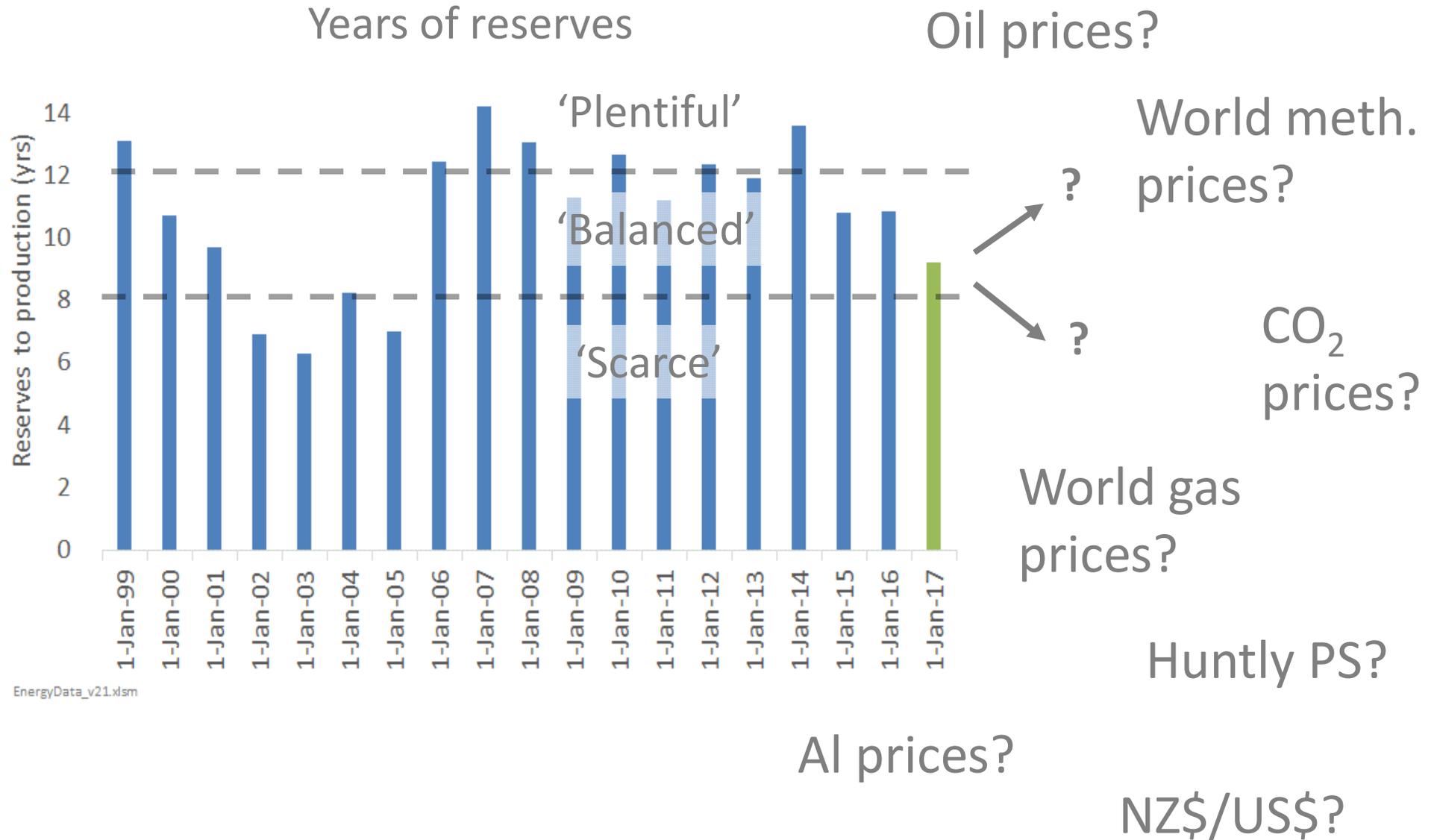


Simon Coates
Concept Consulting
27 October 2016

**Long term gas supply and demand scenarios –
2016 update**

5 October 2016

Is the NZ gas reserves roller coaster heading for a cross-roads?

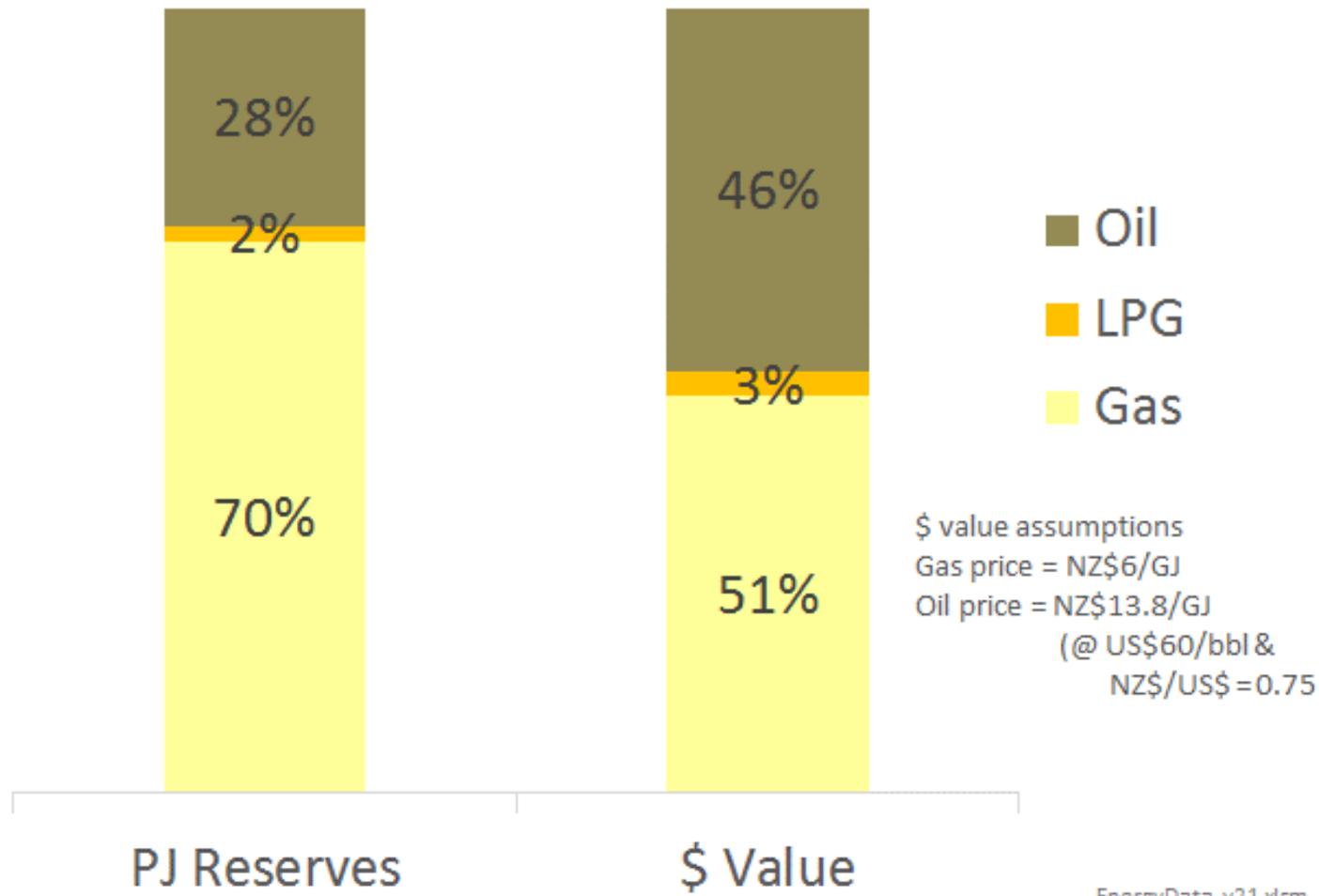


Impact of oil prices on New Zealand's gas future

In New Zealand, oil and gas are predominantly found together

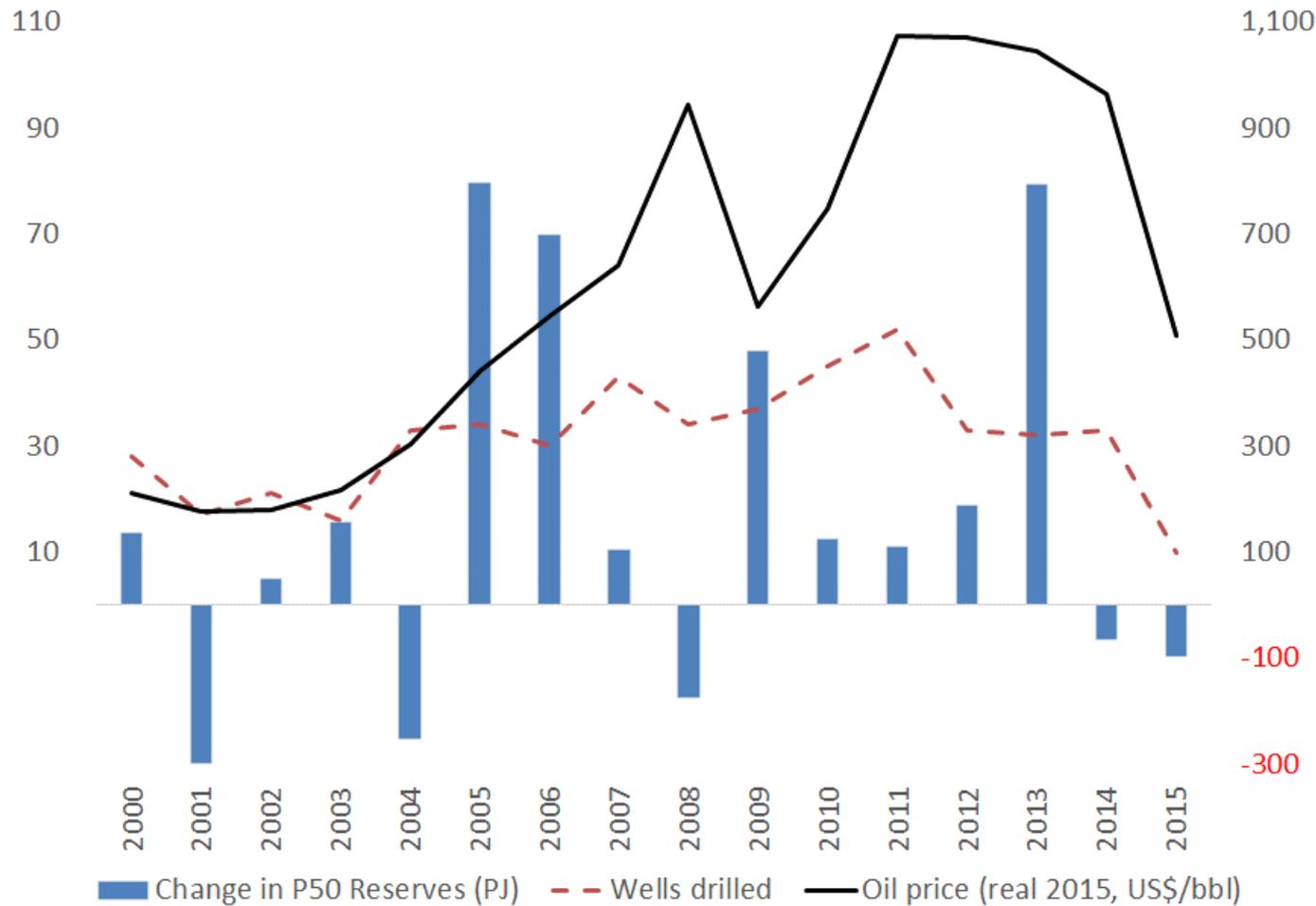


Ultimate recoverable reserves from NZ's gas producing fields at 1-Jan-16



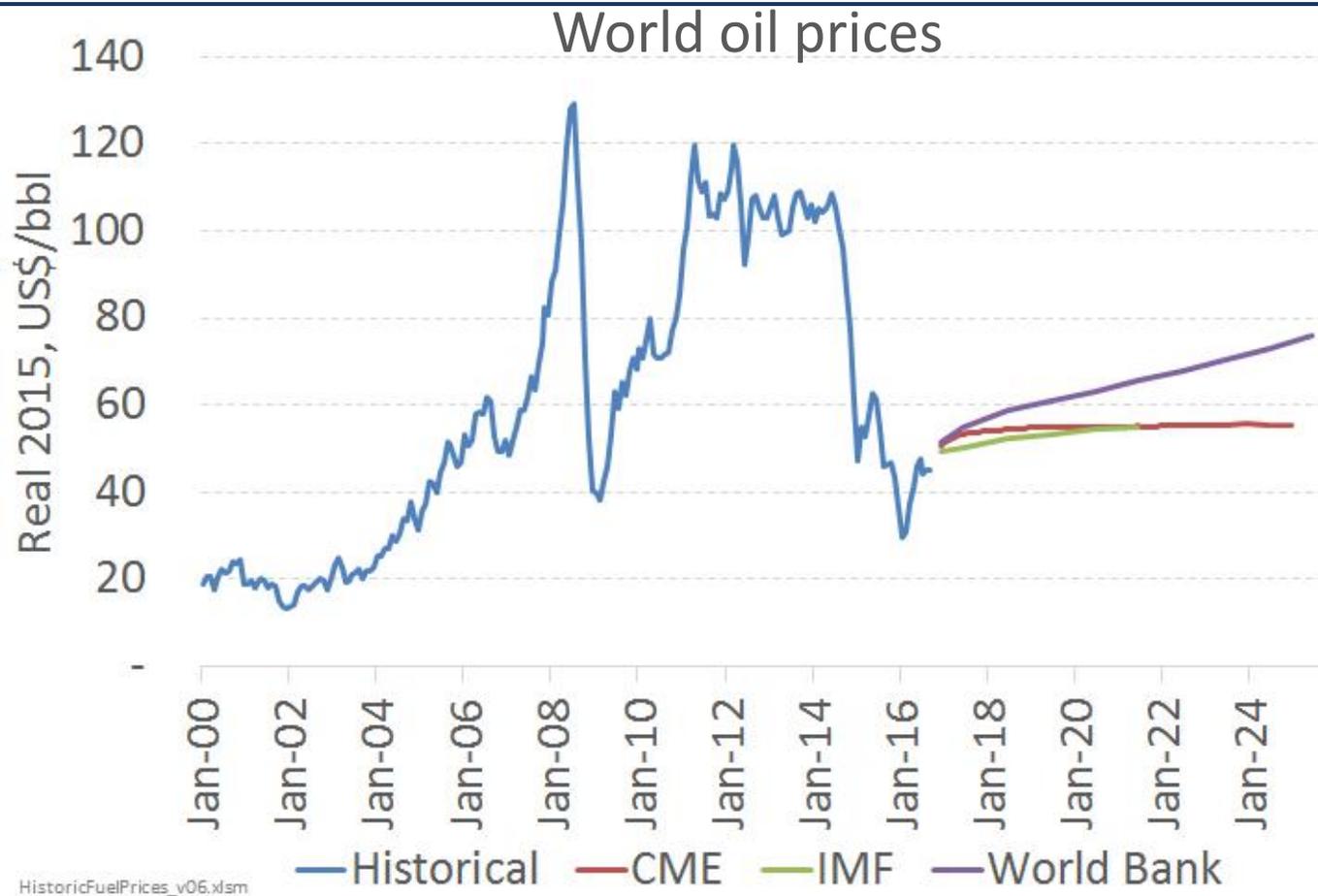
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Oil prices are a major driver of NZ gas exploration



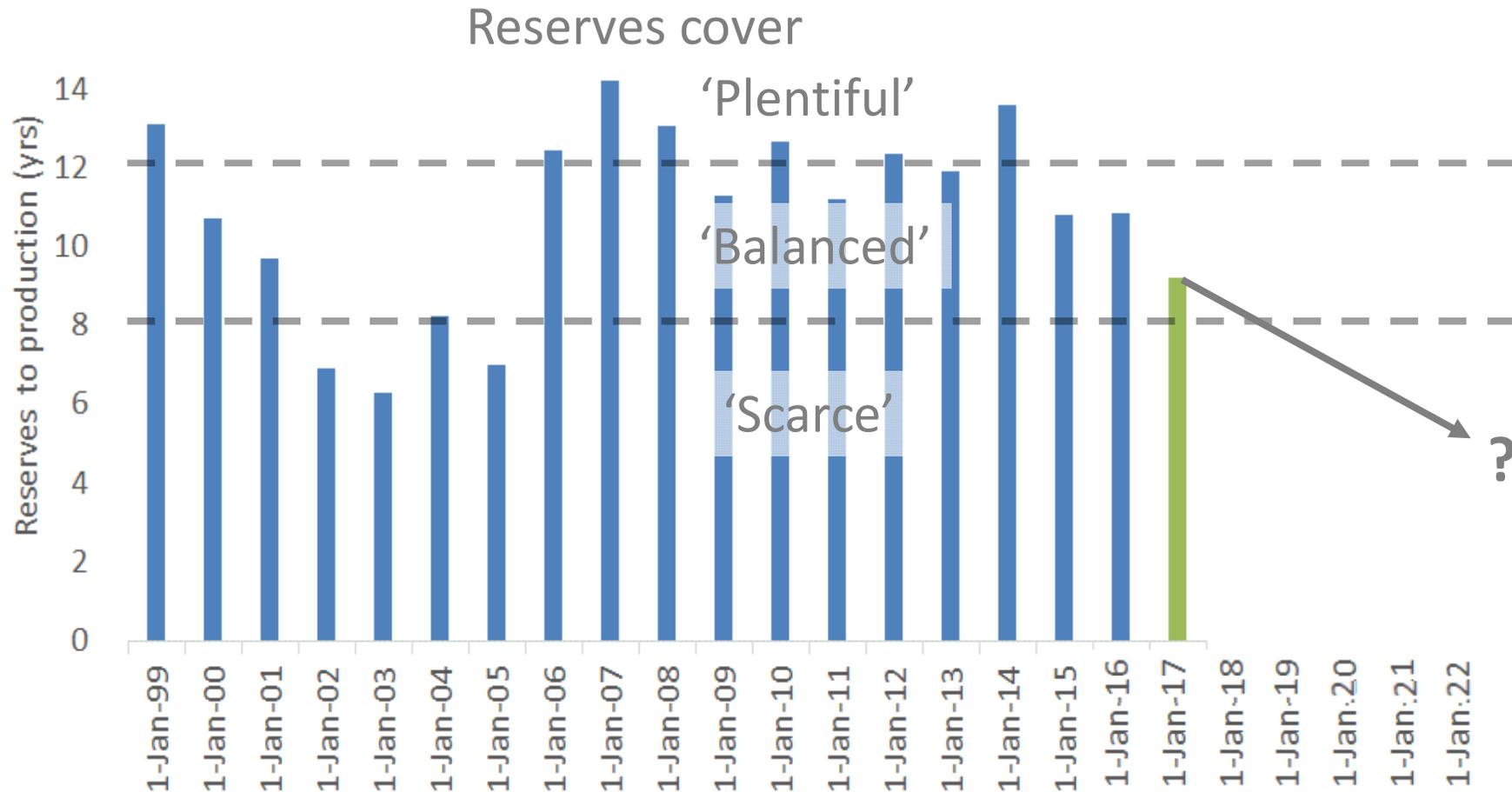
- Until recently, high oil prices → high petroleum exploration → general increase in gas reserves
- Recent collapse in oil prices → little exploration → no new reserves
- What might the future hold?

\$40 < \$60 < \$100 !



- i.e. some oil-driven exploration is expected to resume as prices move from current \approx US\$40/bbl levels towards US\$60/bbl
- However, unlikely to be at levels seen when oil $>$ US\$100/bbl

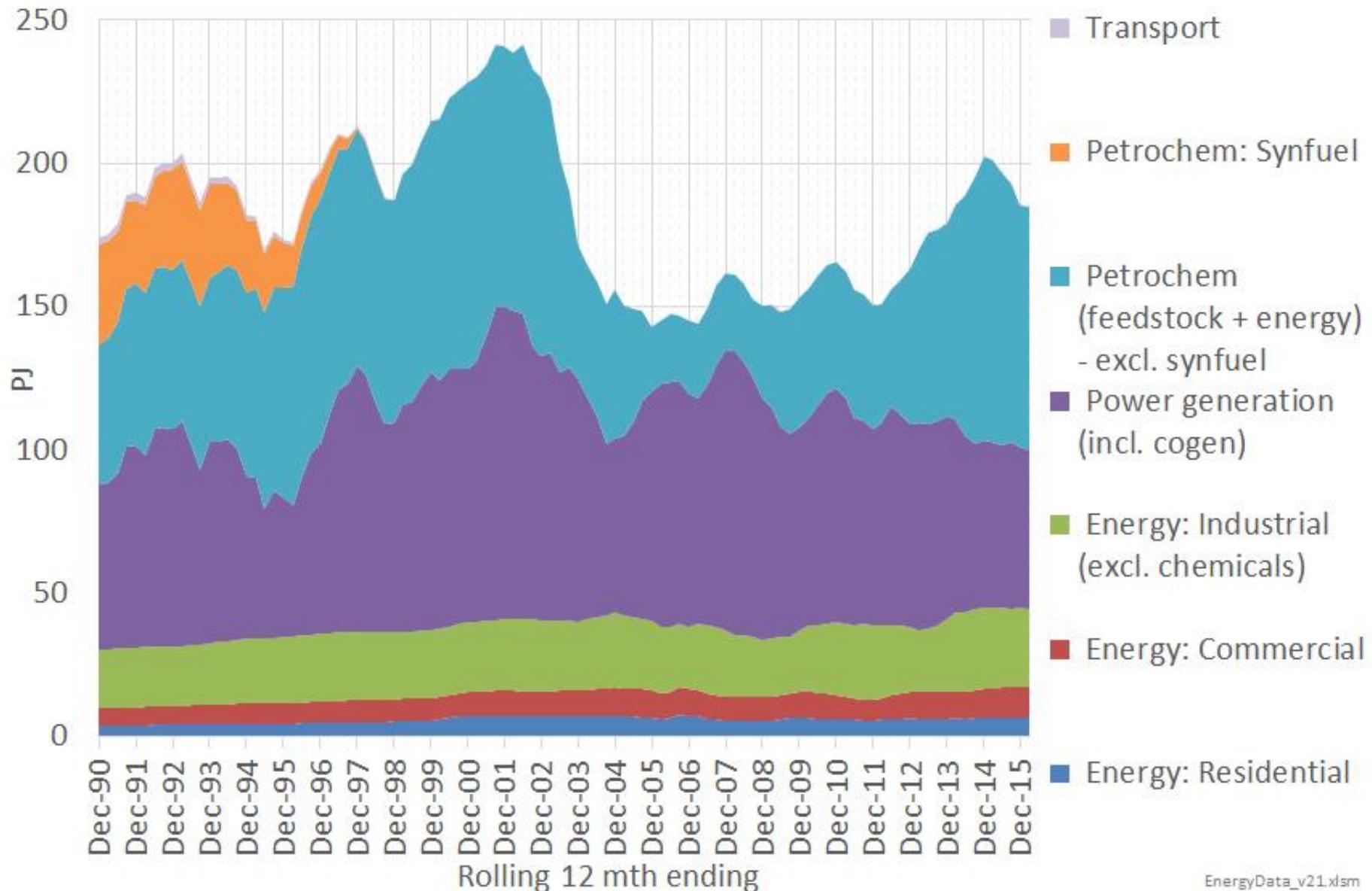
If exploration doesn't pick up soon, is NZ heading for scarcity?



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- Although probably tighter in short-term...
- ... market forces acting on demand and supply will move NZ into balance

Historically, demand response from the petrochemical and power generation sectors have helped 'balance' the market



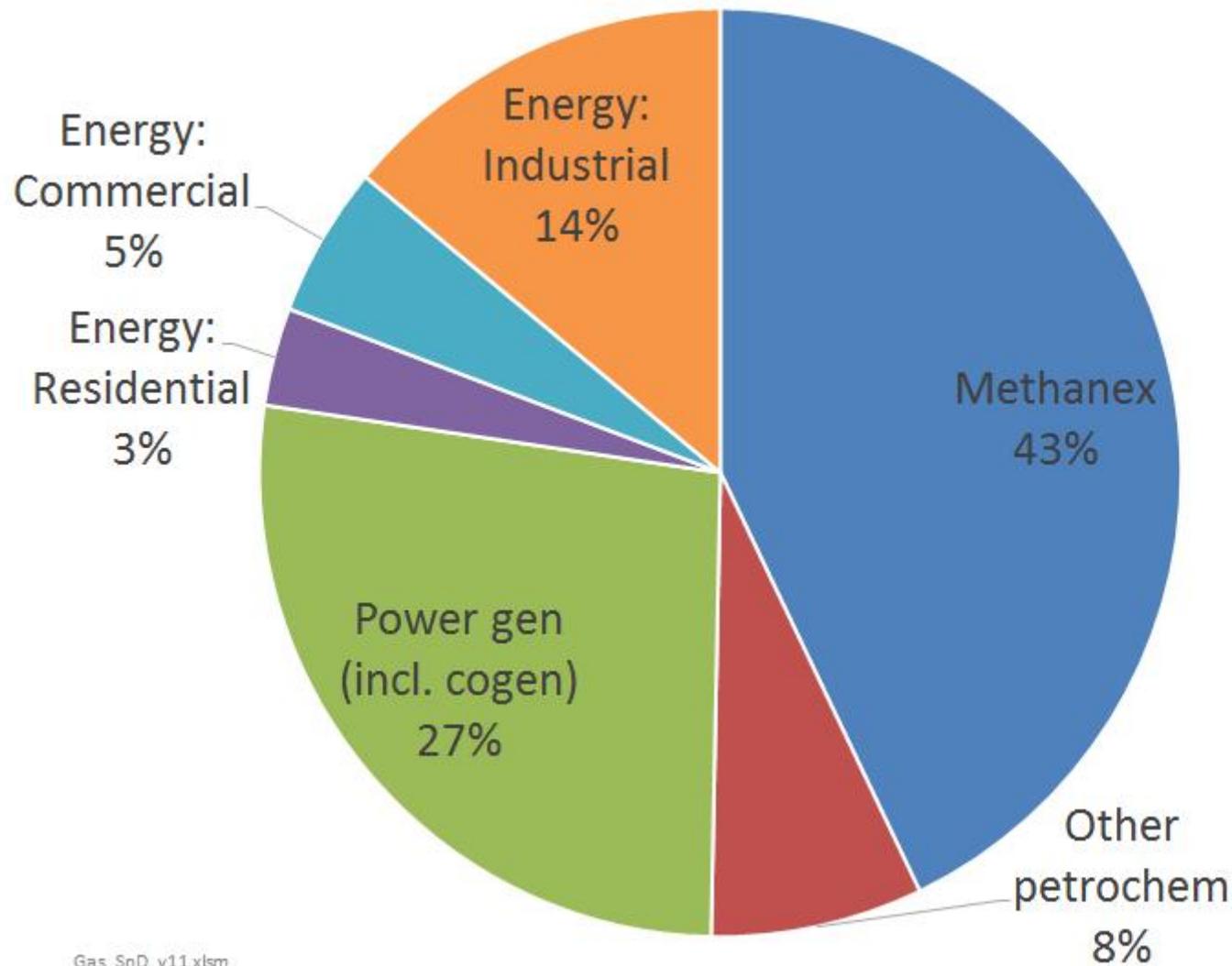
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Impact of petrochemical sector on New Zealand's gas future

NZ's gas demand is dominated by petrochemical production – particularly methanol

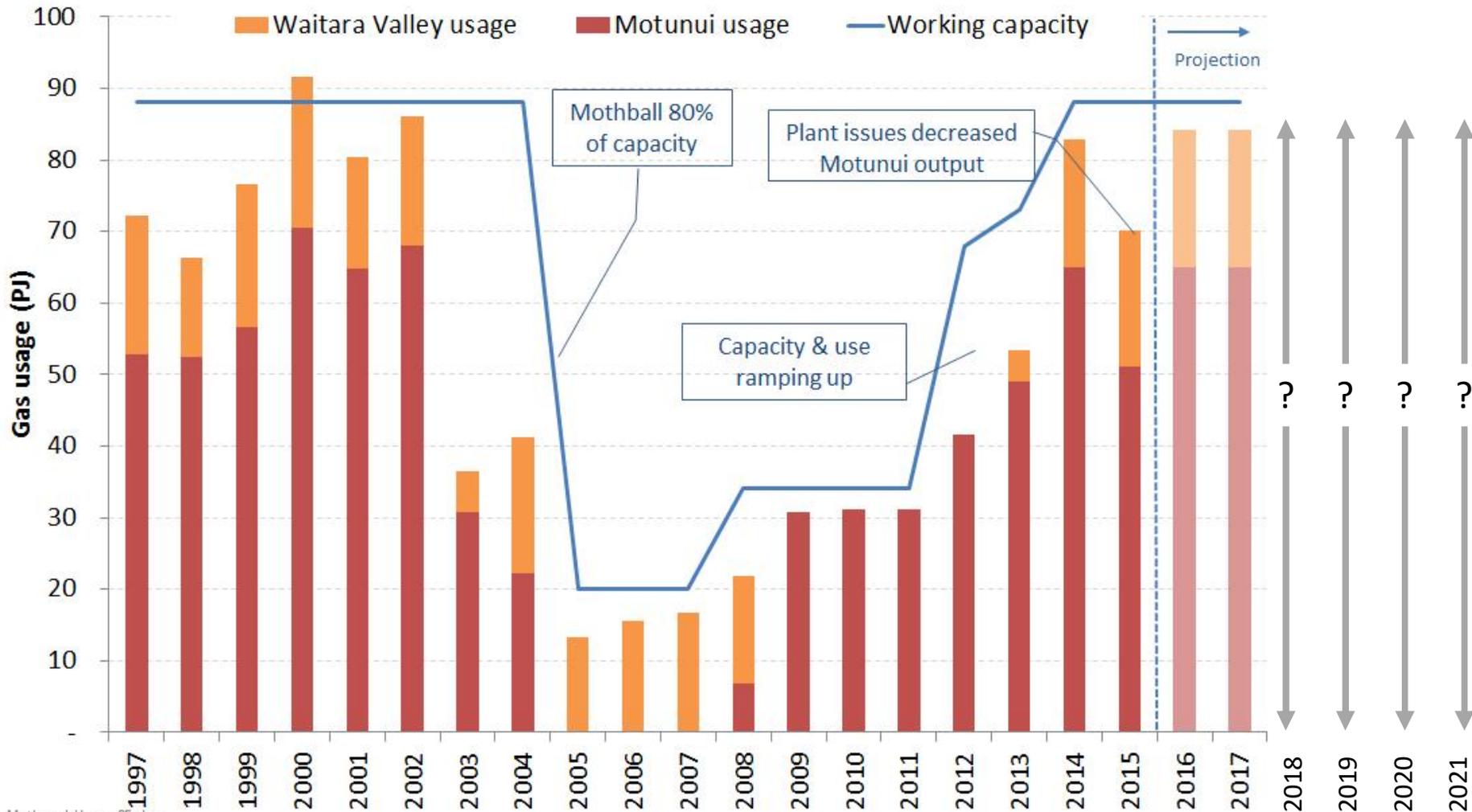


Projected 2016 demand breakdown



Gas_SnD_v11.xlsm

Methanex has been the principal source of petrochemical ‘demand response’



Methanol_Urea_v05.xlsm

Major drop in reserves from Maui re-determination

Pohokura and Kupe start production

Methanex's plant turn-arounds in 2017/18 raise some interesting questions

- Will it re-contract for another 4-5 years in this tighter market environment?
- Why would producers sell to Methanex at prices lower than others' willingness-to-pay?
- Would significant sales to Methanex be a “good thing”?



Interesting re-negotiation dynamic



GREYMOUTH PETROLEUM

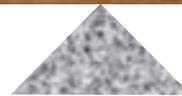
Taranaki has advantages over alternative production locations:

- Existing plant
- Closer to Asian markets than US Gulf

Although Methanex's willingness-to-pay < other consumers'

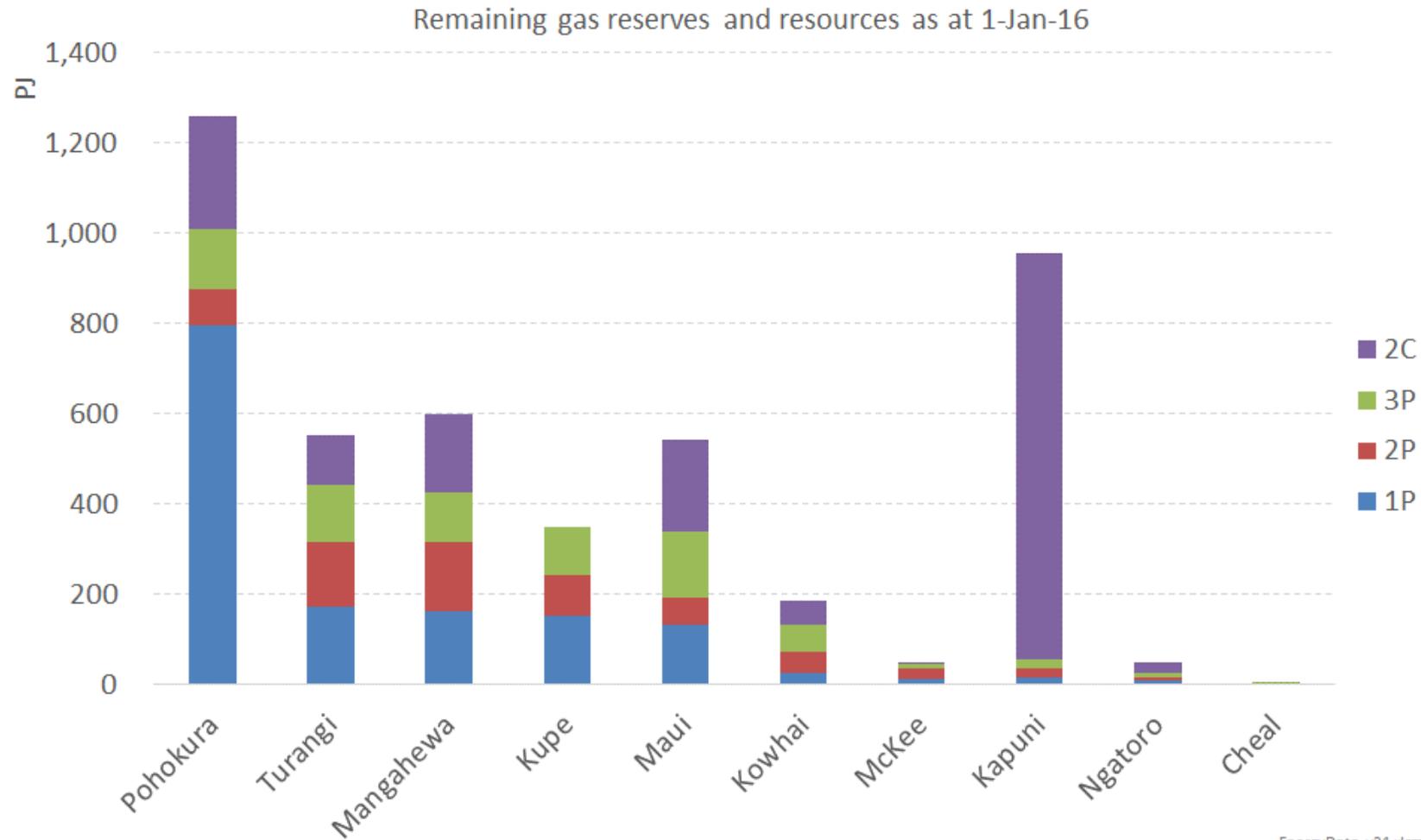
Methanex is *discretionary* demand.

i.e. producer choice is
sale-to-Methanex vs.
sale-to-someone-else-many-years-later!



- Suggests that, even though P50 reserves getting tighter, there is a deal to be done
- Plus, only looking at P50 reserves is not the full picture

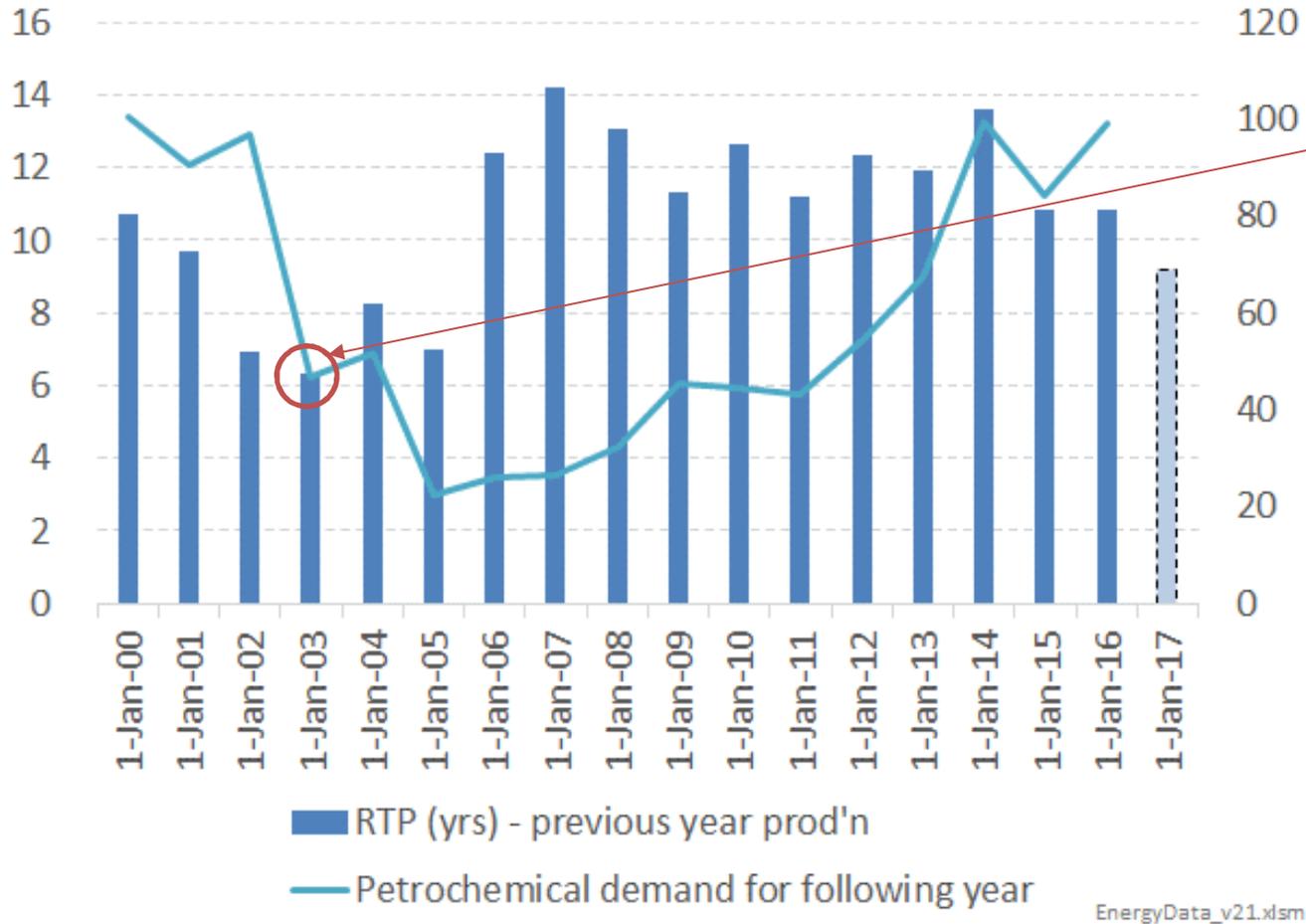
New Zealand has a significant quantity of contingent gas resources in addition to its gas reserves



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- A tighter gas market should make it economic to develop some of these contingent resources → some 2C will become 2P
 - E.g. 2012 Methanex:Todd deal helped develop previously contingent resource

Ultimately, absent a major new gas discovery, Methanex will scale back demand

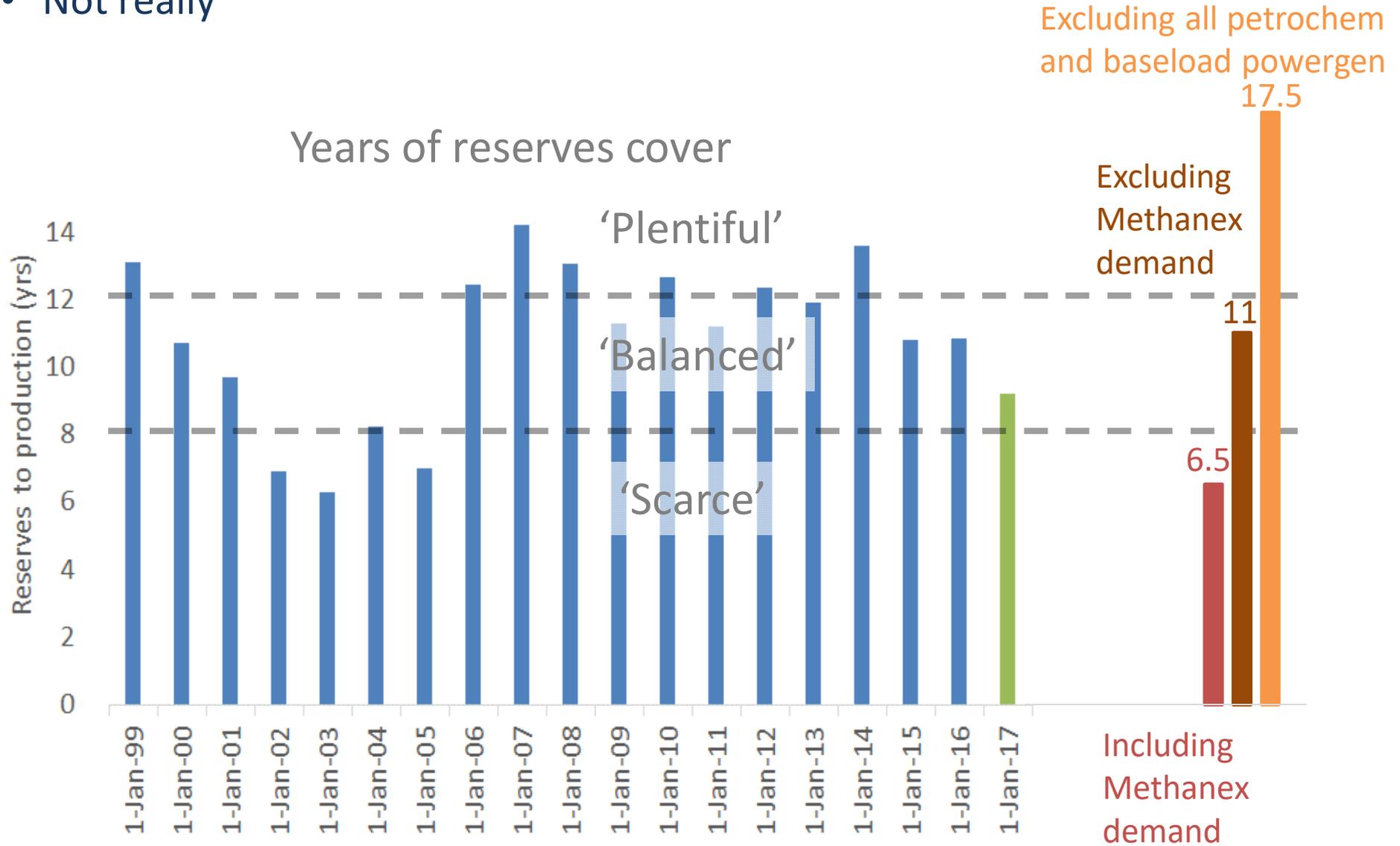


- In early 2000's occurred when RTP ratio \approx 6.5 years.
- Could reach similar level in 2021 to 2025-ish – depending on extent of 2C resources developed

But 6.5 years' reserve cover is still too tight, right?



- Not really



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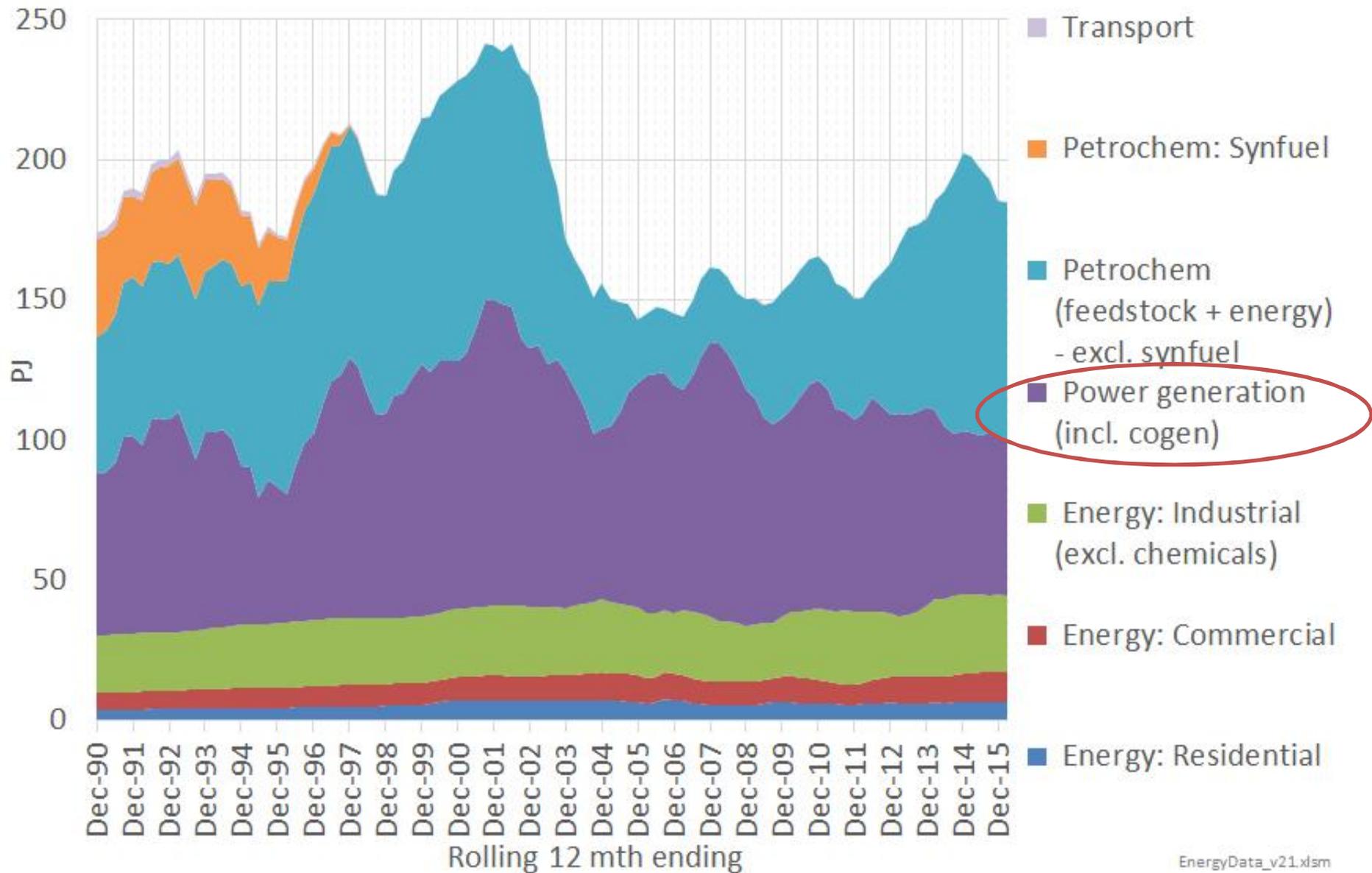
In summary, Methanex is a key enabler of the NZ gas market



- If / when market gets tight, Methanex can reduce demand
→ ensures reserves remain available for higher-value gas uses....
- until gas is found again (as higher gas prices will help stimulate exploration)
→ Methanex starts up again
- Methanex important for providing upstream confidence to invest in New Zealand

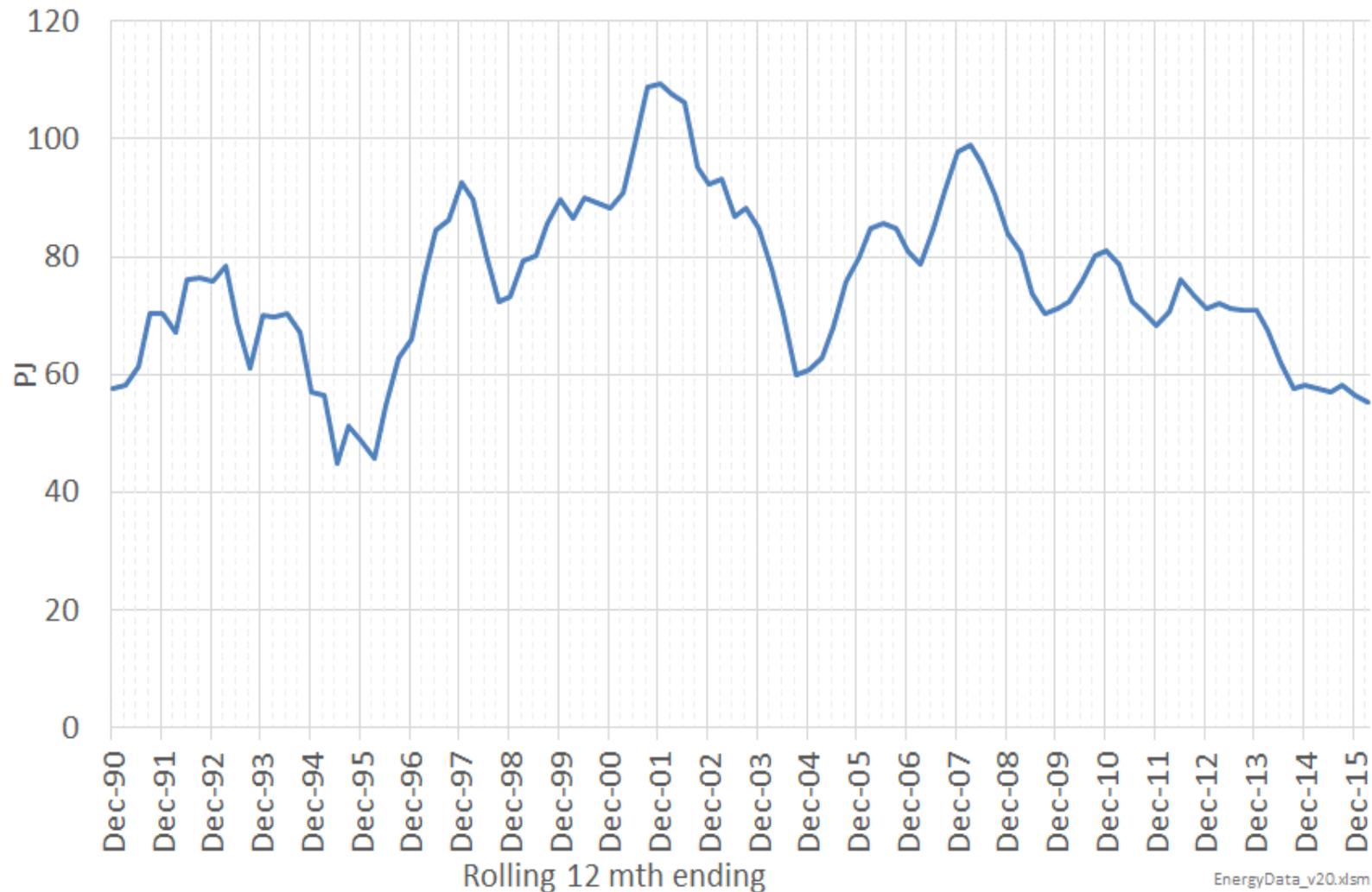
Impact of power generation sector on New Zealand's gas future

Power generation is the next most significant gas-using sector



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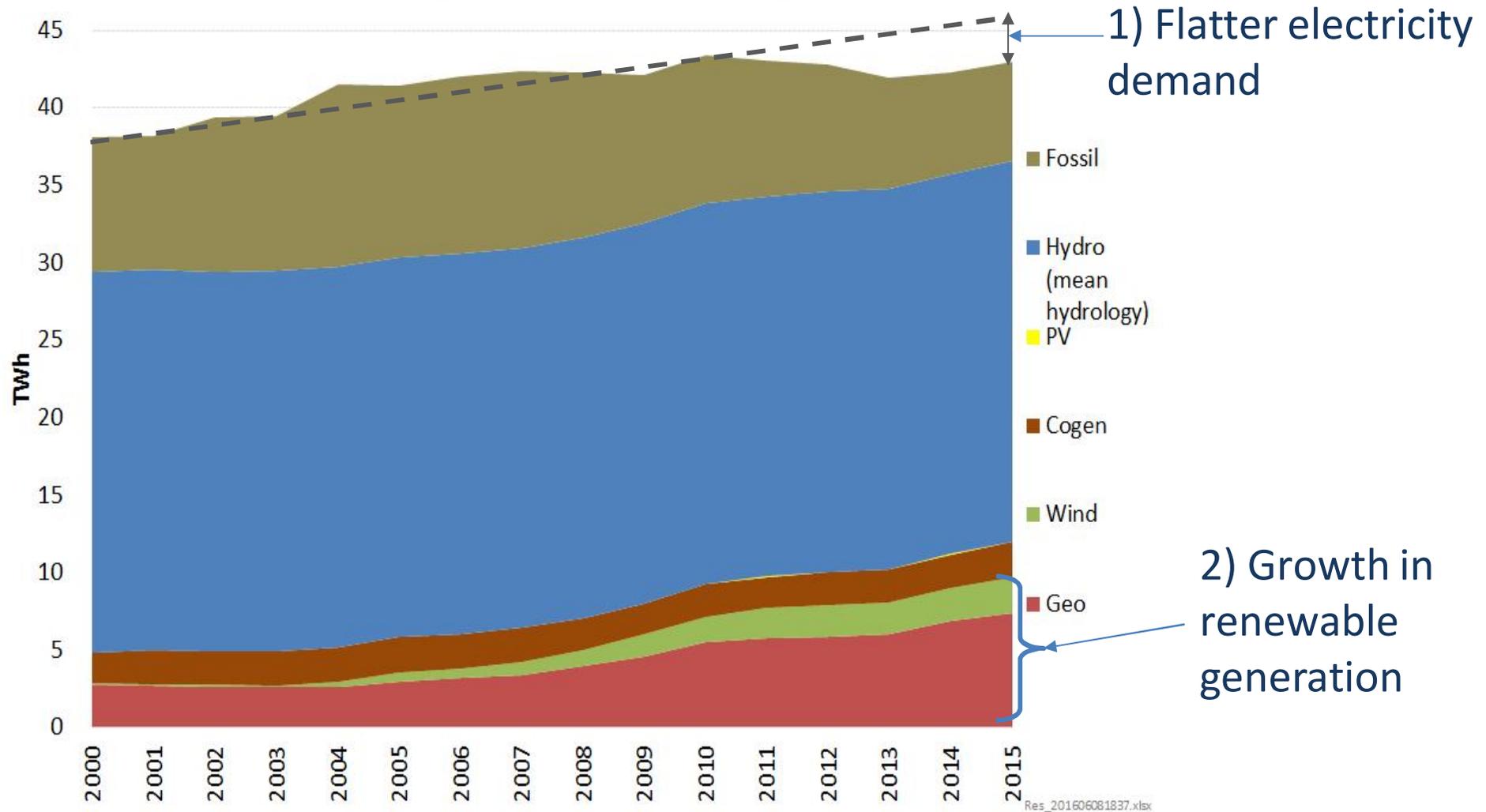
Significant historical volatility in part driven by hydrology



- The role of thermal plant providing hydro-balancing → hard to discern underlying trends from the hydro ‘noise’

Correcting for mean hydrology → signal from noise

- Recent decline in gas and coal-fired generation due to:



- Are these trends going to continue?

Concept's electricity and gas market models used to examine range of possible futures



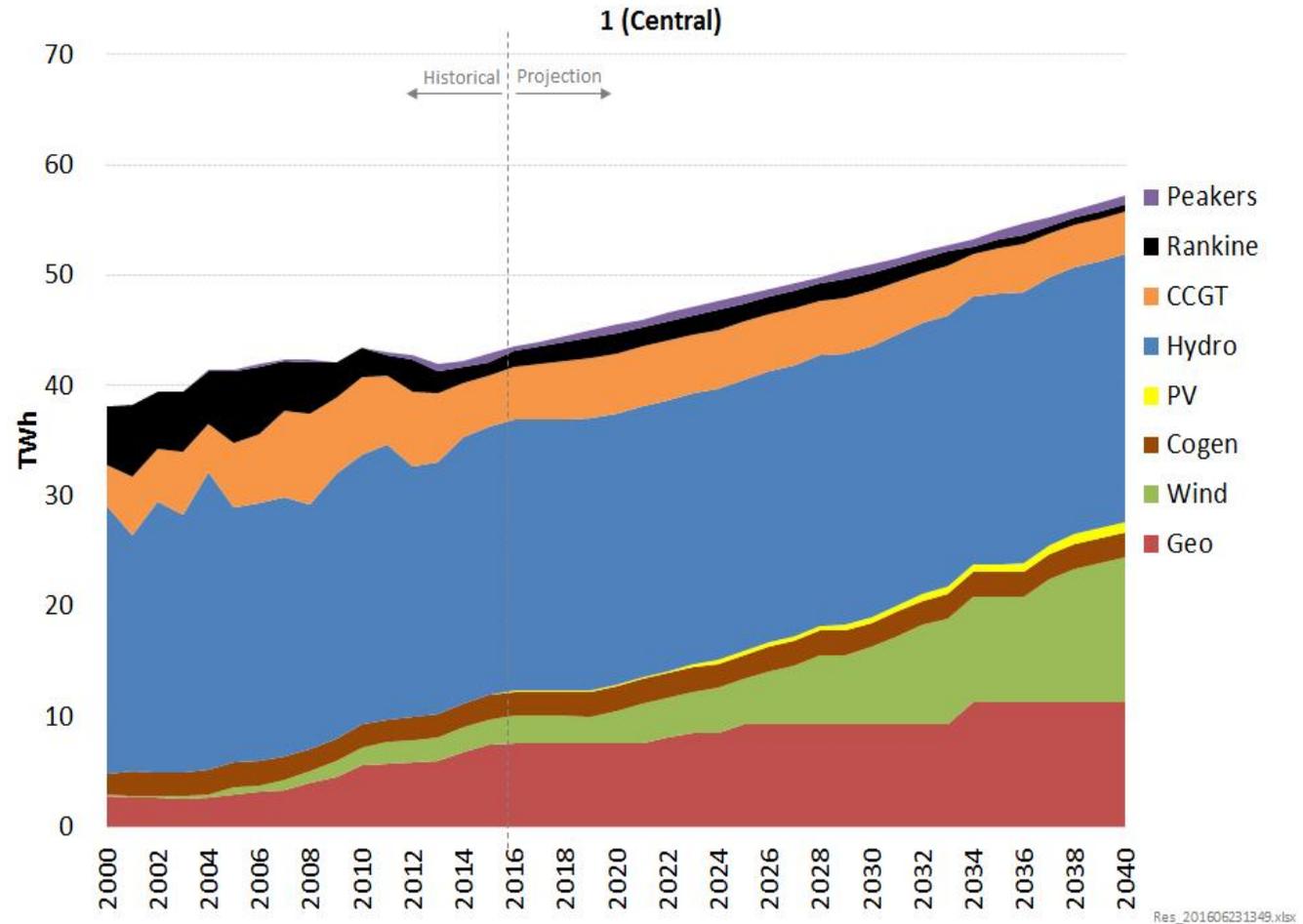
- Central
 - ‘Balanced’ gas reserves position
 - Steady increase in CO₂ prices
 - ≈ 1% electricity demand growth

- A number of key sensitivities examined, including
 - Possible Tiwai closure
 - CO₂ prices
 - Degree of gas reserves scarcity

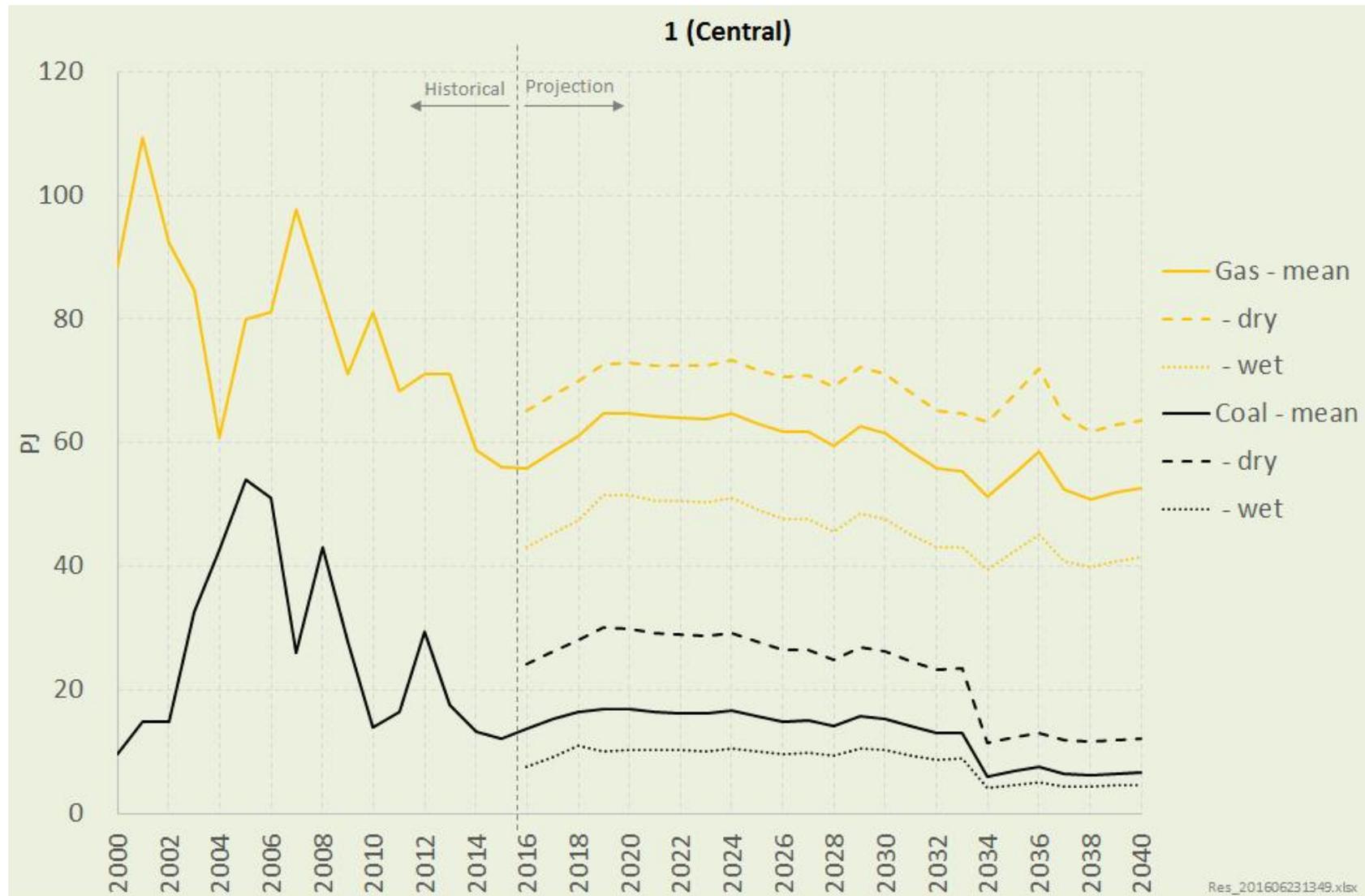
Our central projection is for stable gas & coal-fired generation



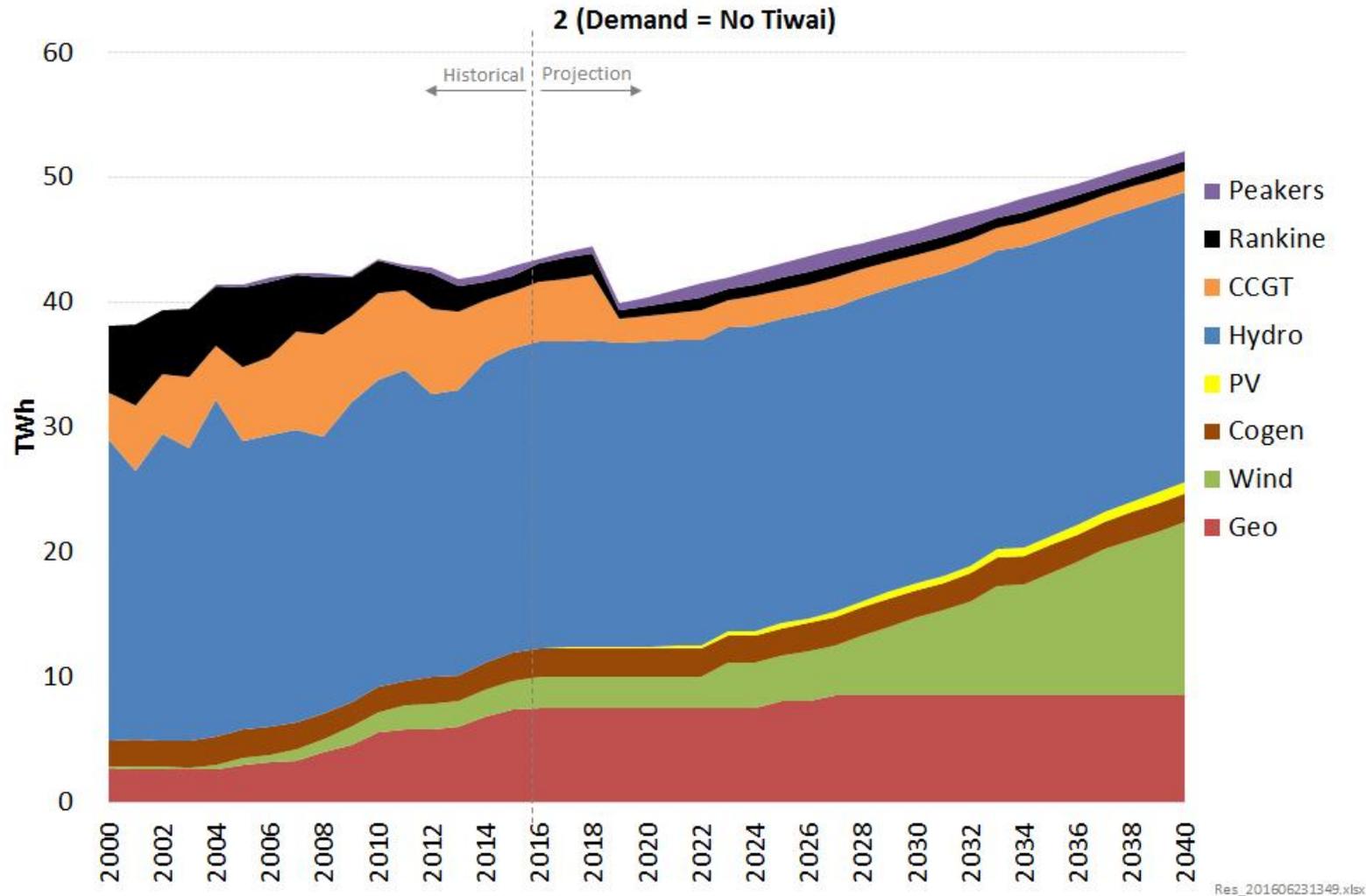
- Gas & coal-fired generation has already largely been displaced from baseload roles by renewable generation
- Central projection sees continuation of fossil plant predominantly providing dry-year, seasonal, and peaking duties
- Demand growth mainly met by renewables



Gas (and coal) demand largely stabilises, but exhibits significant dry/wet year variation



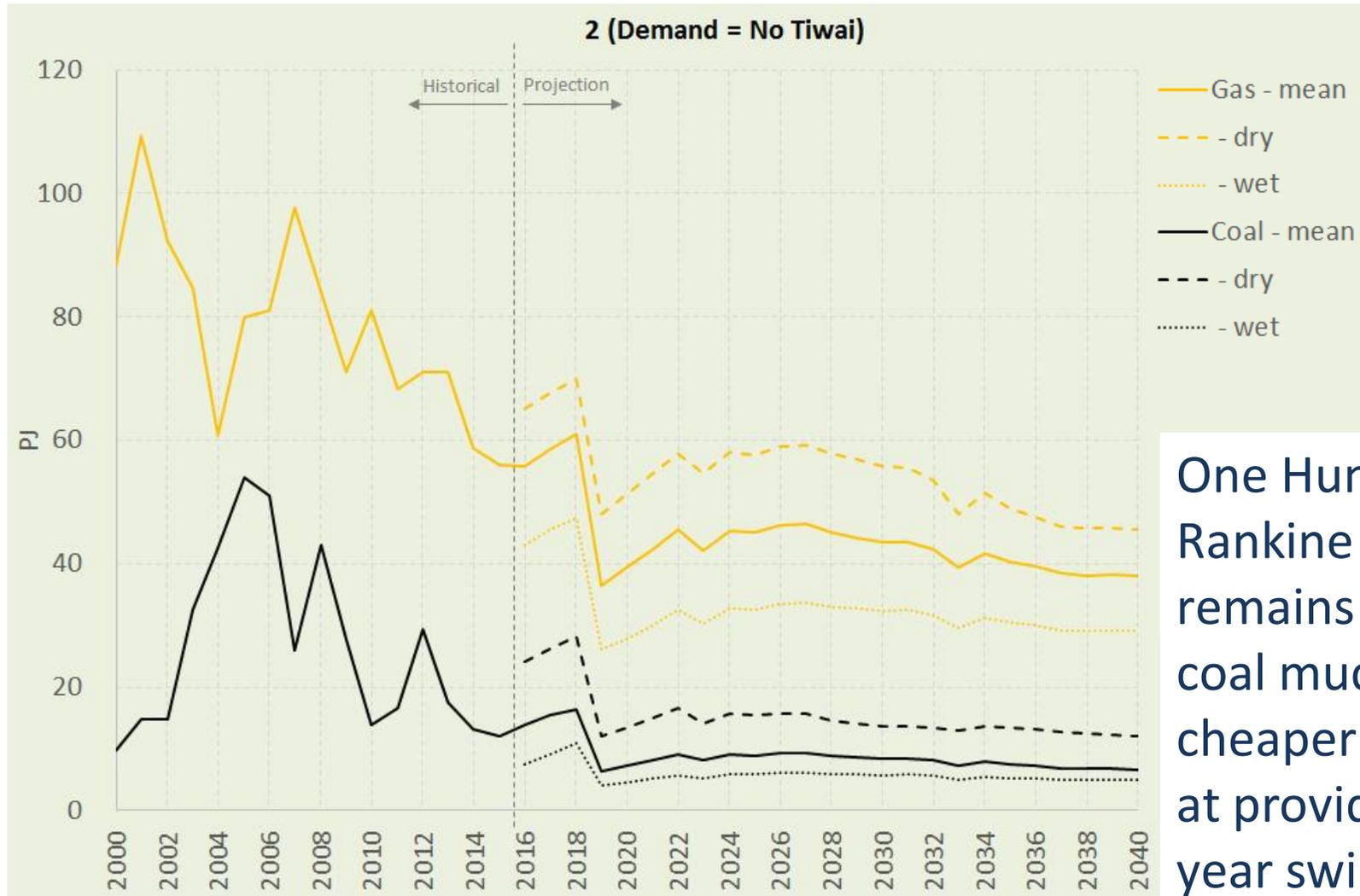
A Tiwai exit would significantly reduce gas & coal demand (1)



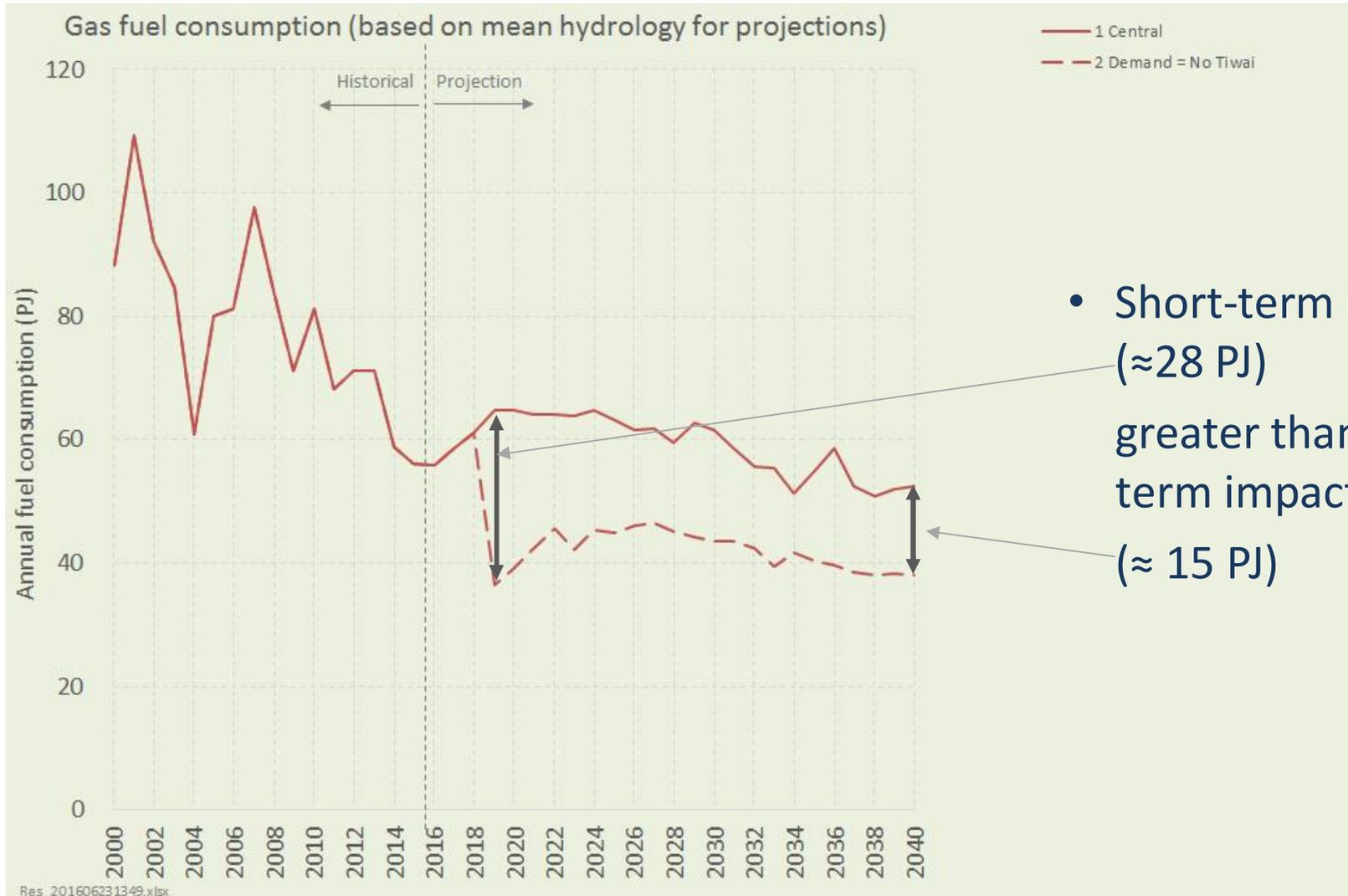
Res_201606231349.xlsx

- A Tiwai exit would likely trigger at least a couple of major thermal plant retirements (TCC CCGT plus at least one Huntly Rankine PS unit)

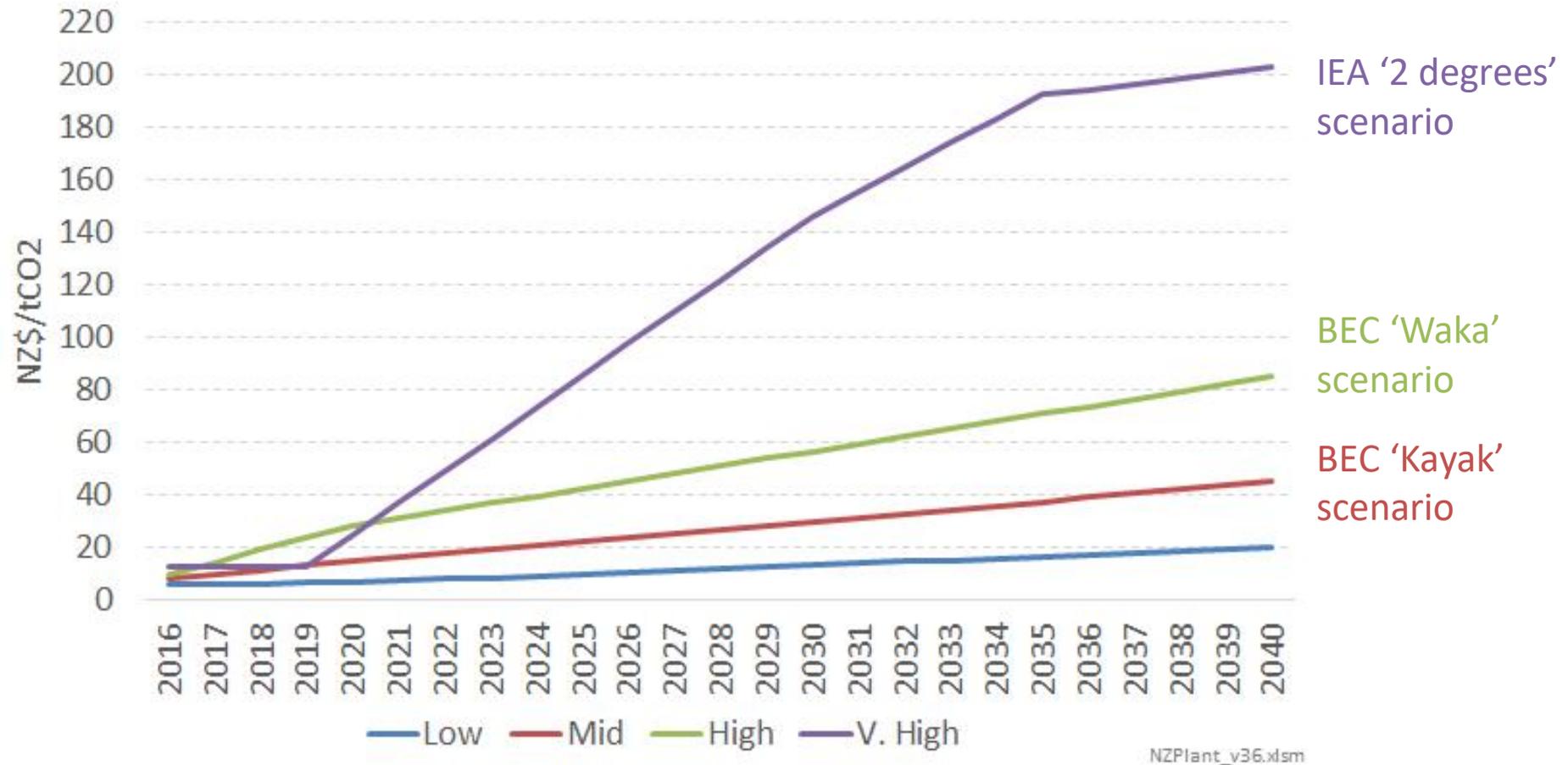
A Tiwai exit would significantly reduce gas & coal demand (2)



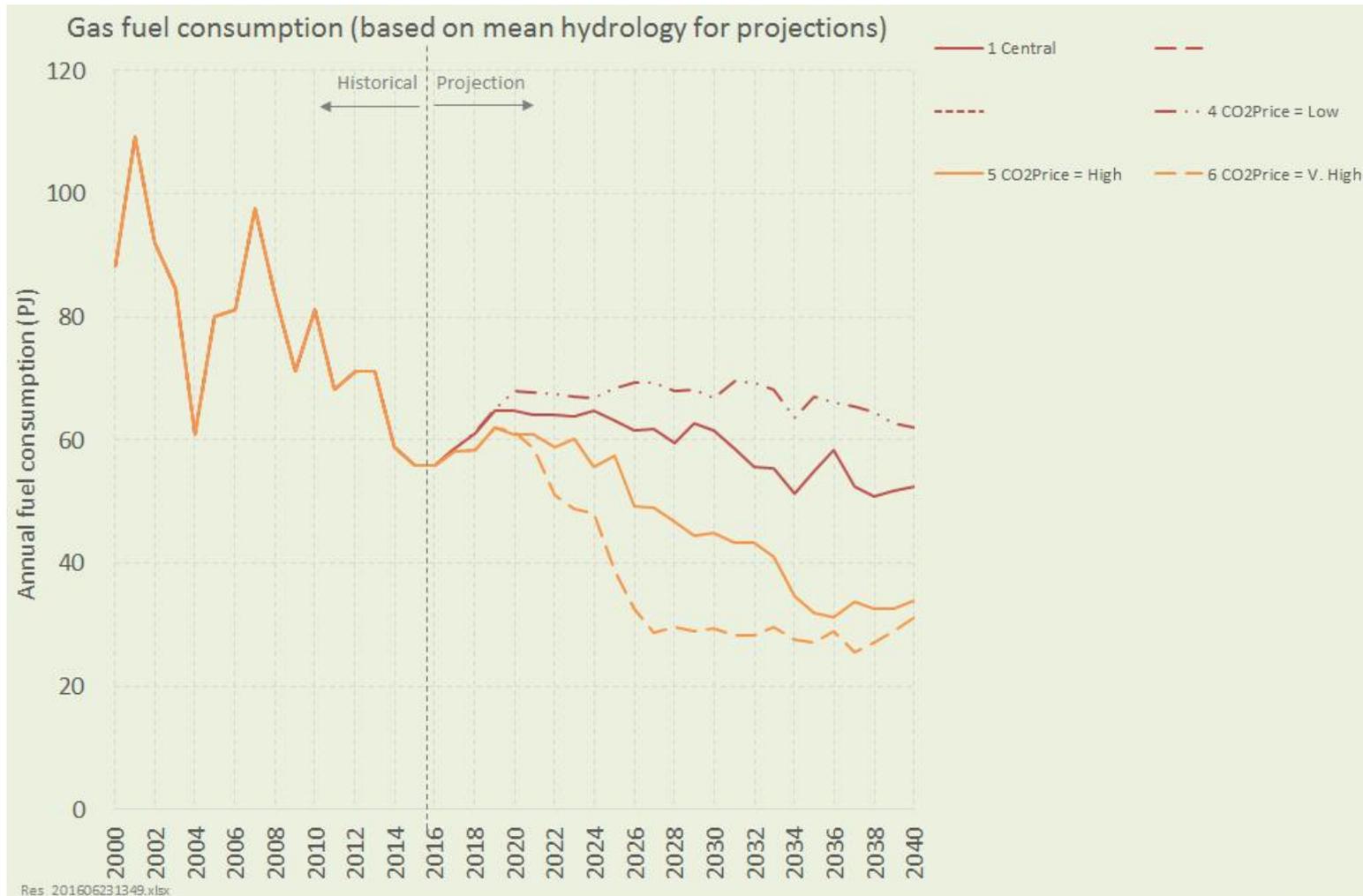
Some (but not all) loss of gas demand likely to be permanent



Significant uncertainty over future CO2 prices



Future power generation gas demand is sensitive to CO2 prices

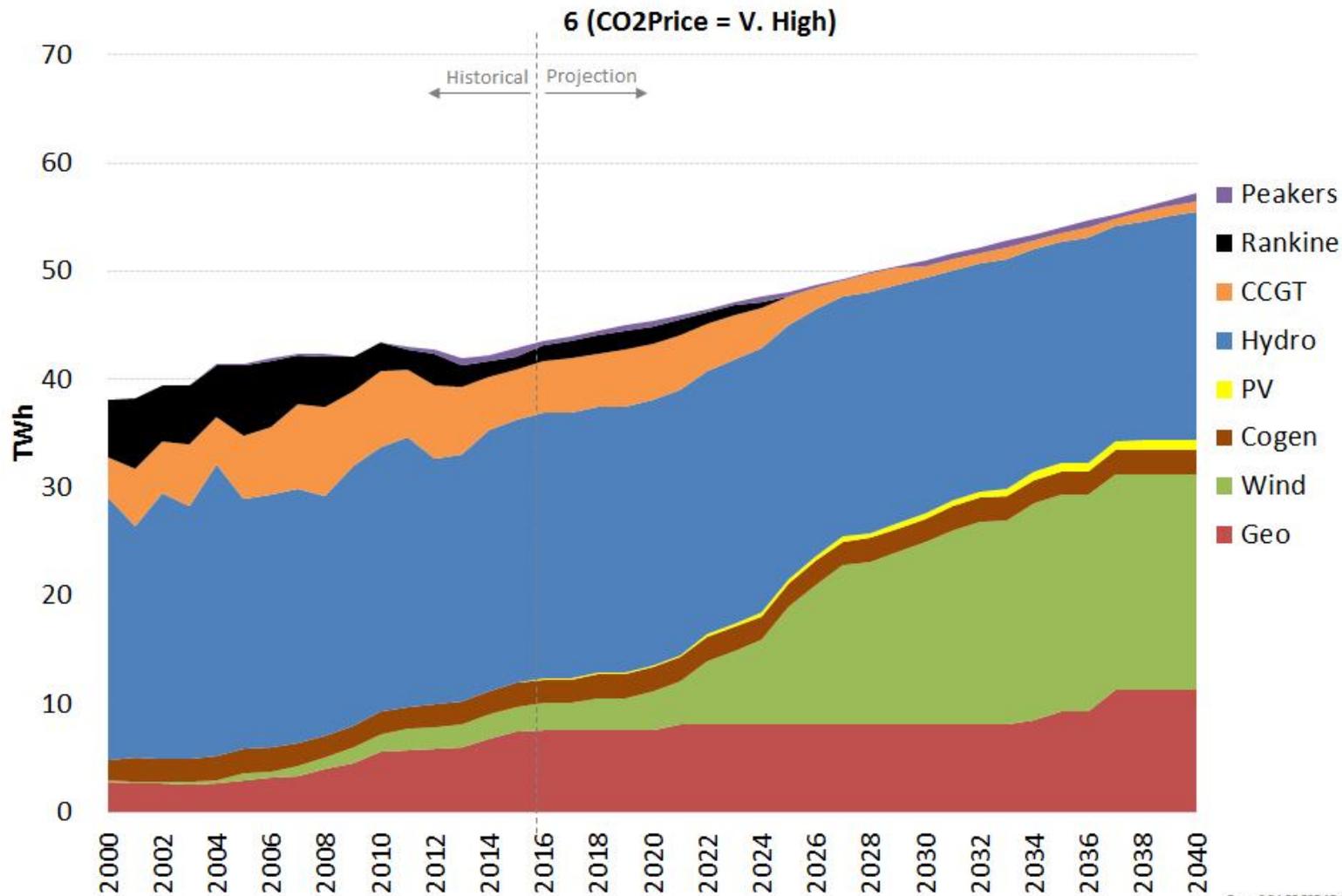


- However, even in the very high CO2 price future, there is likely to be a role for gas-fired power generation

Even in a very high CO2 price future, it is more economic to use gas-fired power generation for seasonal and dry-year duties



- The alternative is to over-build renewables and use spill to provide seasonal & dry-year flex



Res_201606231349.xlsx

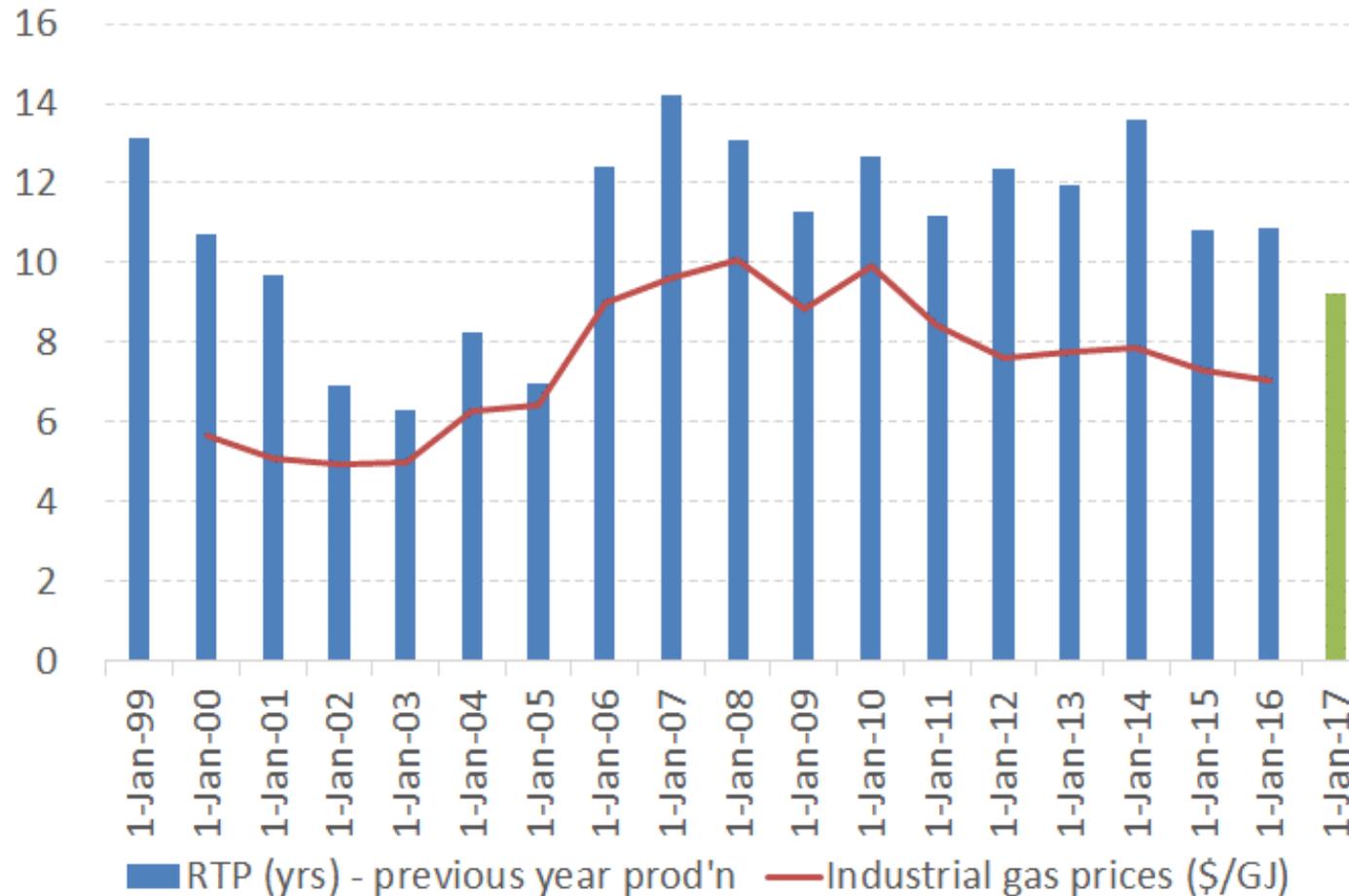
As an aside, petrochemical & industrial/commercial/residential demand much less sensitive to CO₂ prices



- Petrochemical demand should:
 - be unaffected by a high NZ CO₂ price*
 - benefit from a high *global* CO₂ price. Because:
 - accelerate international coal-to-gas switching (for power gen and petrochemical production)
 - higher international gas prices
 - improve relative attractiveness of NZ for petrochemical production
- For industrial, commercial and residential demand, CO₂ comprises a relatively small component of overall energy costs (more later)
 - relatively CO₂ price insensitive

* Provided NZ petrochemical production continues to receive protection from overseas producers who don't face a cost of CO₂

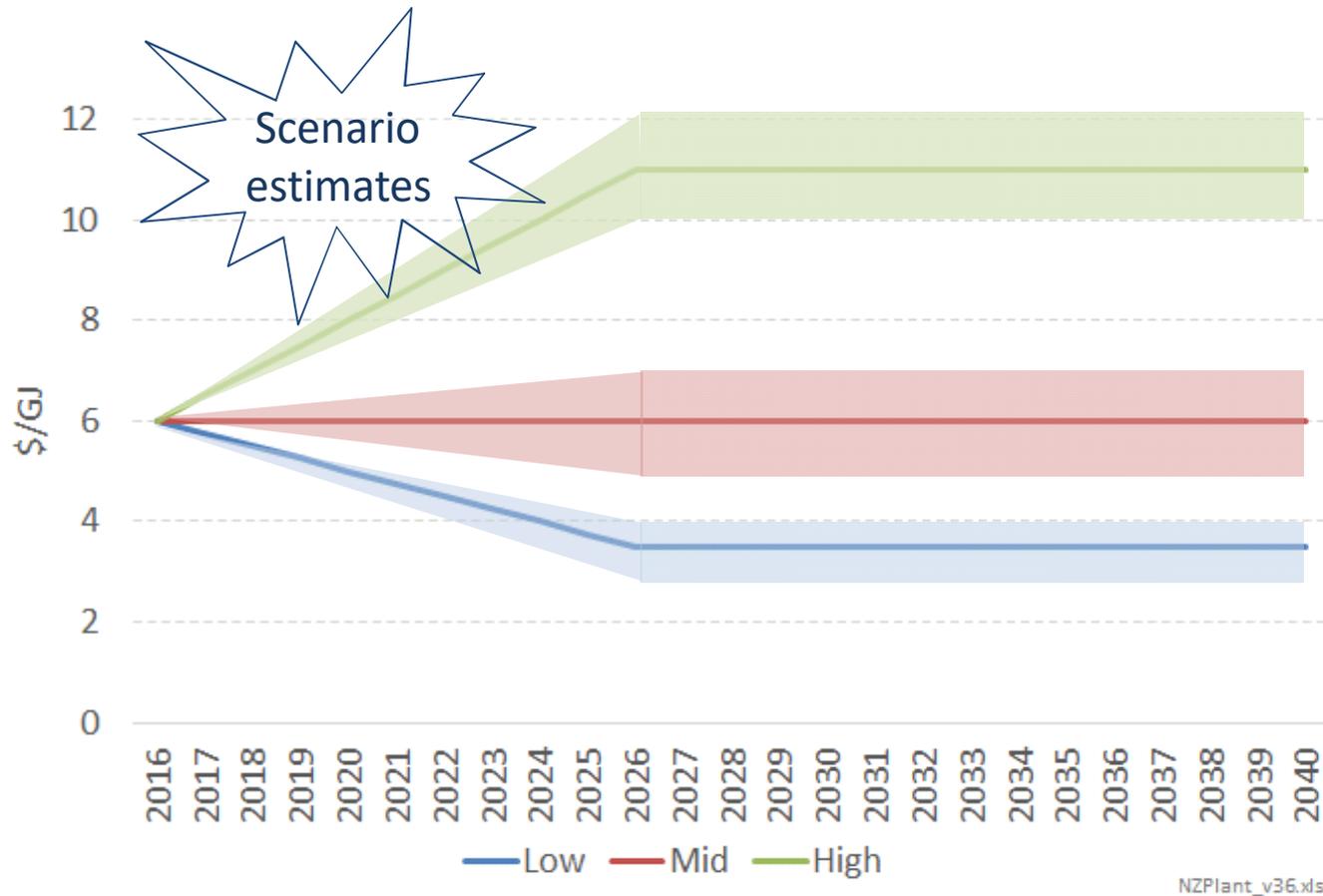
NZ's changing gas reserves position has been reflected in changing wholesale gas prices



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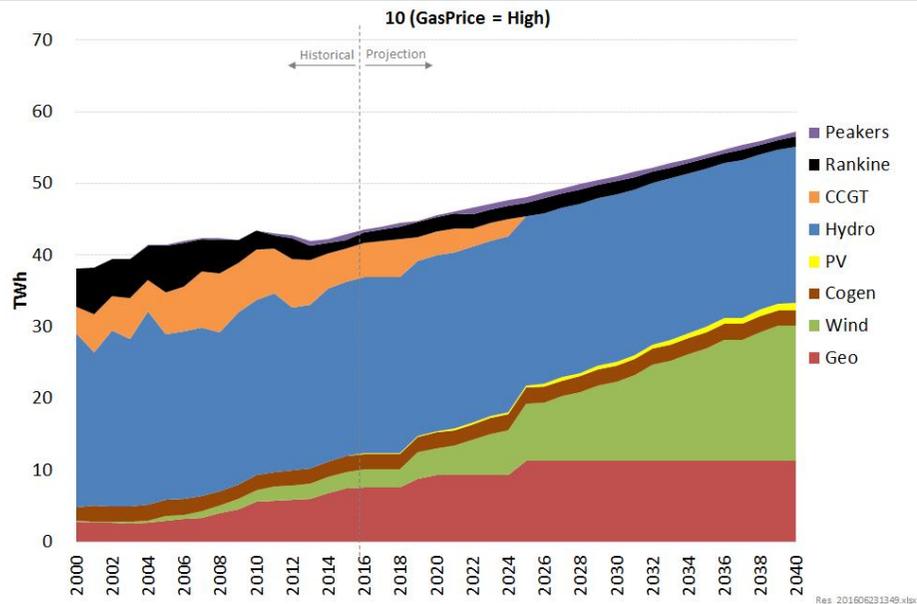
- How might future scarcity / surplus, and associated prices, impact on the power generation sector?

Range of wholesale gas price futures examined

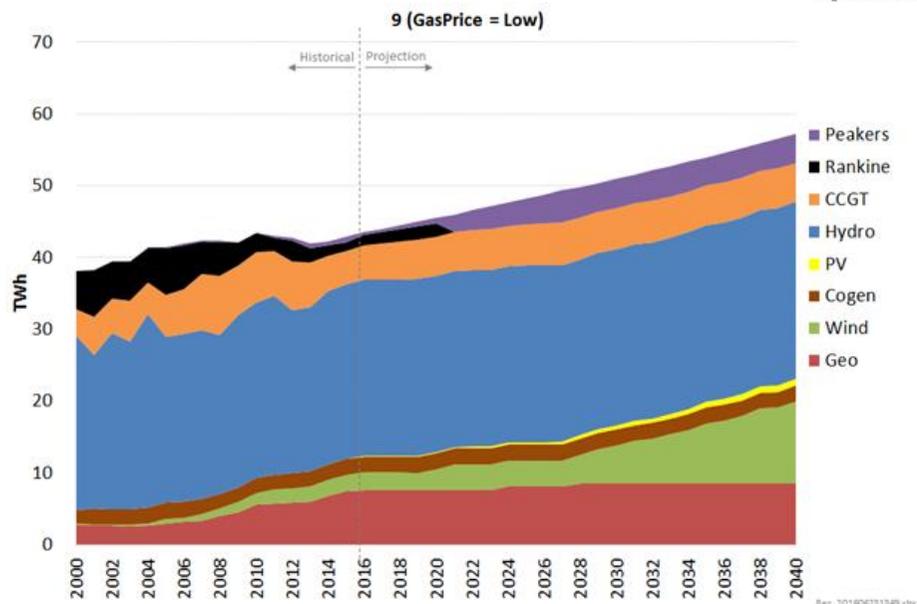


- Upper limit driven by economics of importing LNG
- Mid prices driven by netbacks from existing petrochemical plant
- Lower floor driven by netbacks from new petrochemical plant

Powergen sector, like petrochemicals, is important for 'balancing' NZ's surplus or scarce reserves position

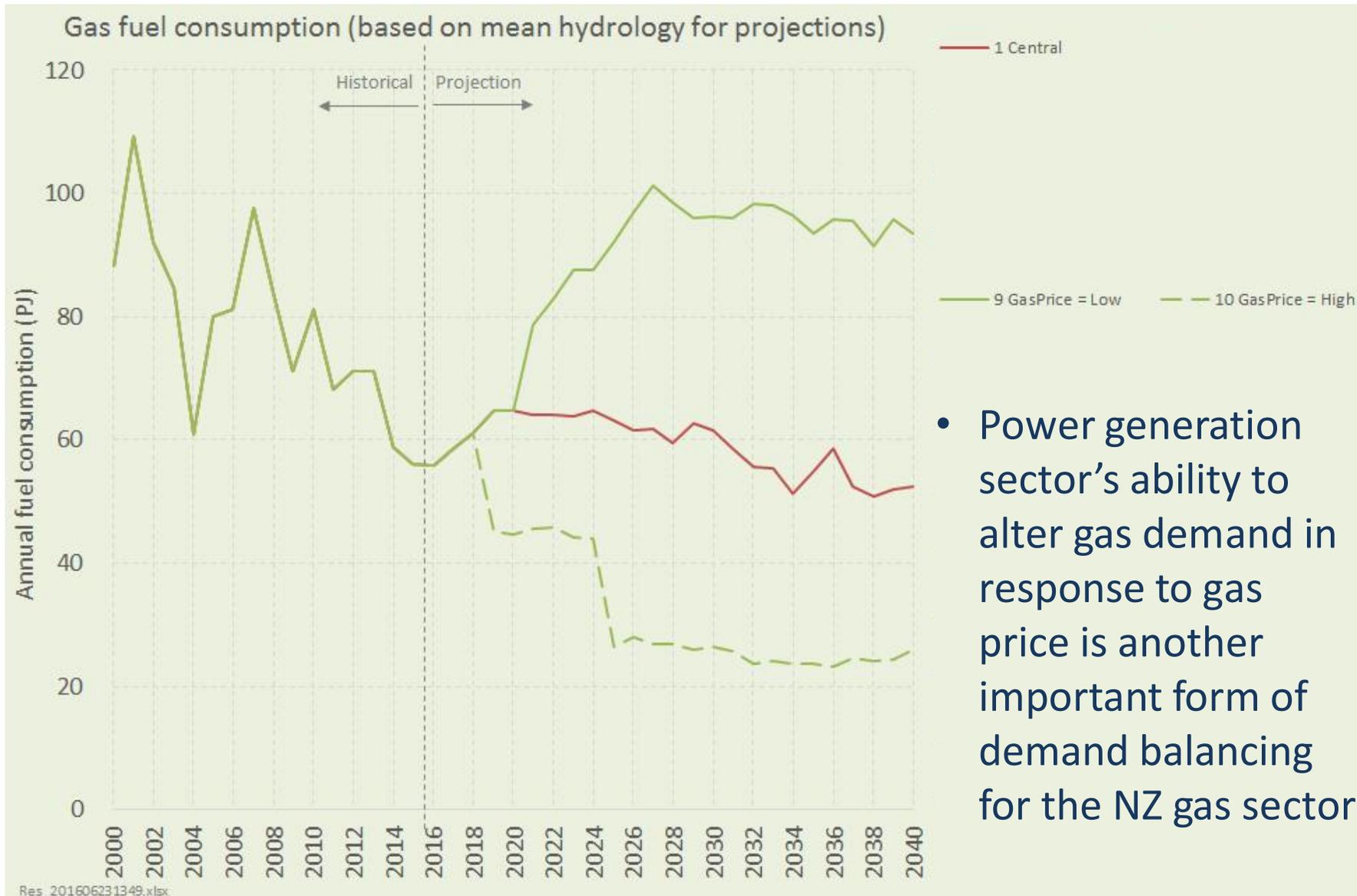


- In a scarce gas future, CCGTs will be retired → Huntly coal, peakers and renewable spill will provide seasonal and dry-year flexibility

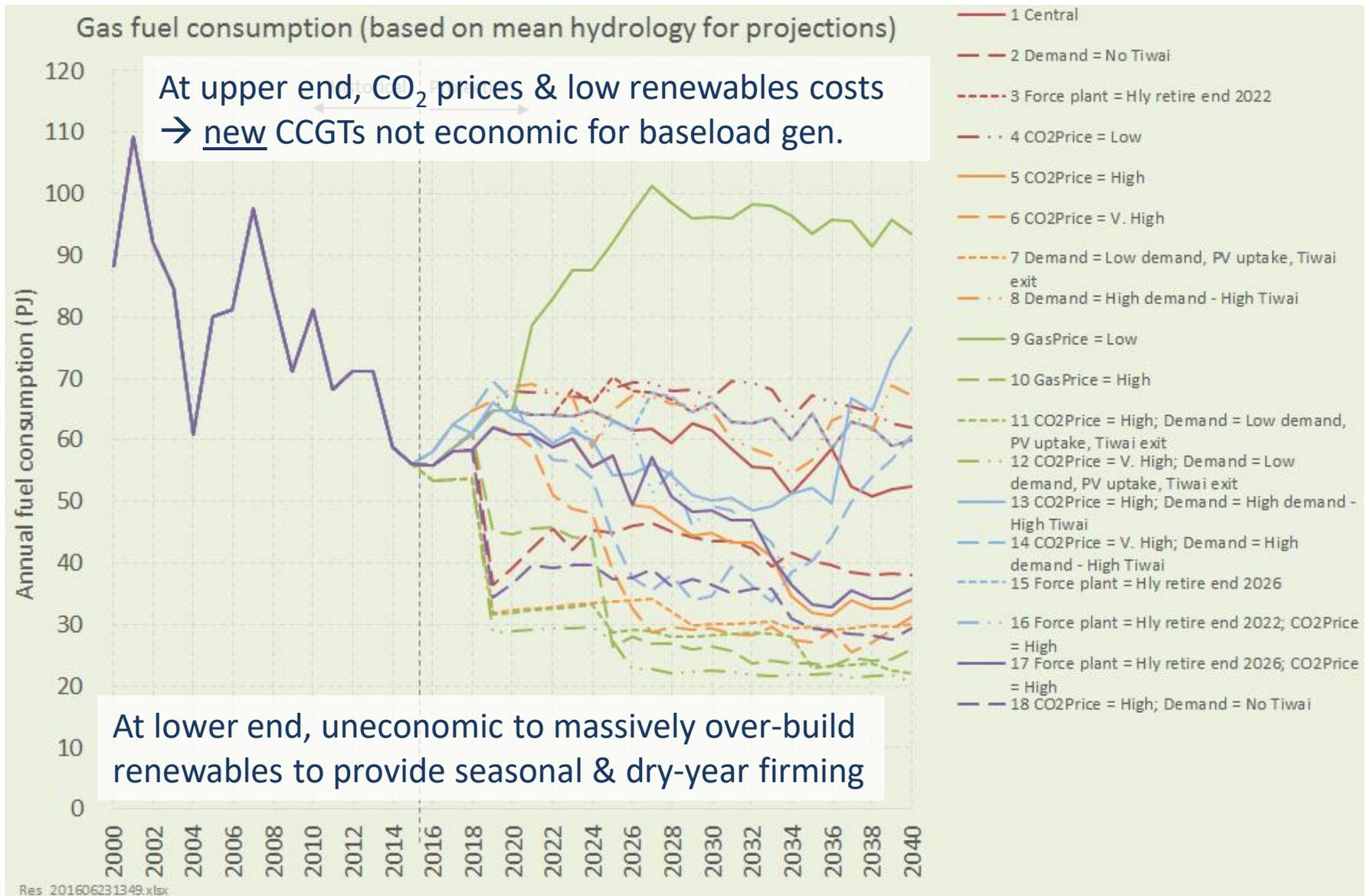


- Even in a low gas price future, it is unlikely new CCGTs will be built
 - Unlike in the late '90s, we now have higher CO₂ prices and cheaper renewables

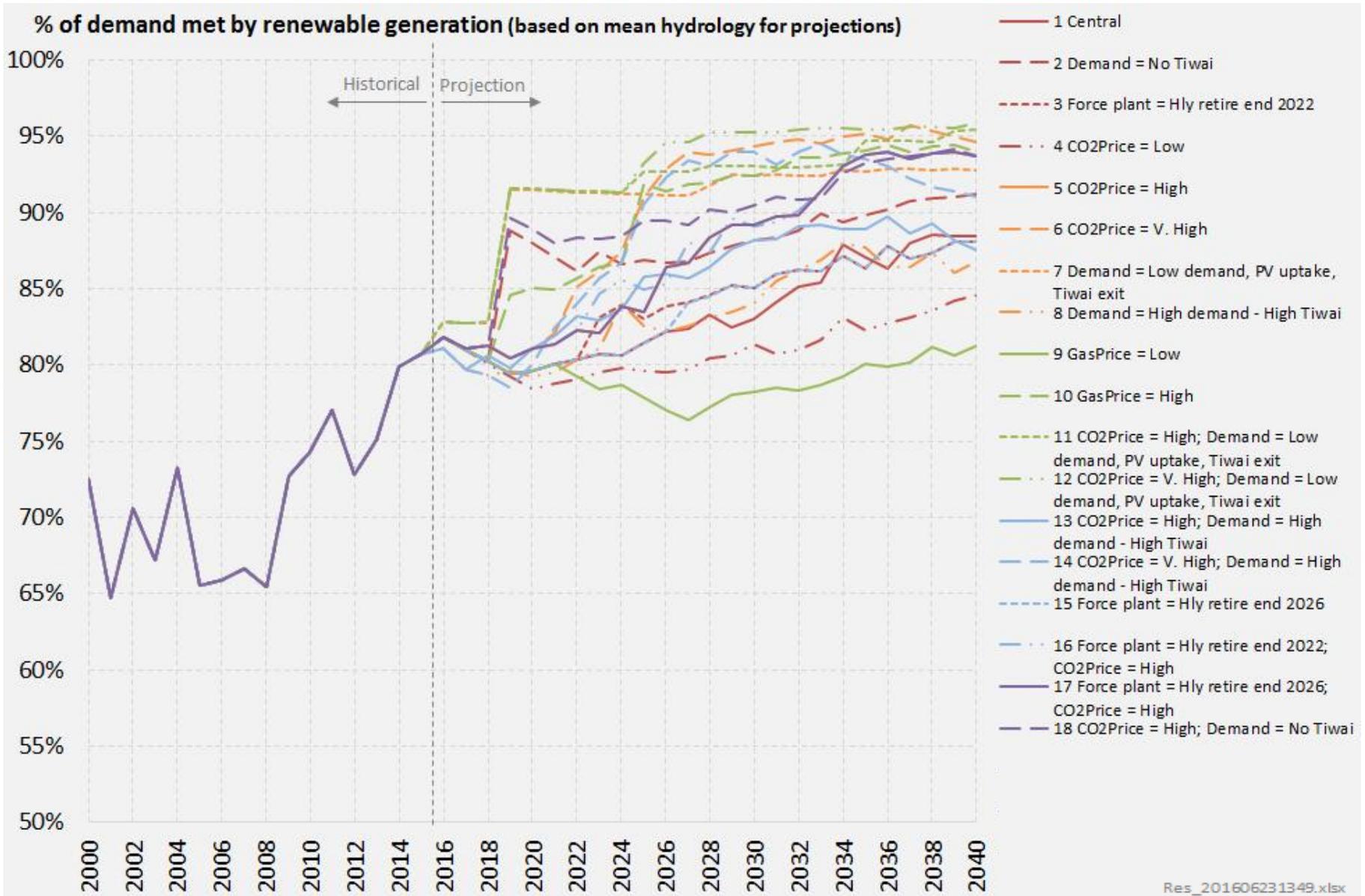
Relative gas scarcity / surplus will significantly drive long-term power-generation gas demand



Overall, although a range of outcomes are possible, there are likely to be economic upper and lower limits

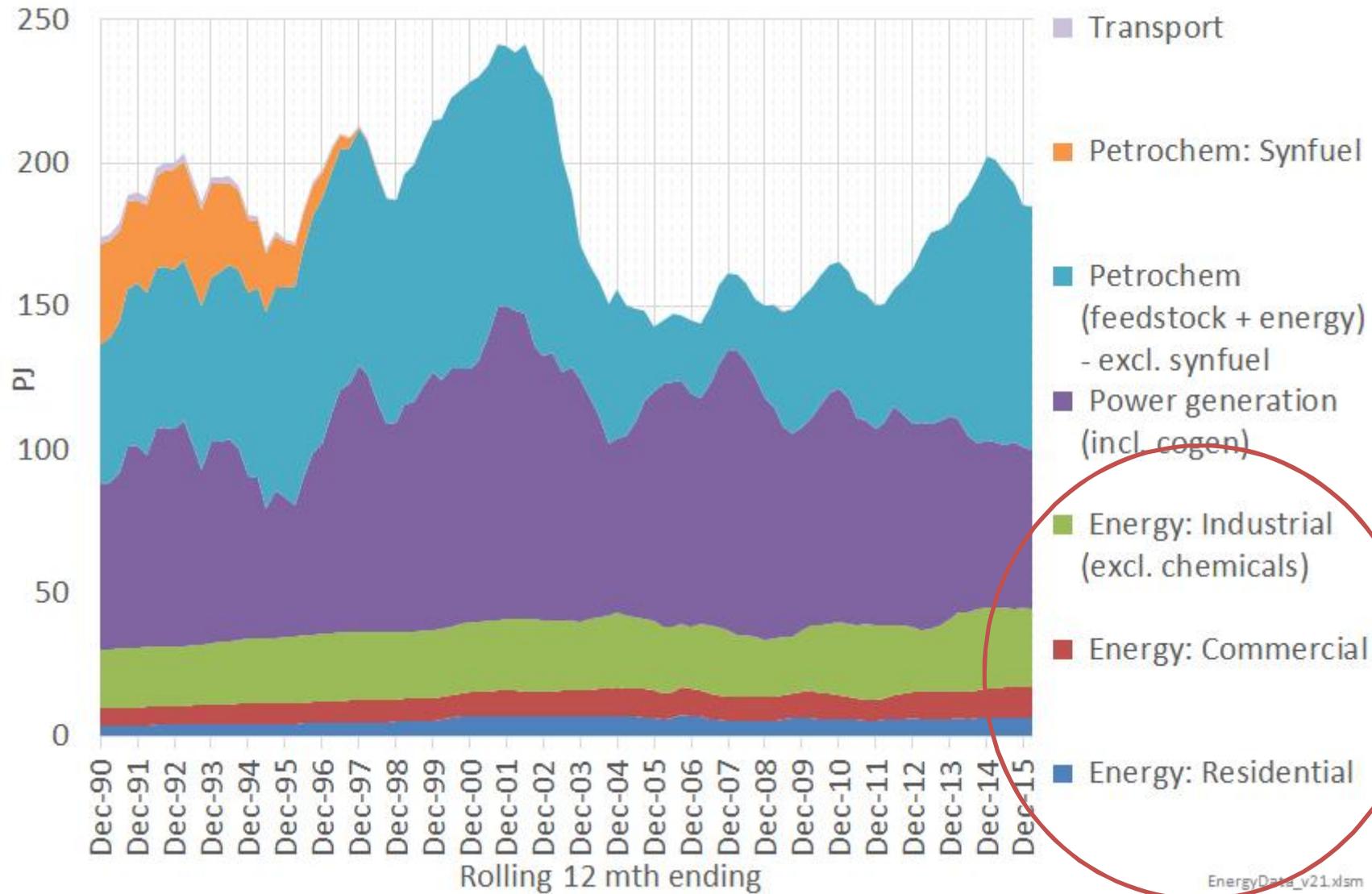


As an aside, these economic limits also have implications for our renewables aspirations

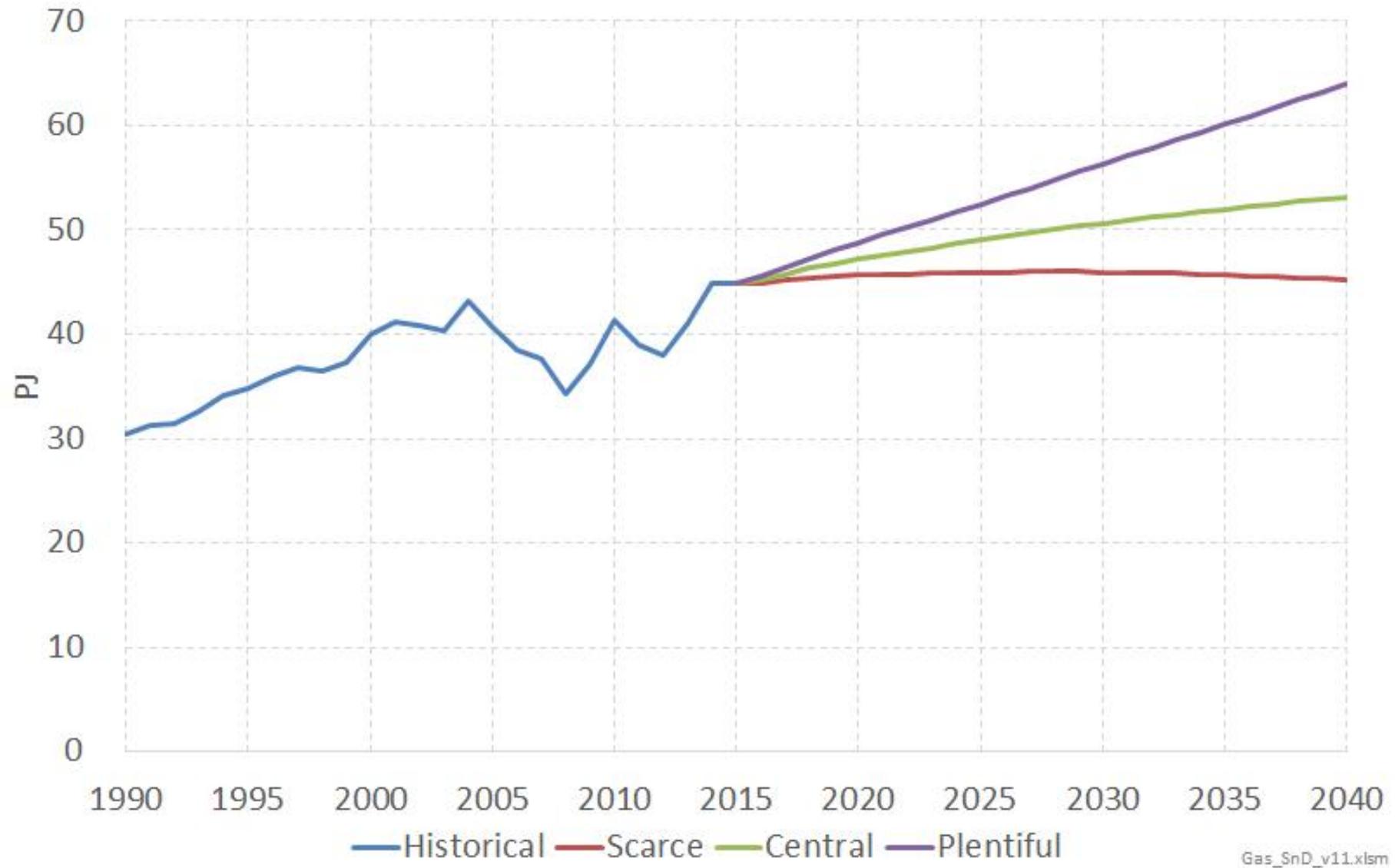


Industrial, commercial, and residential 'direct-use' of gas for energy

Direct use for Energy has historically been stable year-to-year

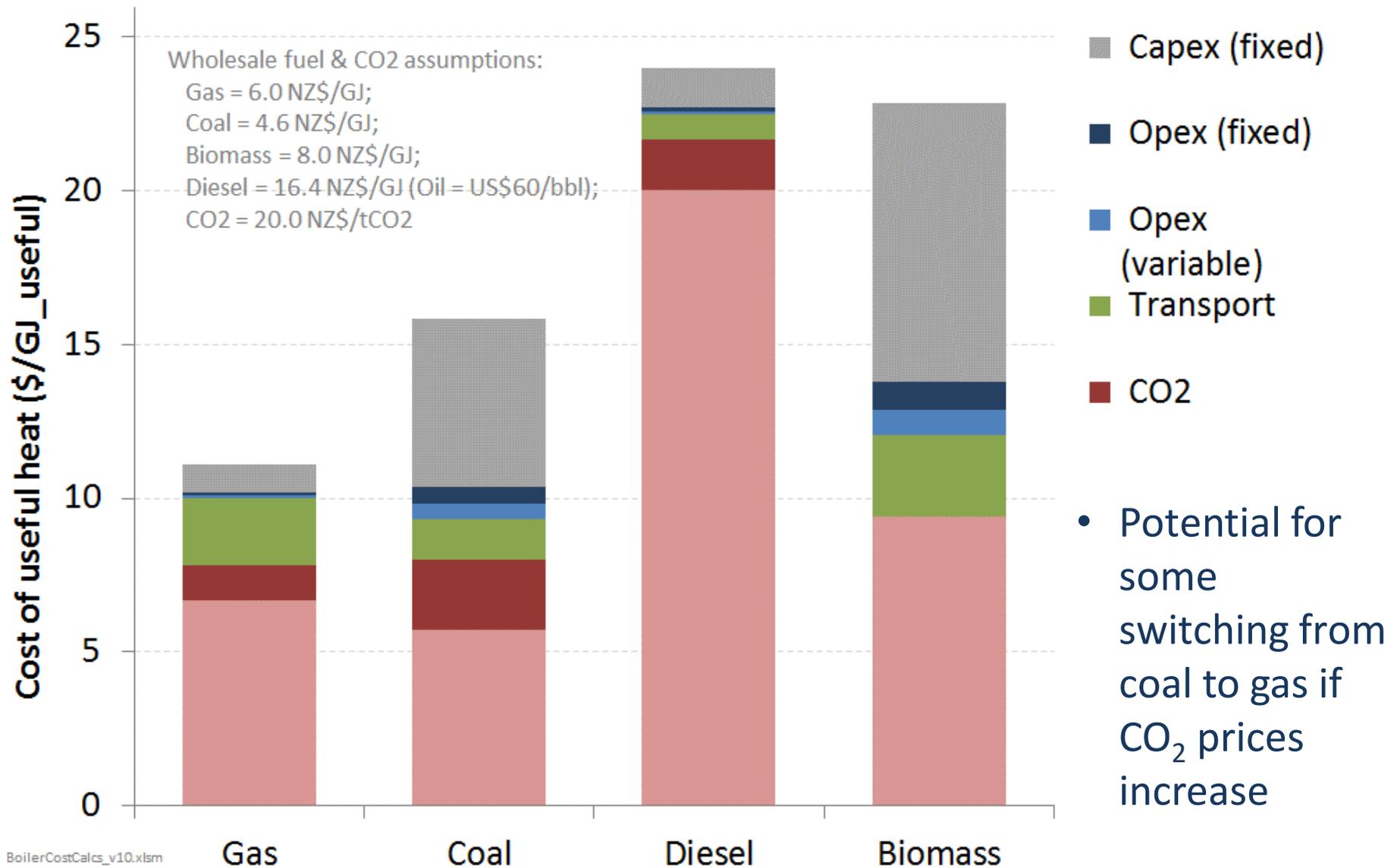


And projected to be so in the future

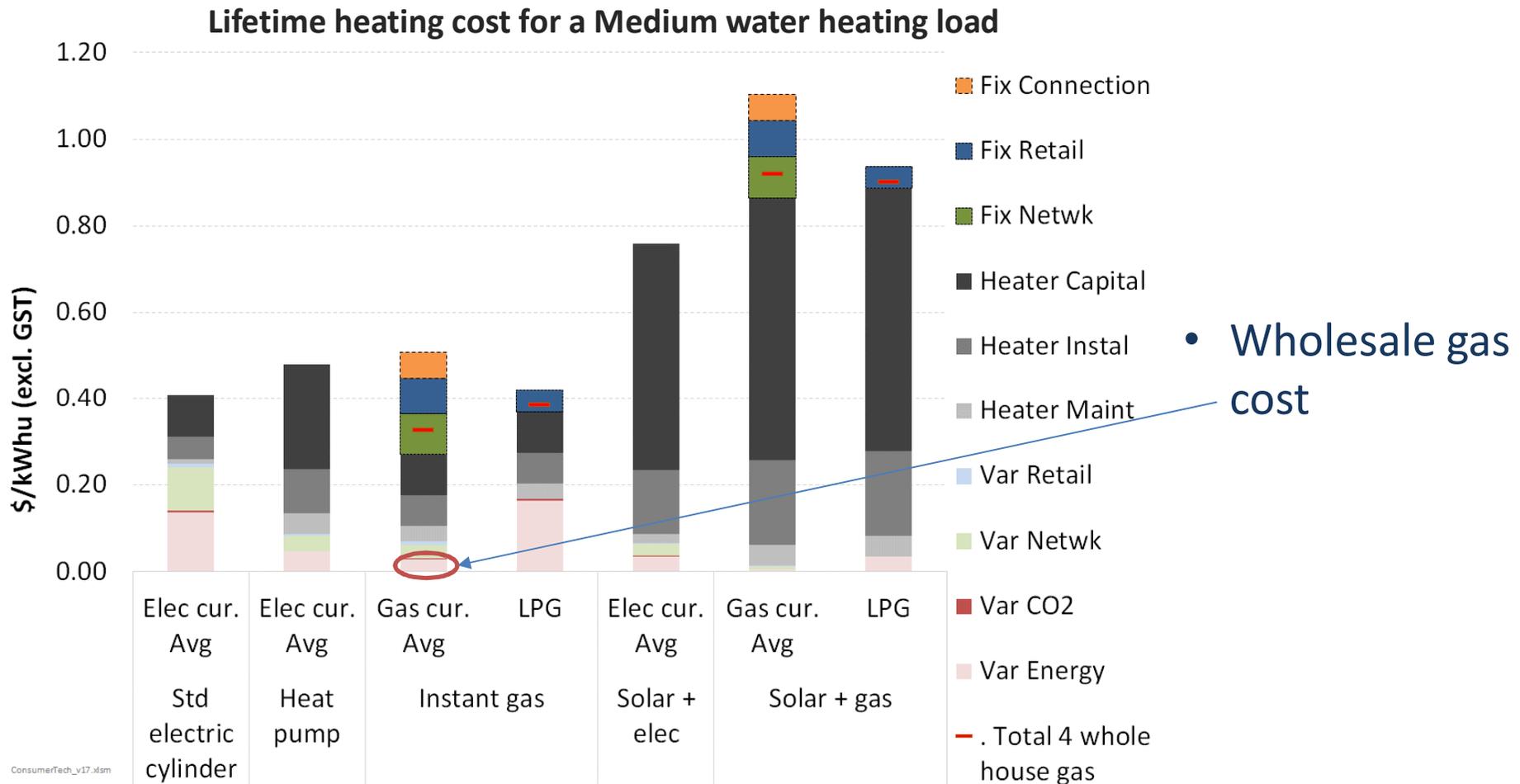


Gas_SnD_v11.xlsm

Industrial process heat is stable because gas is so competitive against alternatives → limited fuel switching opportunities



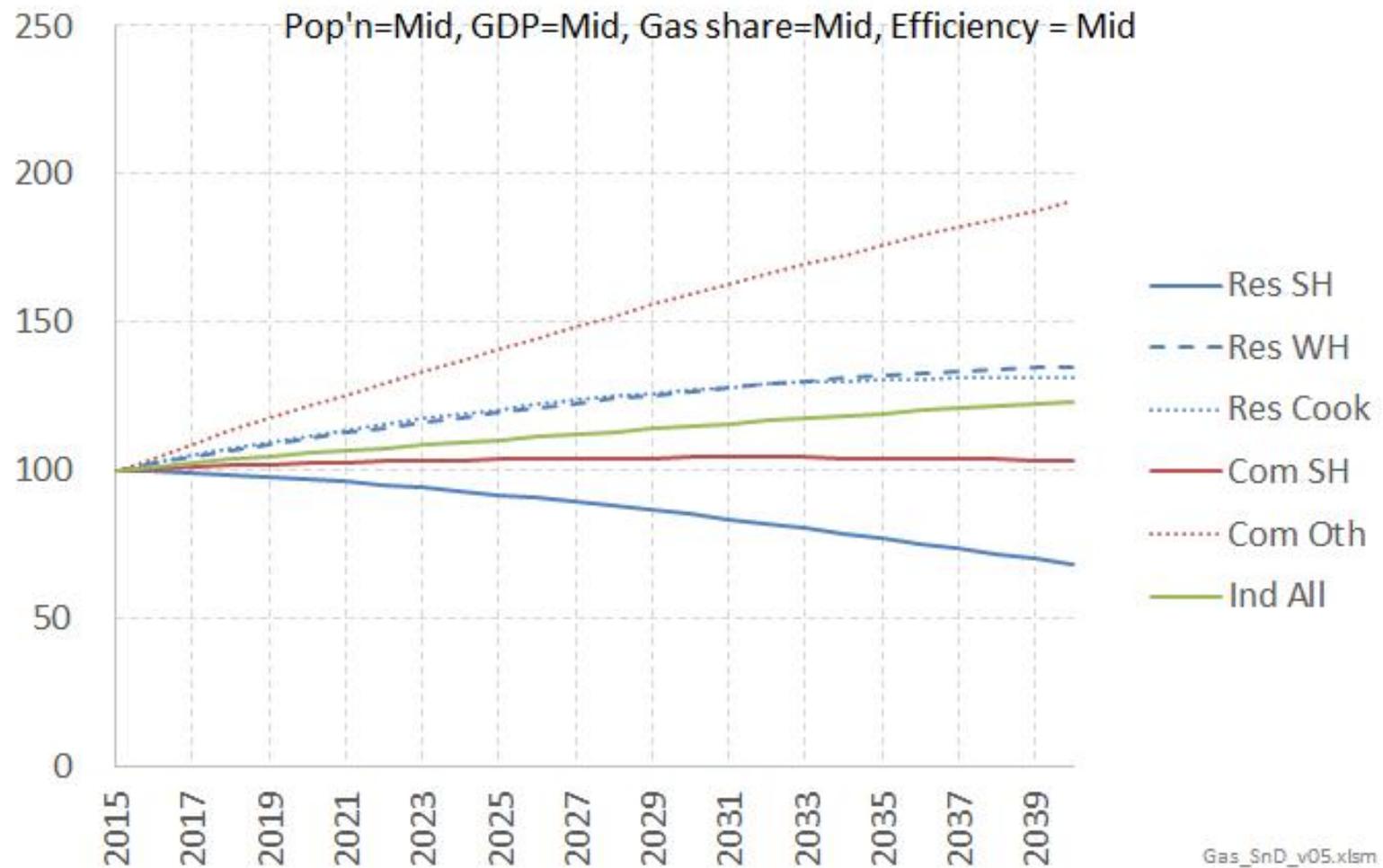
Space & water heating is stable because wholesale gas is small component of overall cost



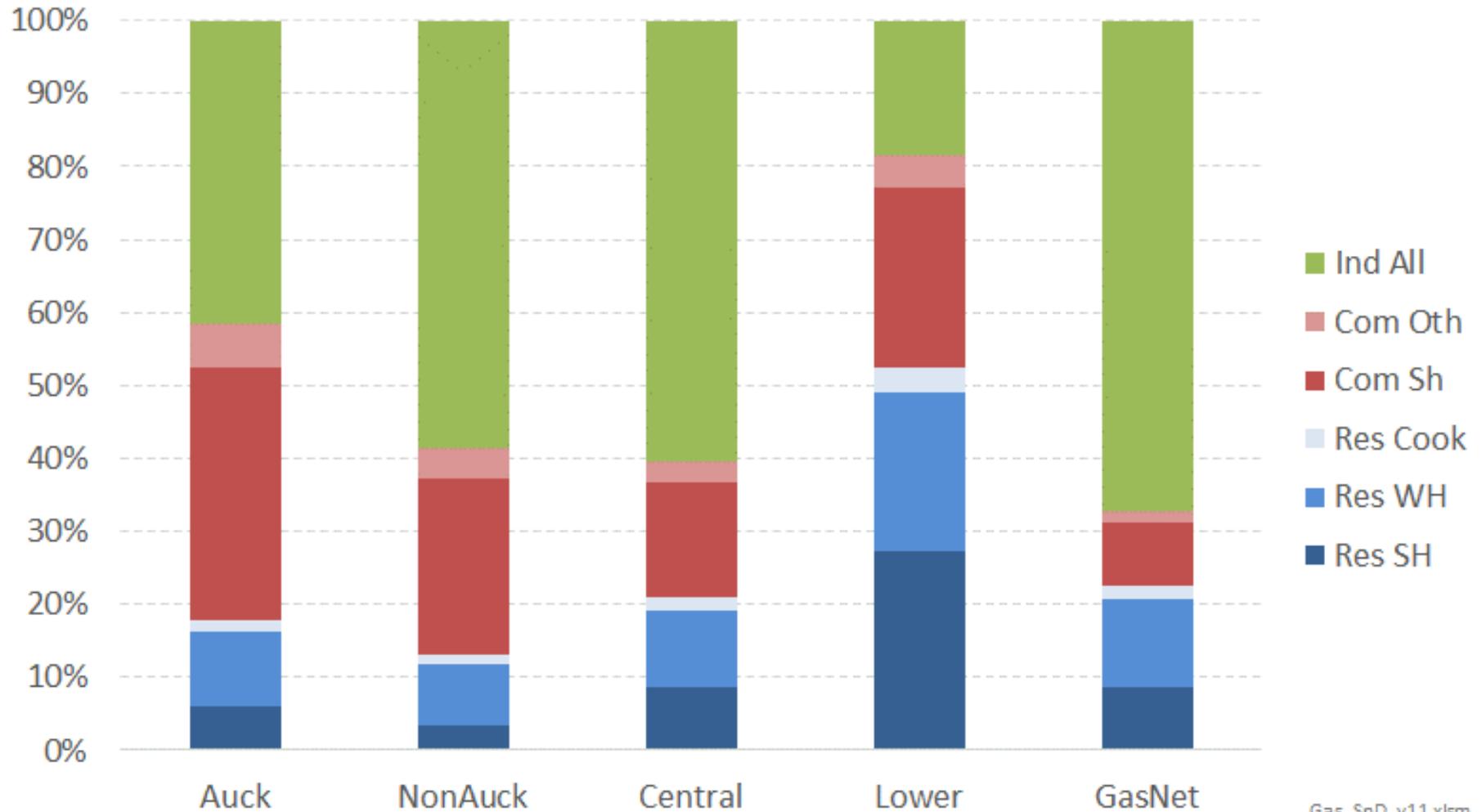
- Fuel switching decisions predominantly when need to replace or buy appliance (i.e. \approx once every 15 years)

Other factors will be main drivers of future gas-for-energy demand: Population, GDP, Energy efficiency

- Extent of drivers different for different end-use segments
→ different projected change in demand



Different gas distribution network areas have different customer mixes ...

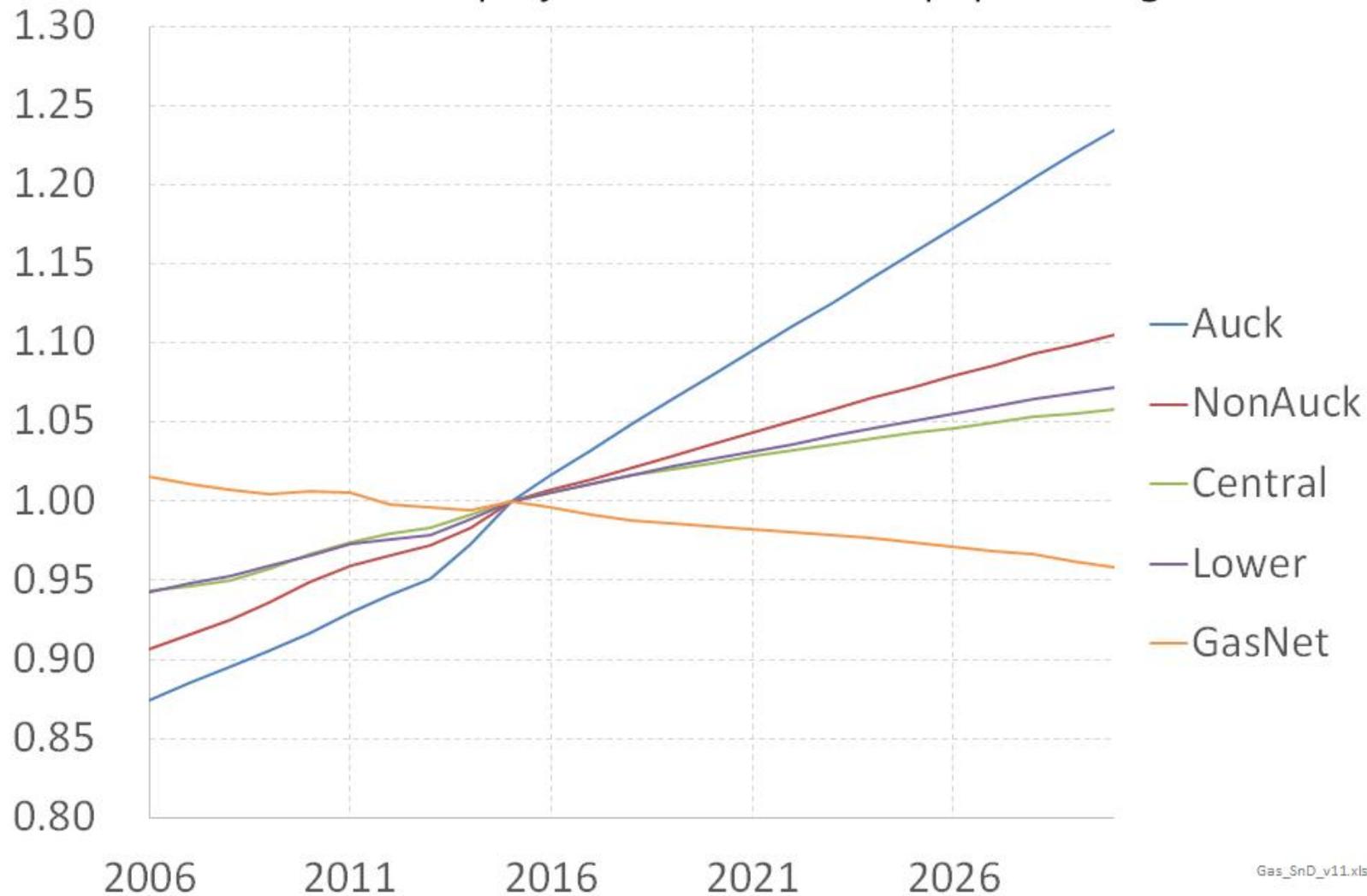


Gas_SnD_v11.xlsm

... and different projected levels of population growth...

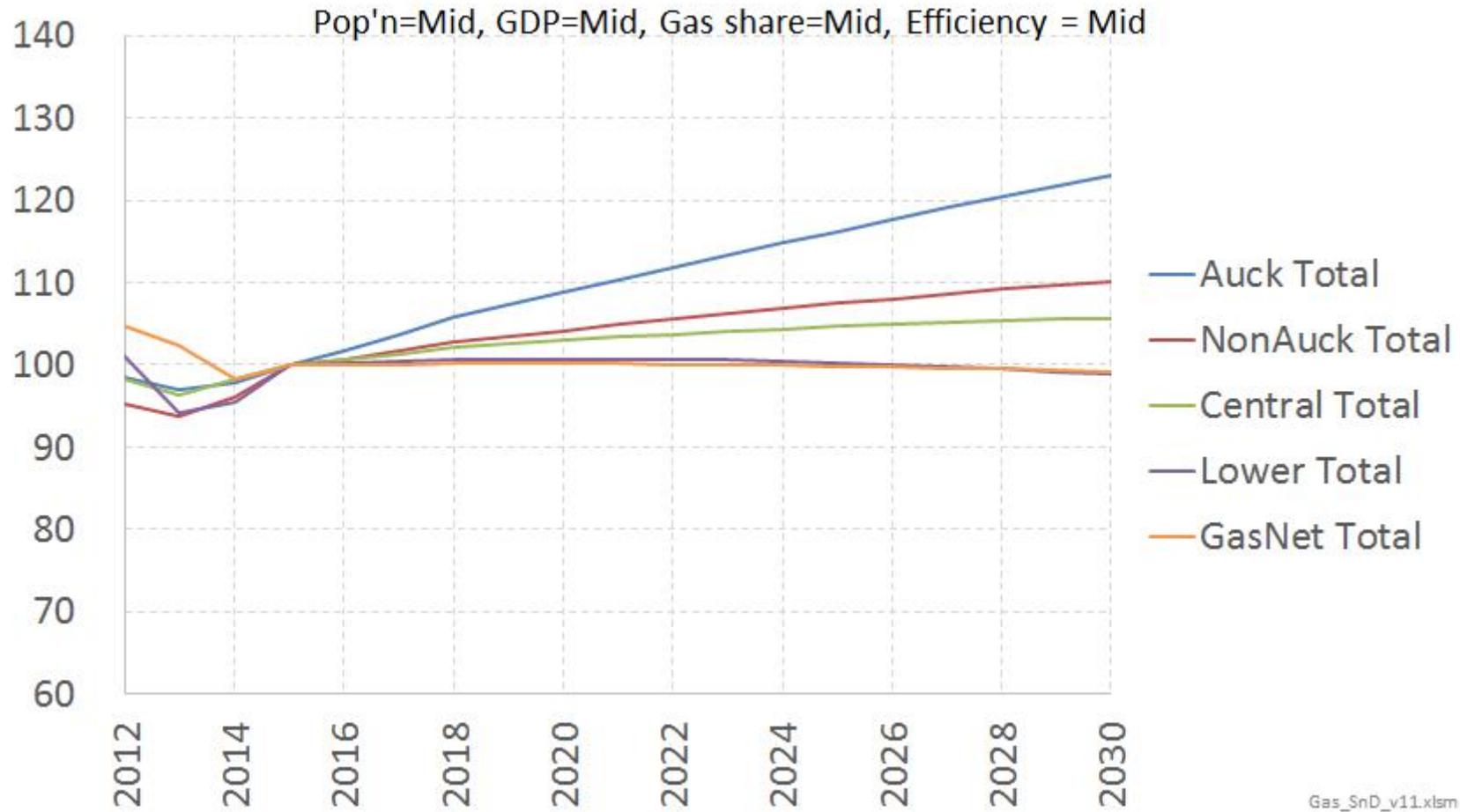


Historical and projected Mid scenario population growth

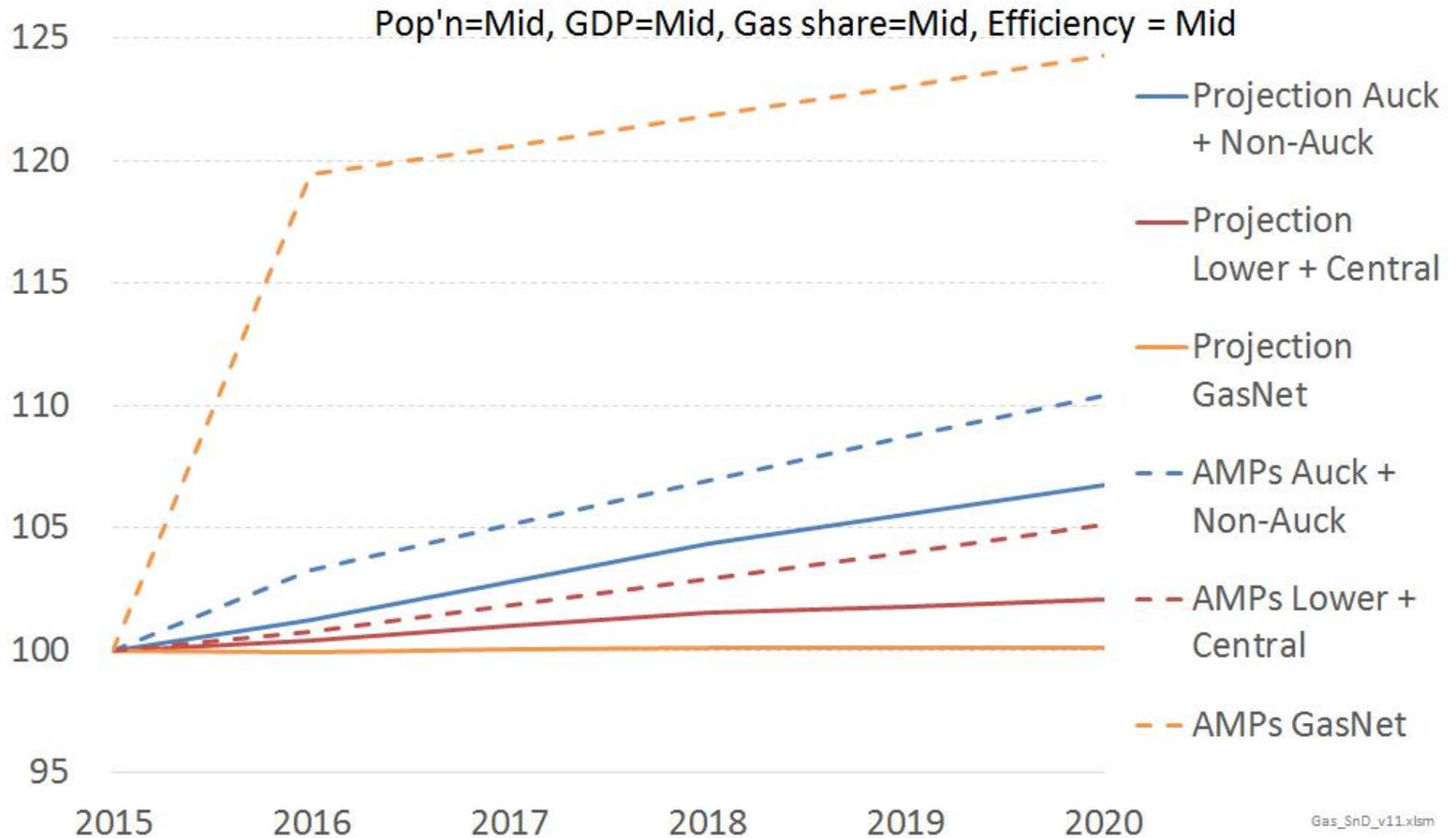


Gas_SnD_v11.xlsm

... resulting in different projections of network demand growth

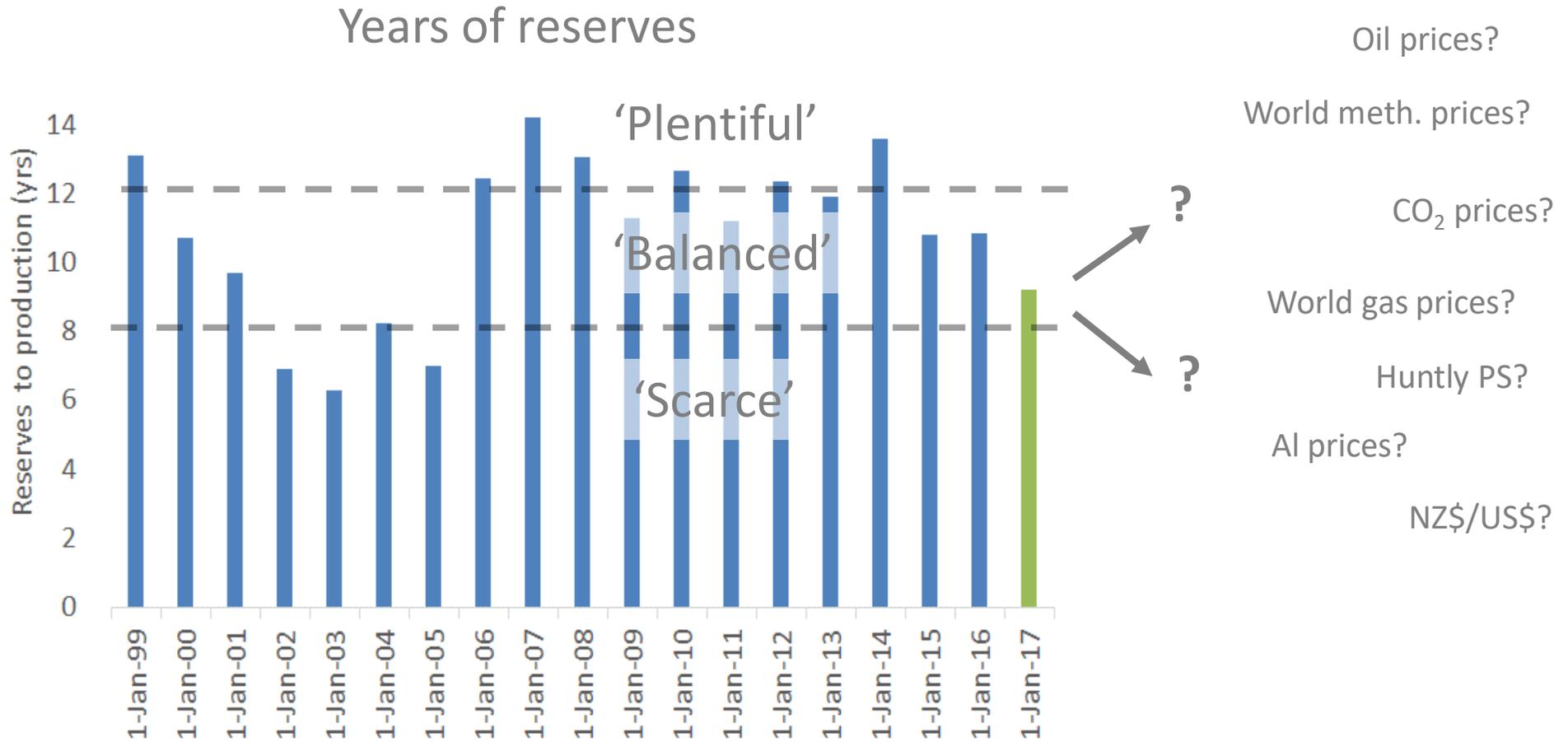


Study projections are (broadly) consistent with networks' own projections



Summary

Although pendulum currently swinging from surplus to scarcity, NZ gas market well placed to handle uncertainty



EnergyData_v21.xlsm

- Market forces will help supply and demand adjust to changing dynamic and keep market in balanced situation over time

Thank you

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- Concept provides advice on energy sector policy, business analysis, restructuring, market design, regulatory issues, energy modelling, market analysis, and technical issues.
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