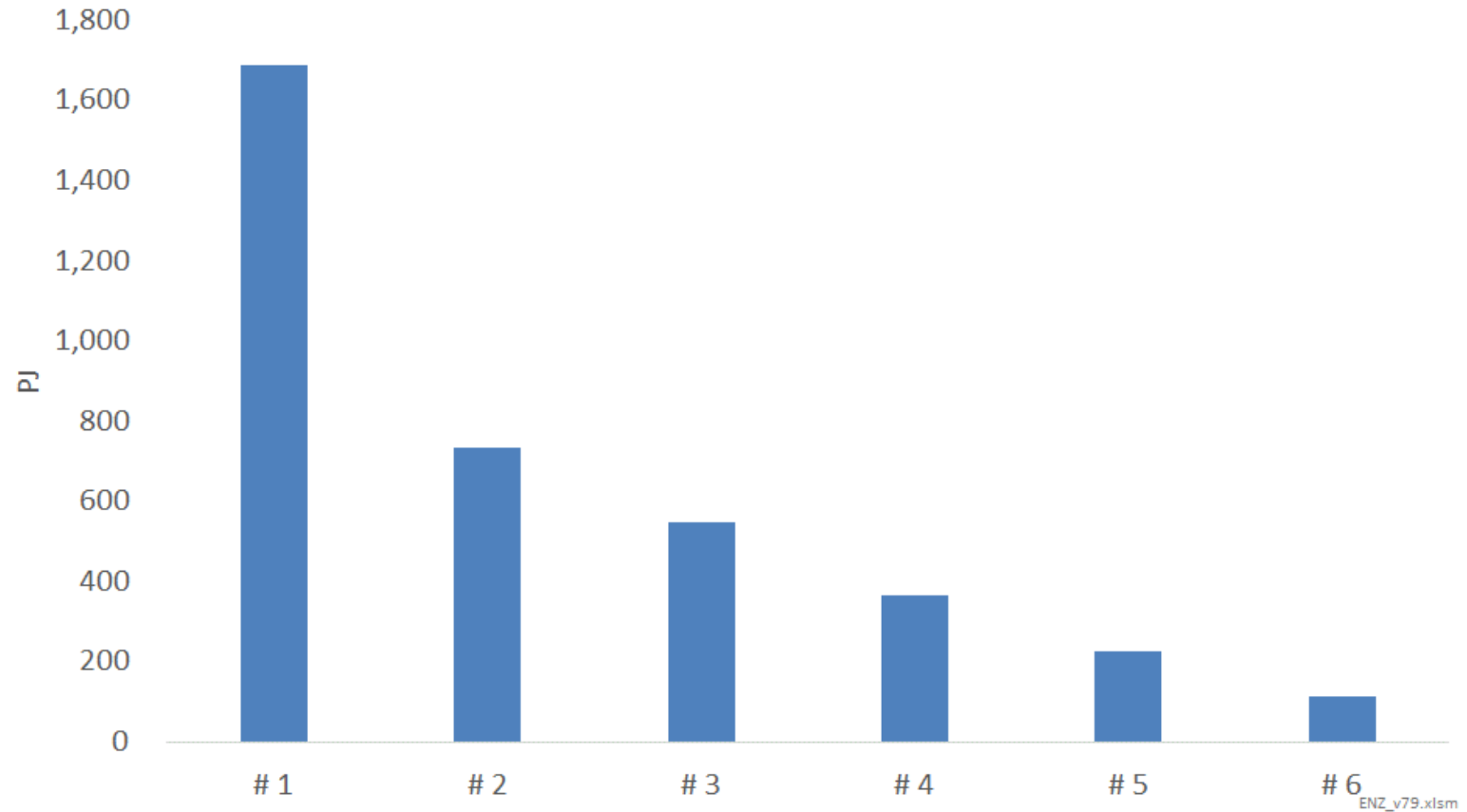
Source: Concept analysis of MBIE & NZIER reports

Gas isn't smeared evenly across the Taranaki basin

- GNS P50 estimate was for just 6 more fields



GNS Estimated undiscovered gas fields





- Stake: \$80-100m (cost of an exploration well)
- Chance of success: 1-in-10!*
- With these odds, you can't keep rolling the dice forever
- MBIE numbers suggest another dozen-or-so exploration wells

* Source: GNS



OMG!
Less than 200 PJ more
offshore gas will be
found and produced!
(Probably)

- All of a sudden

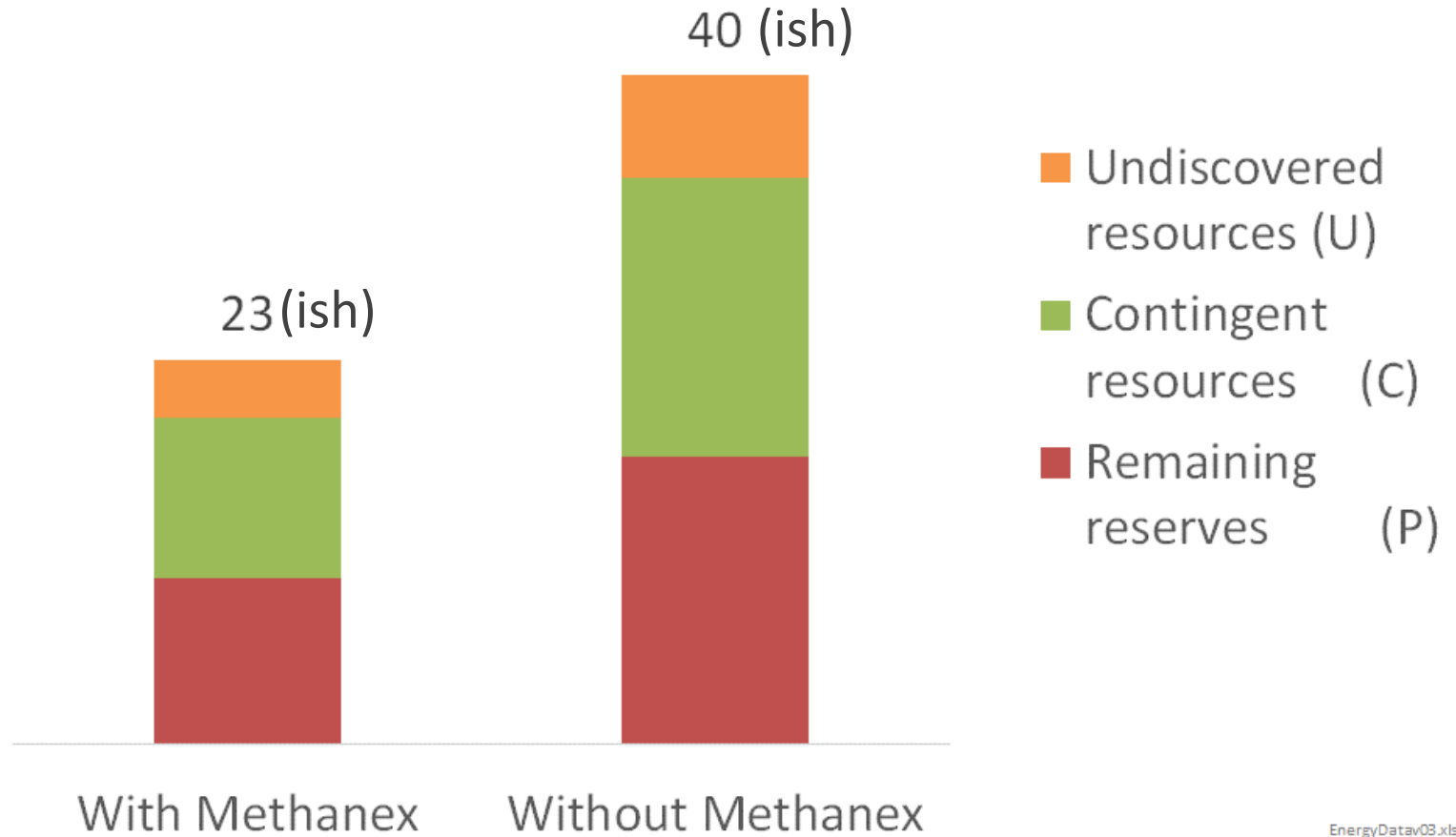
**New Zealand is going
to run out of gas in
23(ish) years' time!**

So surely Methanex will scale back production ASAP?

*Fear not fair maiden.
I will scale-back my methanol
production trains to enable
scarce gas to be allocated to
higher value users*



Years' worth of gas reserves & resources



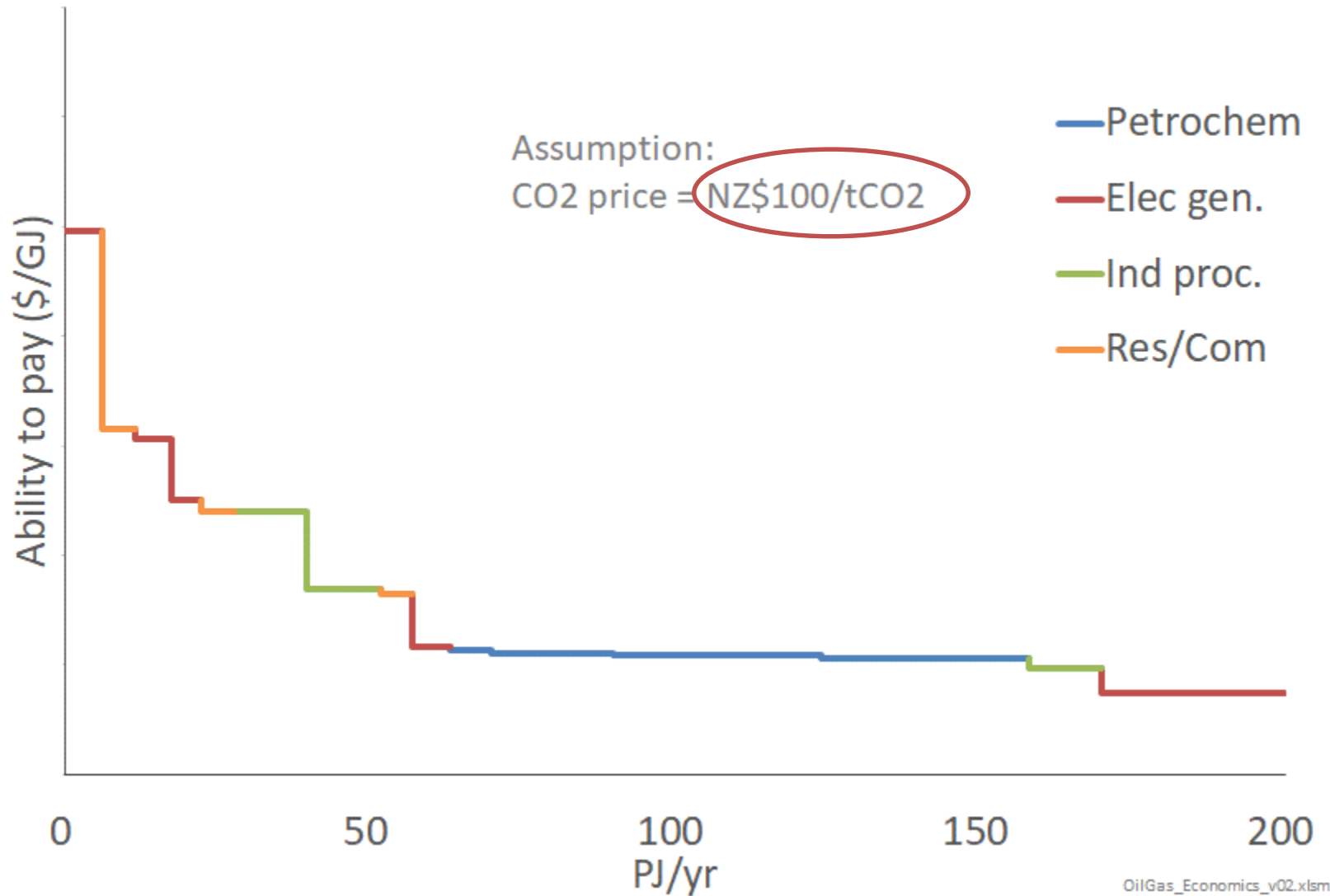
Maybe not.

Methanex has already bought most of its gas for the next 10 years!

- Why would producers sell to Methanex ‘today’, when they could sell to higher-value consumers ‘tomorrow’?
- There are many reasons:
 - ‘Tomorrow’ could be 8 to 10 years away
 - Offshore producers incur high fixed operating costs
 - Postponing gas sales may also postpone oil sales
 - There is CO2-related uncertainty over future
 - gas (and oil) prices
 - regulatory framework
 - gas production costs

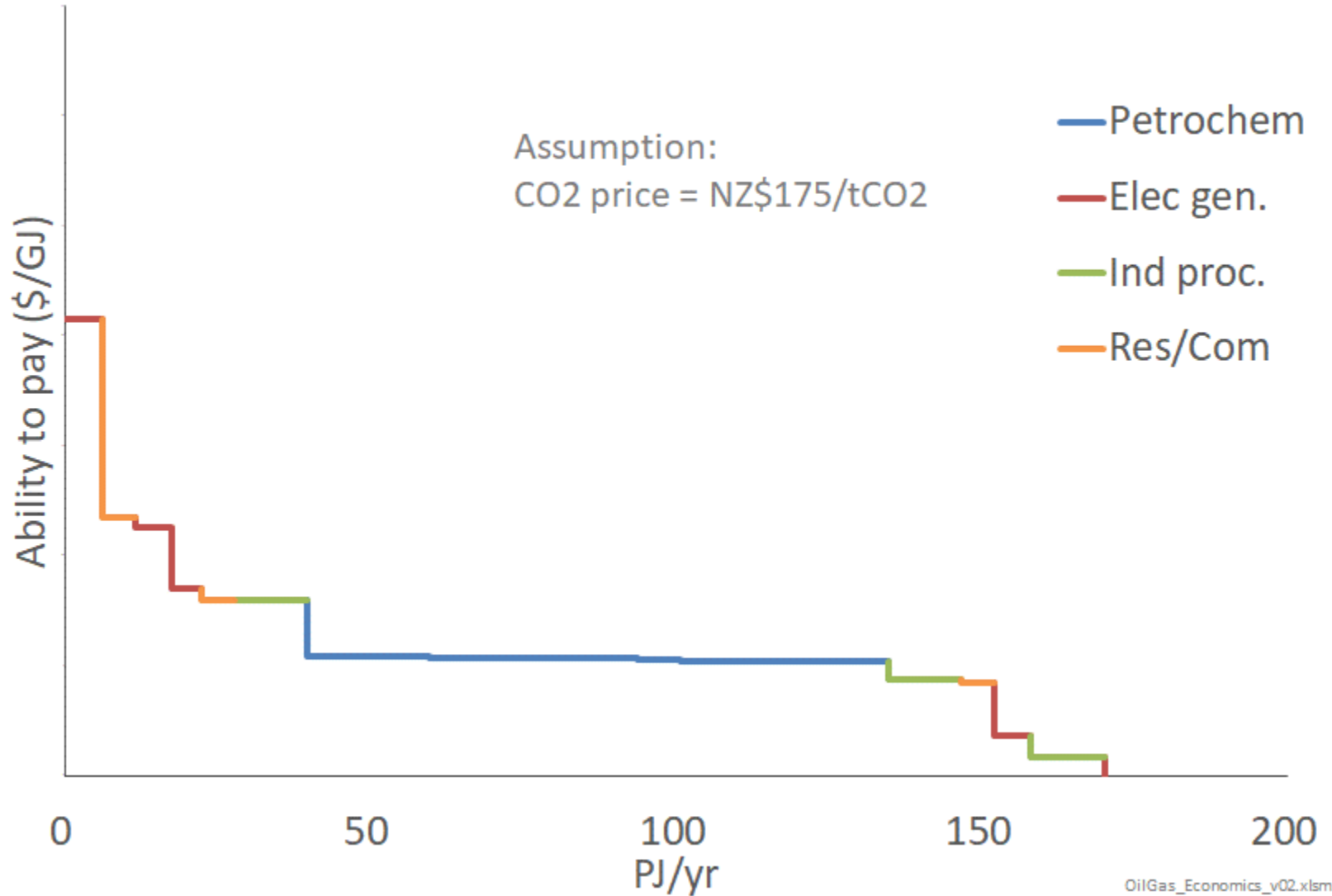


Increased CO2 prices will affect users' ability-to-pay



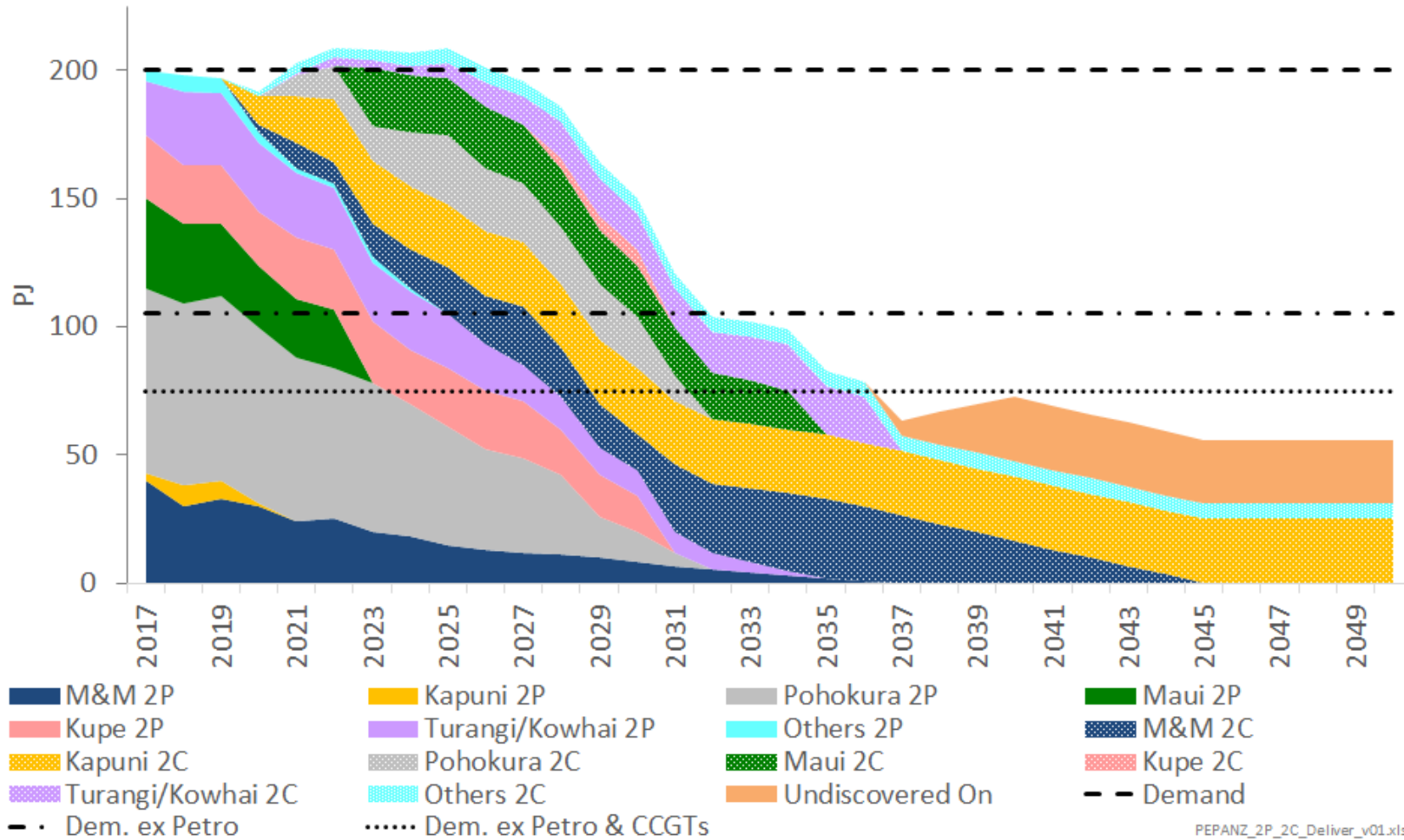
- Every \$19/tCO2 equivalent to \$1/GJ on gas price
- Except for Petrochemicals which are largely insulated under the ETS
- At \approx \$70/tCO2 baseload electricity can't afford to pay as much as methanol
- And at \approx \$100/tCO2, neither can some industrial process heat

But even at high CO2 prices, there will be a rump of high-value users for whom gas remains the most economic fuel



- New Zealand could move from being a 200 PJ to a 40 PJ market
- Infrequently-required peaking electricity generation likely to be highest value user

So Methanex will probably keep sucking for a while yet. But it (probably) won't affect high-value gas users

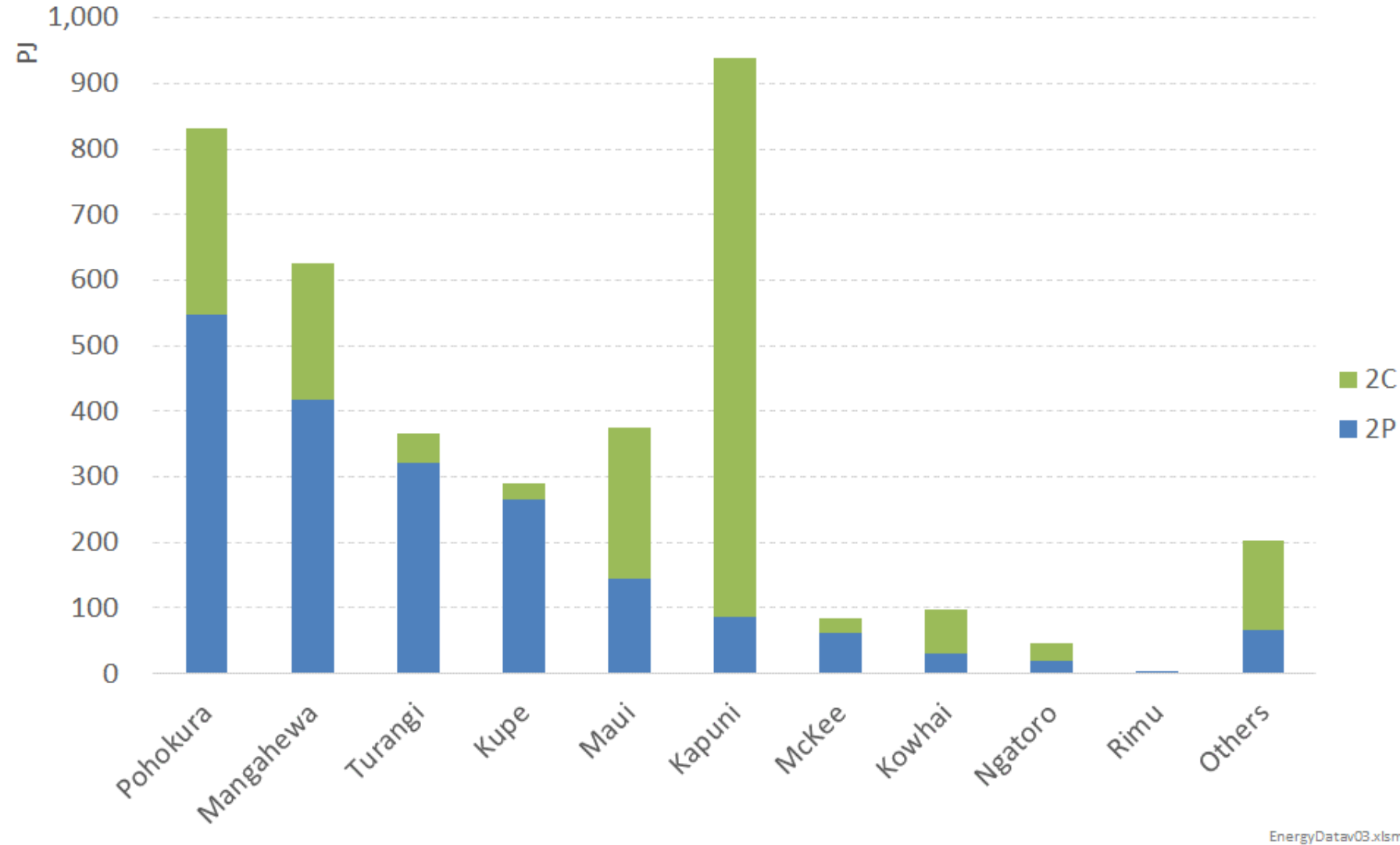


- Methanex key to offshore fields producing their remaining gas
 - And giving confidence for the remaining few rolls of the offshore exploration dice
- Once existing offshore depleted, in the absence of any new offshore finds, likely that Methanex (& Ballance) exit NZ
 - Replaced by overseas petro.
- Baseload powergen will also likely exit due to CO2 price
 - Replaced by renewables
- The rump of remaining high-value consumers can be met by existing and new onshore gas.

Source: PEPANZ + Concept analysis

In the long-term, a large number of our future gas eggs are in the Kapuni basket

Remaining gas reserves and resources as at 1-Jan-18



- Some uncertainty over contingent Kapuni as
 - It is in a new, even deeper accumulation
 - It is very high CO₂ content → may require cost-effective CCS

So high-value users will (probably) still have gas.
So that's (probably) all right then....

A green, muscular, and somewhat grotesque creature, resembling a kaiju or a mutated animal, is shown emerging from the water. It has a speech bubble coming from its mouth.

I smell
supply
security

.... or is it?

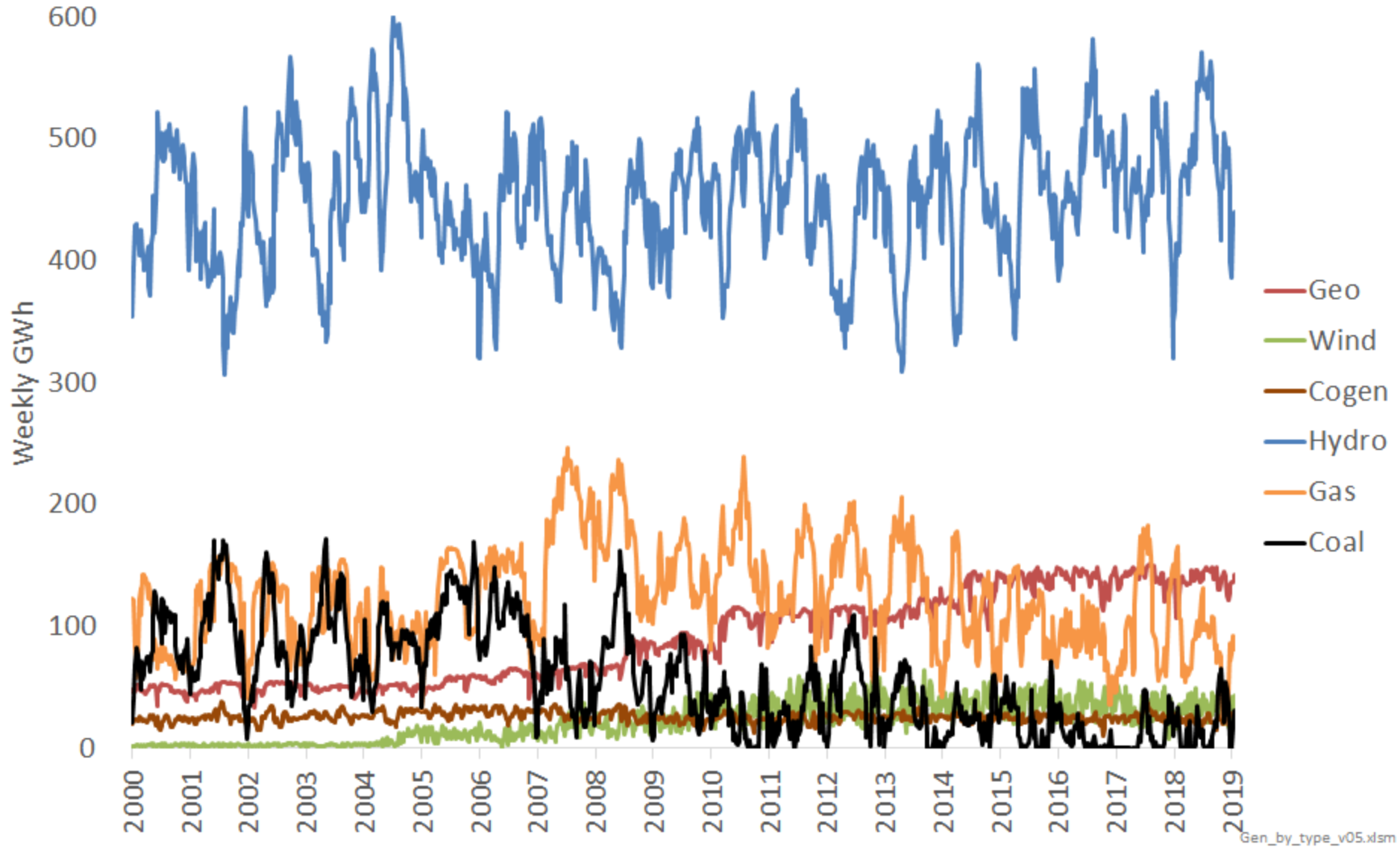
The deliverability
beast cometh

- Deliverability = Peak production capability

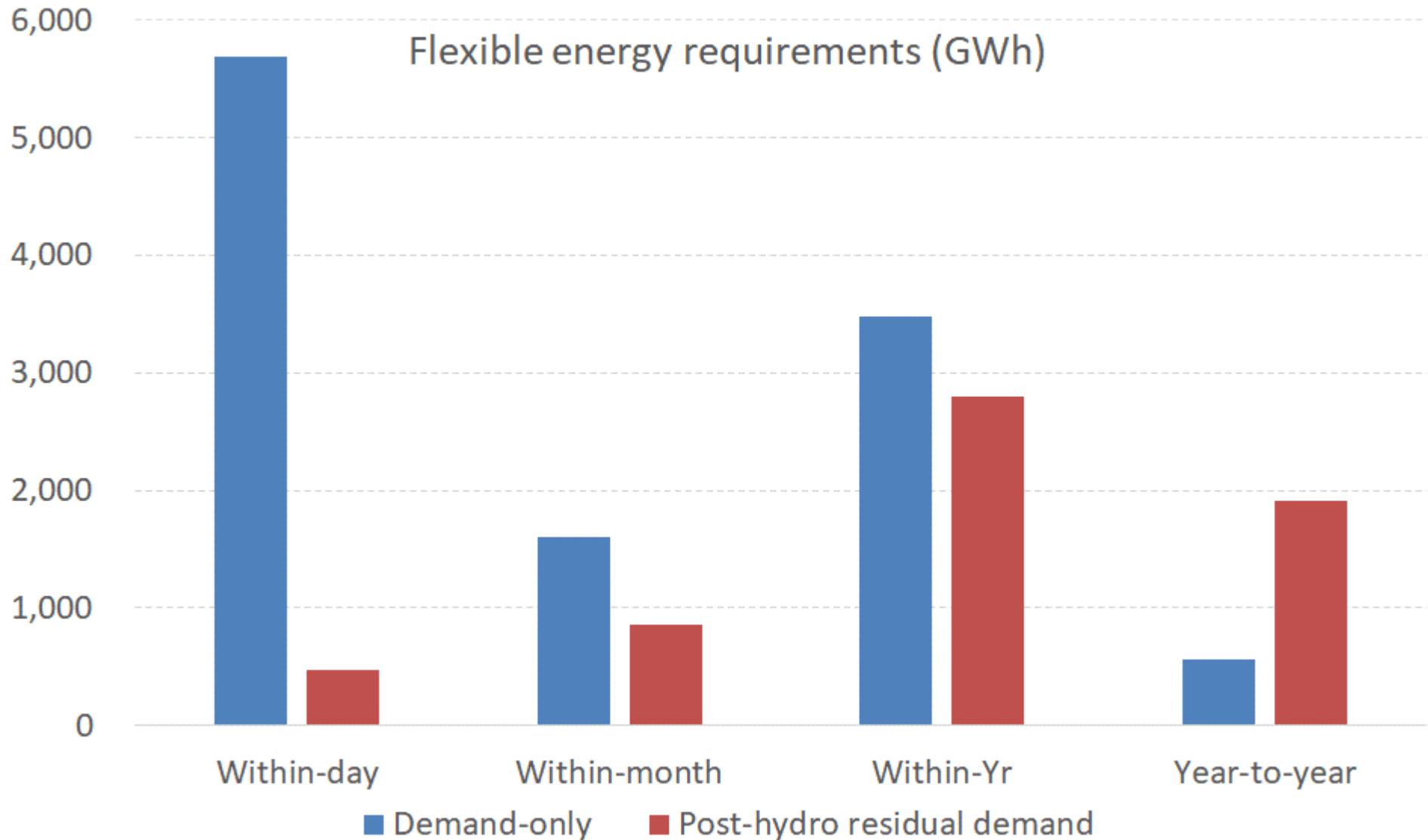
- But deliverability just one dimension of broader need for *Flexibility*:
 - Peak capability
 - + Ability to move up and down
 - + Ability to sustain output

Market	Demand variations	Supply variations
Gas	Gas consumers	Supply interruptions
Electricity	Electricity consumers	Renewable fluctuations

Despite declining *total* gas and coal generation, gas and coal, along with hydro, continue to do most of the heavy lifting for providing *flexibility*



Variability in different timeframes drive the need for flexibility

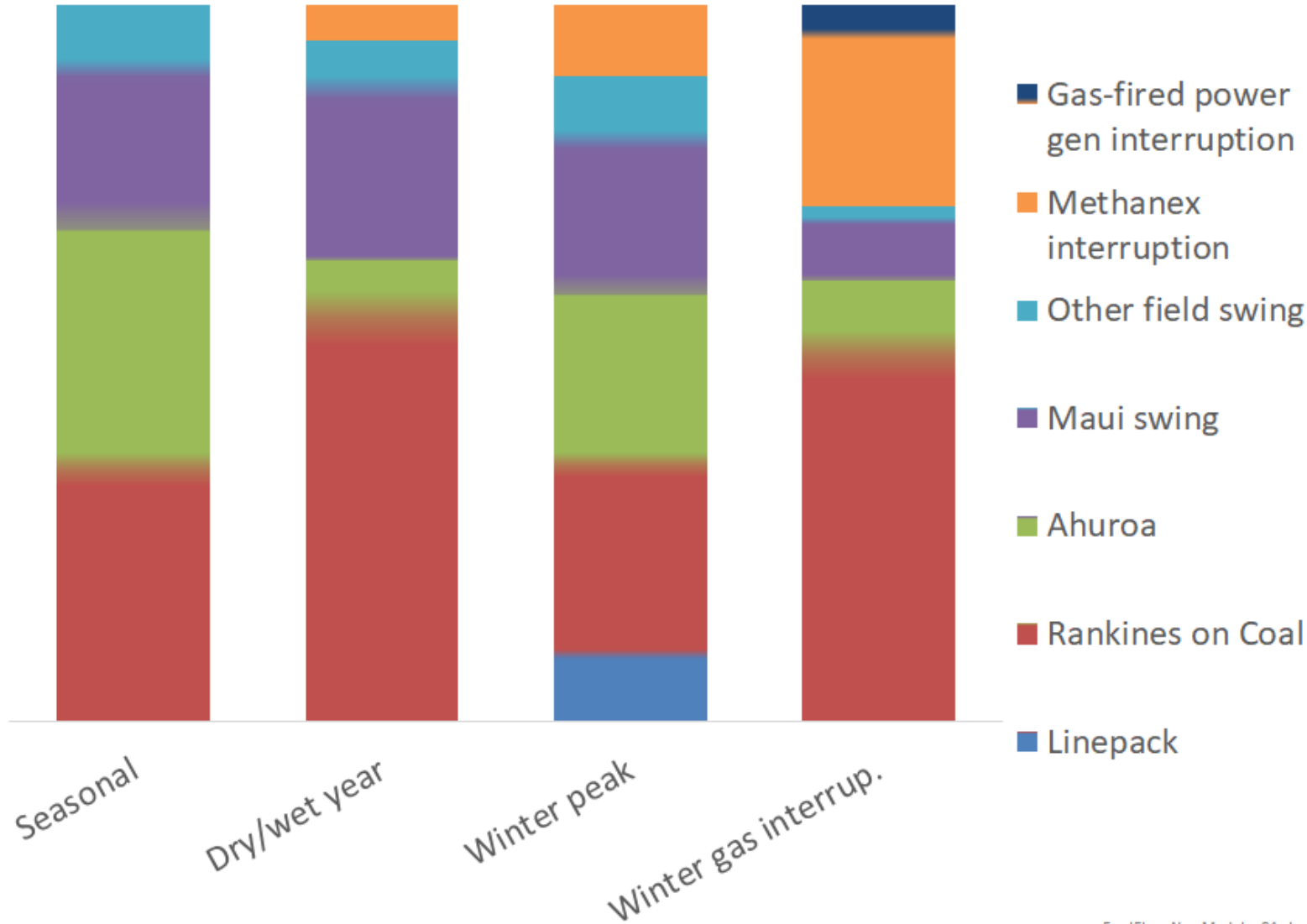


Gen_by_type_v05.xlsm

- Hydro both contributes to, and causes the need for, flexibility
- Different flexibility resources are appropriate for meeting different flexibility timeframes

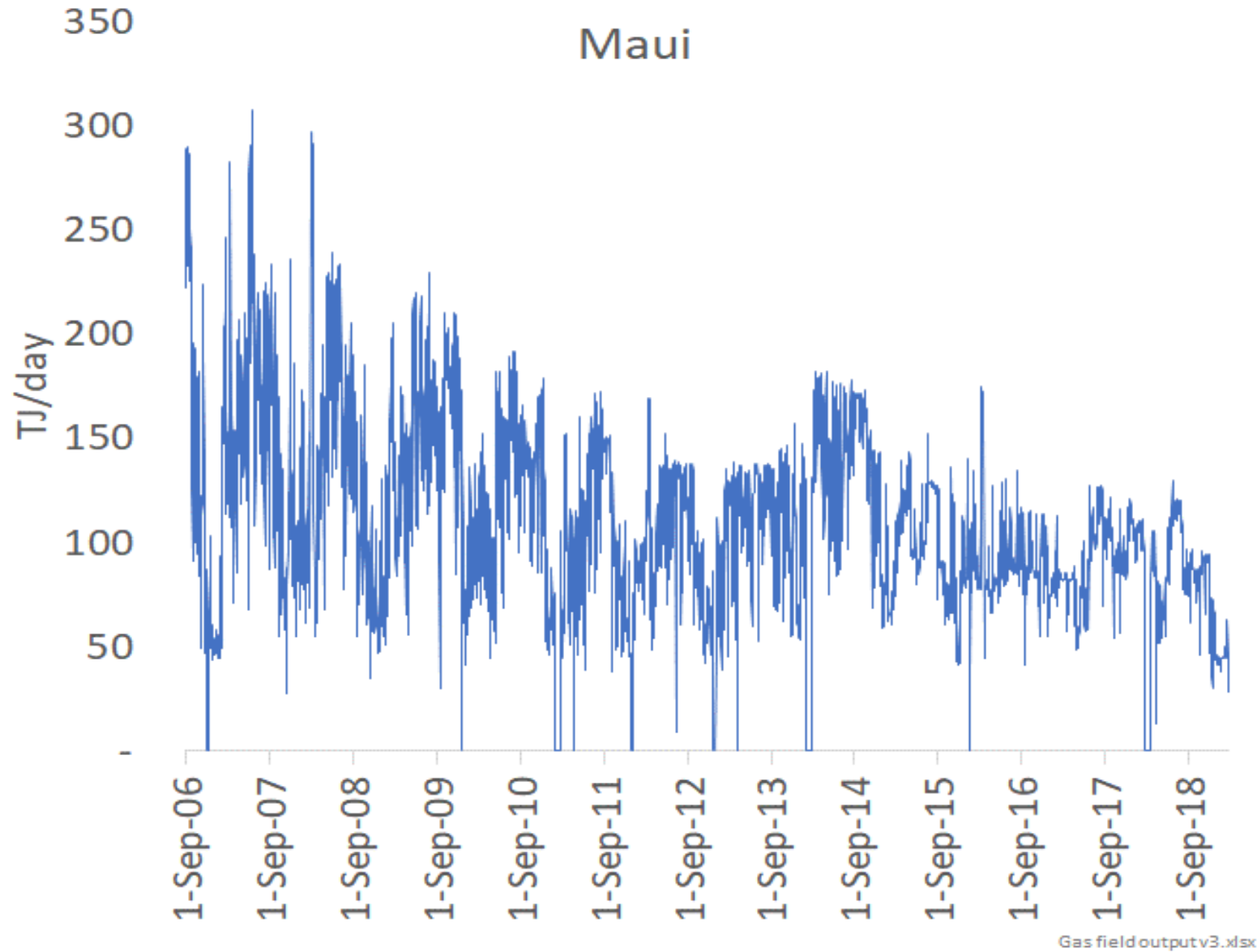
Overall, gas assets plus coal have provided the bulk of after-hydro flexibility

Breakdown of non-hydro flexibility providers



- Increased wind and solar will increase the need for flexibility
 - Particularly peak capacity
- But there are some flexibility head-winds coming...

The Maui field has been one of the biggest providers of flexibility. But it is getting old and infirm. And will eventually die



Gas field output v3.xlsx



Other offshore gas providers

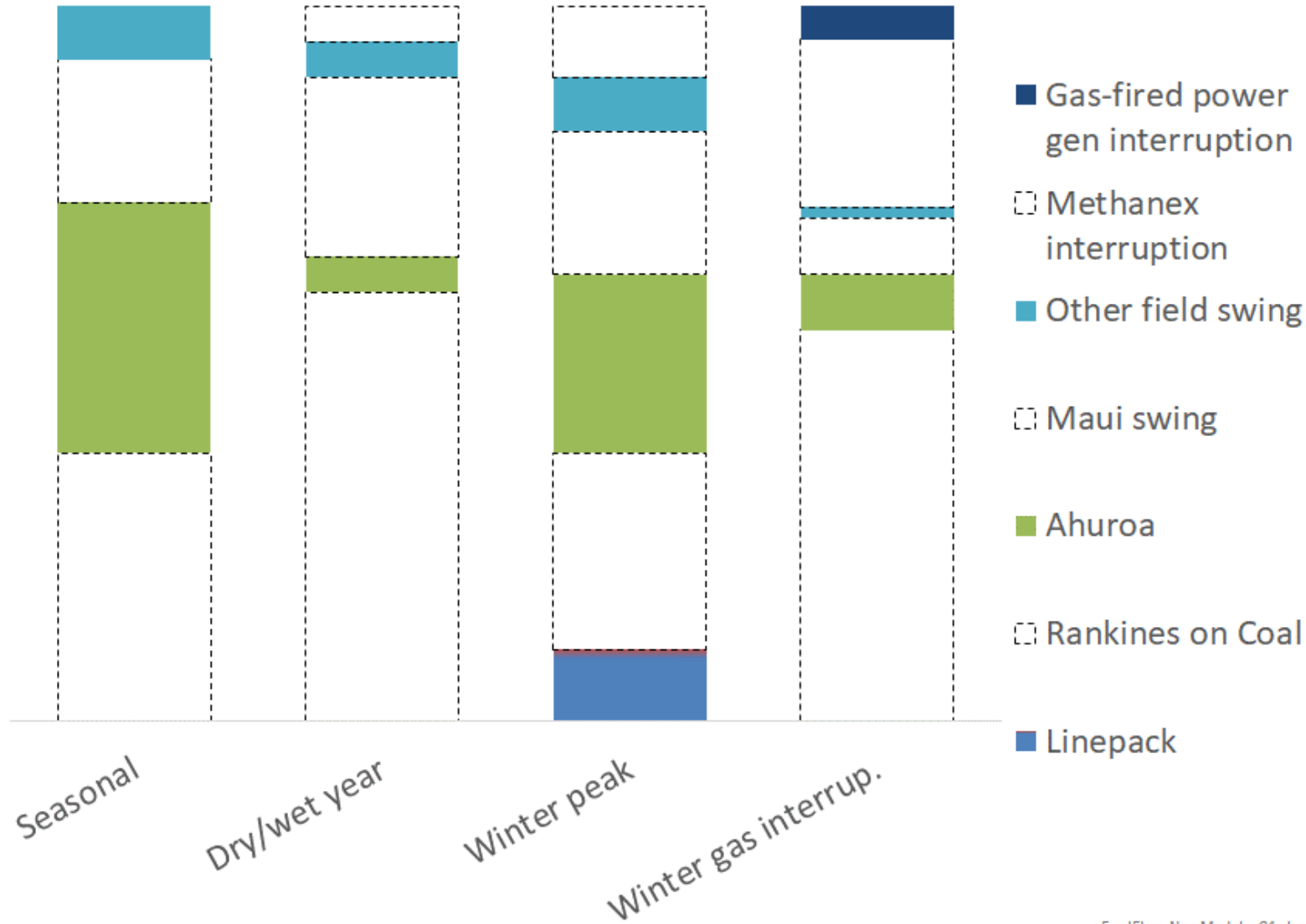
Gone in 10-15 years



Methanol interruption

What's going to (cost-effectively) keep the lights on if/when we lose some of our biggest current providers of flexibility?

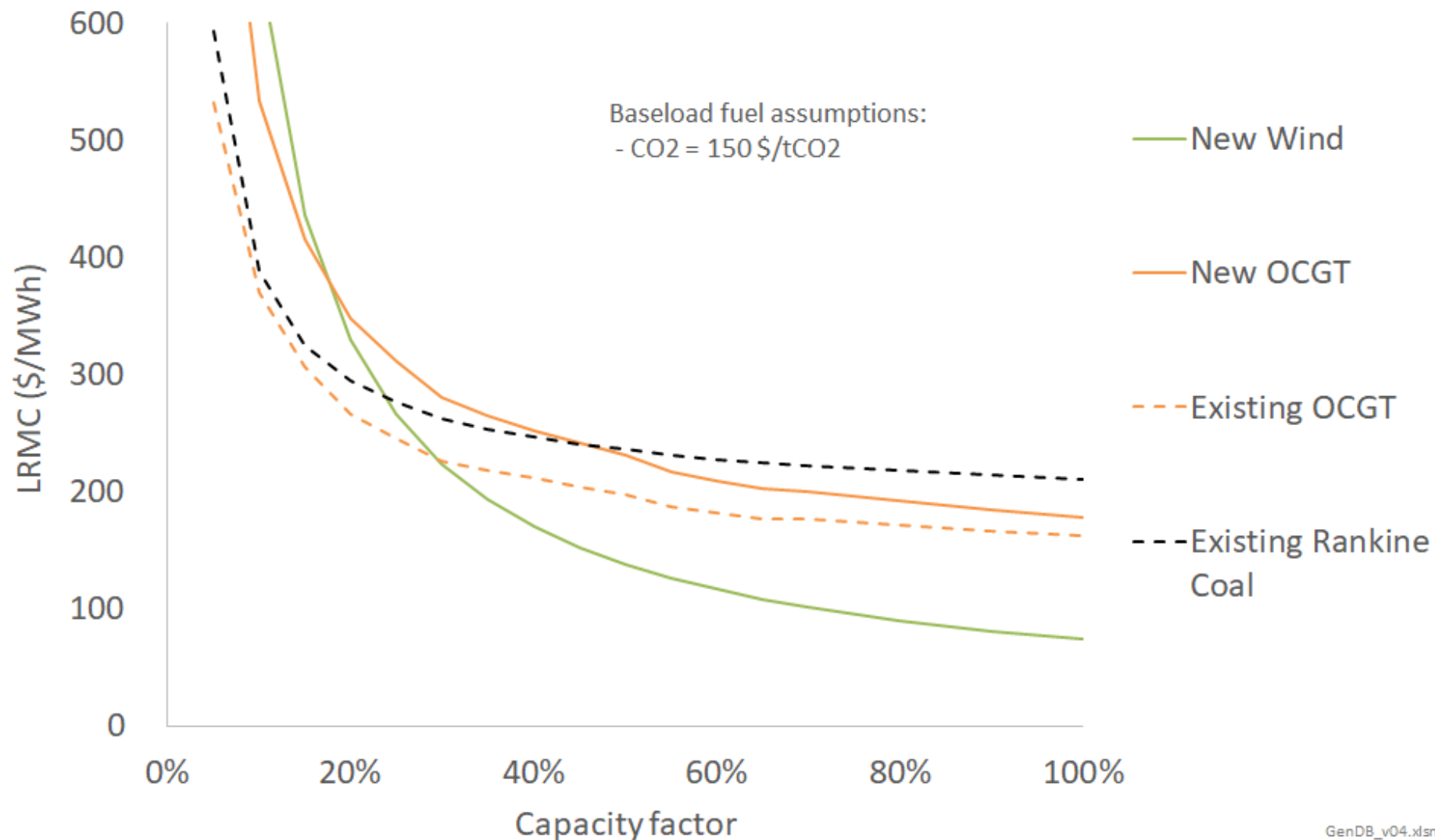
Breakdown of non-hydro flexibility providers



FuelFlex_NewModel_v04.xlsm

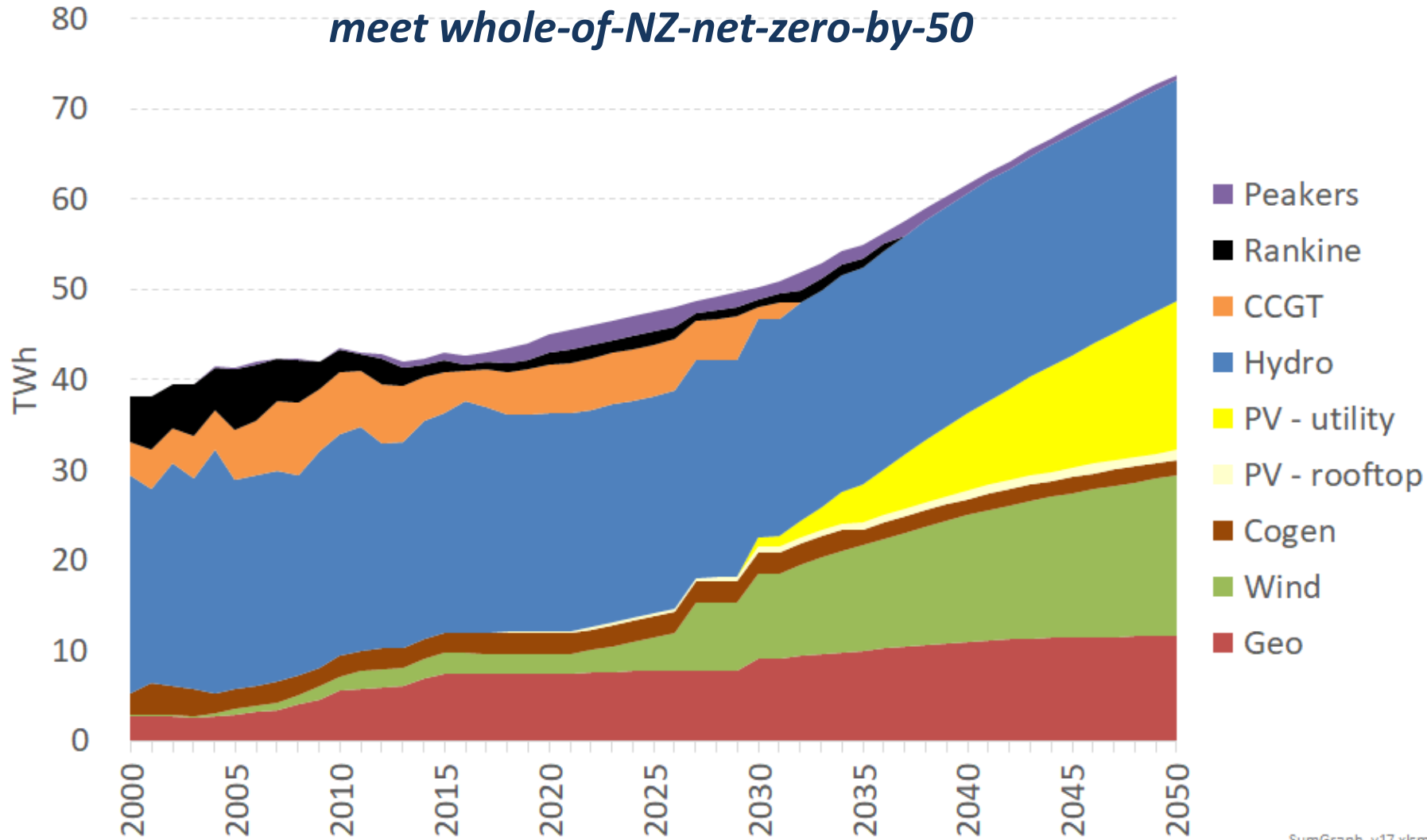
Even with high-priced CO₂, Huntly on coal may be least-cost dry-year solution for a while yet

- Huntly is sunk capital
- Coal is a low-cost option for low capacity-factor fuel
 - Stockpile costs relatively low
 - Top-up from overseas purchases
- At very high CO₂ prices, over-building renewables plus some gas flexibility (Ahuroa + some upstream gas swing) is cheapest



Keeping a small percentage of gas and coal generation should deliver greater whole-of-economy emissions reductions

Concept projection of least-cost generation to meet whole-of-NZ-net-zero-by-50



SumGraph_v17.xlsm

- Having 2-3% of generation from gas and coal for renewables balancing will keep electricity lower-cost
- Lower-cost electricity facilitates transport and industrial process heat electrification – both of which dwarf emissions from peaking fossil generation

So, what will 2050 look like?

No more NZ petrochemical production, and a major shift to renewables, but a rump of high-value gas consumers remaining.

More volatile prices.

However, overall effect on baseload prices (electricity and gas) should be modest...

... provided changes are driven through CO₂ price, allowing a small proportion of gas and coal-fired generation to provide high-value flexibility services.

Forcing 100% renewables through non-CO₂ price measures would be costly, and may result in worse whole-of-economy emissions.

We will all be driving flying cars.
And the new transmission pricing methodology will be in place. (Maybe).



Thank you

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- Combining economic rigour, leading modelling & analytical skills, and practical backgrounds in the energy sector, Concept consultants are able to provide practical solutions to client problems based on robust analysis.
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