



Woodward Partners

# 2016 NZ Gas Industry Forum

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# Outline

1. **Energy Inc** – The big picture: Global energy themes & directions
2. **Gas Inc** – How does gas fit into the big picture?
3. **NZ Gas Inc** – How does local gas fit into the big picture?

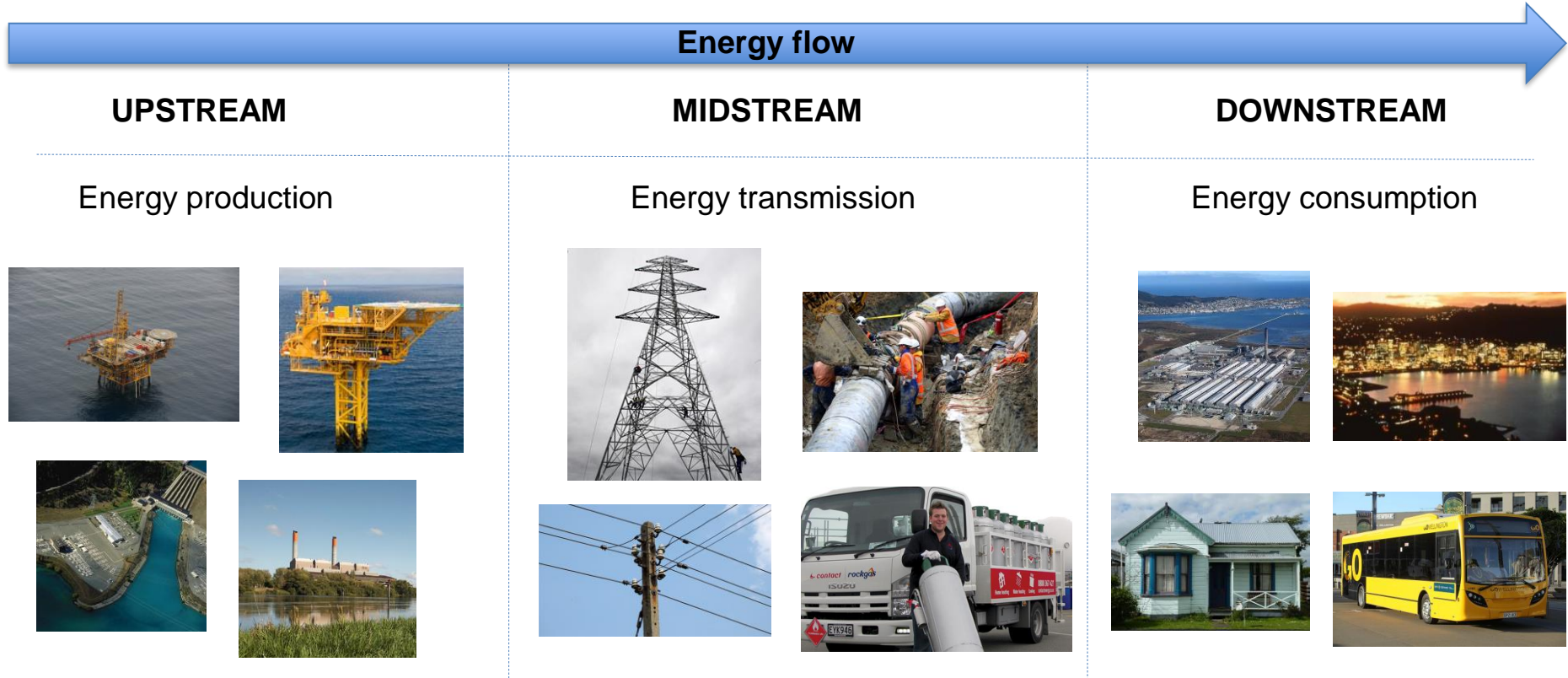


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# 'Supply-push' outdated as energy market philosophy

## Disaggregation to define forward energy thinking and doing



# 'Supply-push' outdated as energy market philosophy

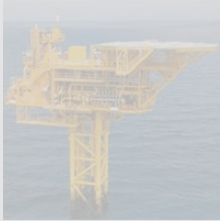
## Disaggregation to define forward energy thinking and doing



### HISTORY of decision-making leverage and power

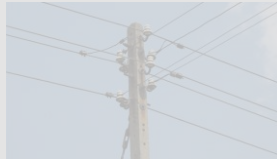
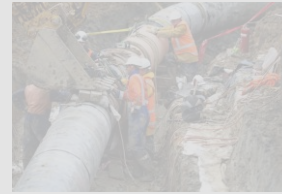
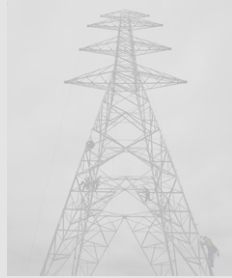
#### UPSTREAM

Energy production



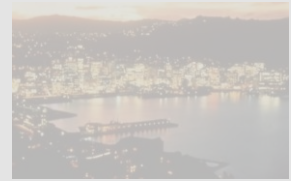
#### MIDSTREAM

Energy transmission



#### DOWNSTREAM

Energy consumption



# 'Supply-push' outdated as energy market philosophy

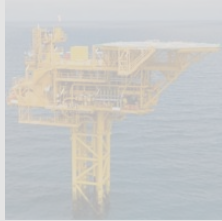
## Disaggregation to define forward energy thinking and doing



**FUTURE of decision-making leverage and power**

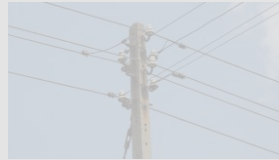
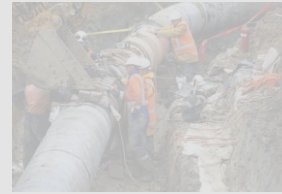
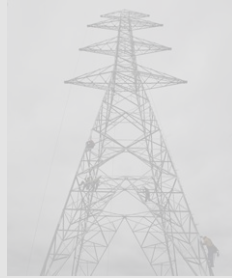
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Energy production



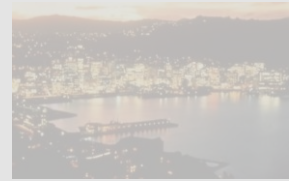
### MIDSTREAM

Energy transmission



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## Disaggregation to define forward energy thinking and doing



### The energy future:

#### 1. Fragmentation

- Replication instead of 'big bangs'
- Scale (micro)economics increasingly supportive

US shale 'factory drilling'



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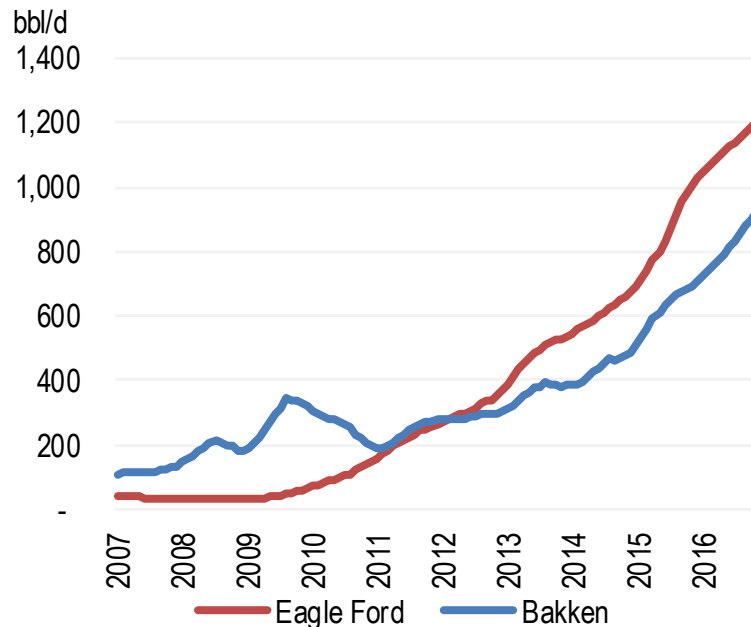


## The energy future:

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Shale new-well oil drilling productivity



Source: EIA, Woodward Partners

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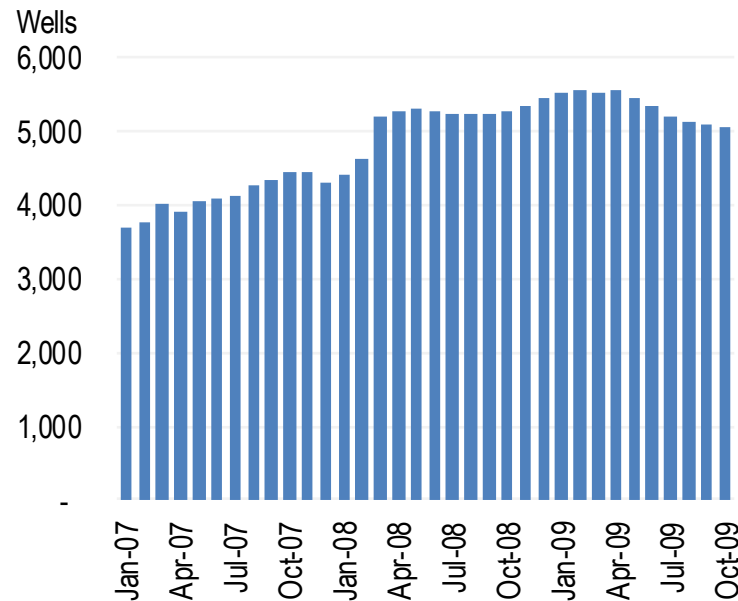


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US DUC wells



Source: EIA, Woodward Partners

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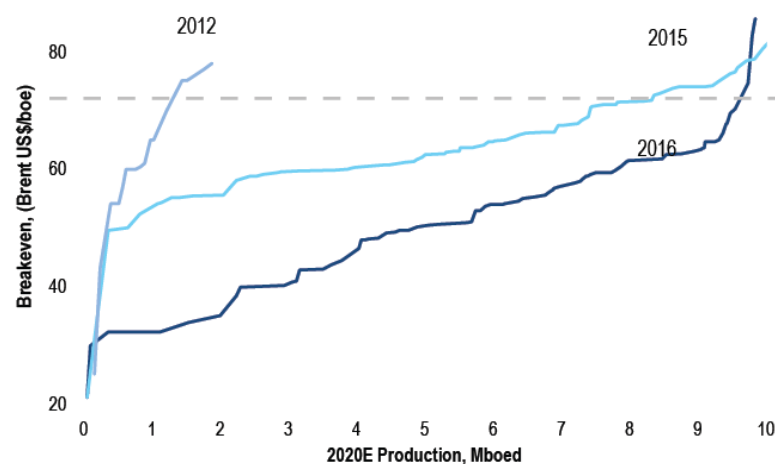


## The energy future:

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## US shale breakeven migration



Source: EIA, Woodward Partners

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Wellington Wind Turbine



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Makara Wind Farm



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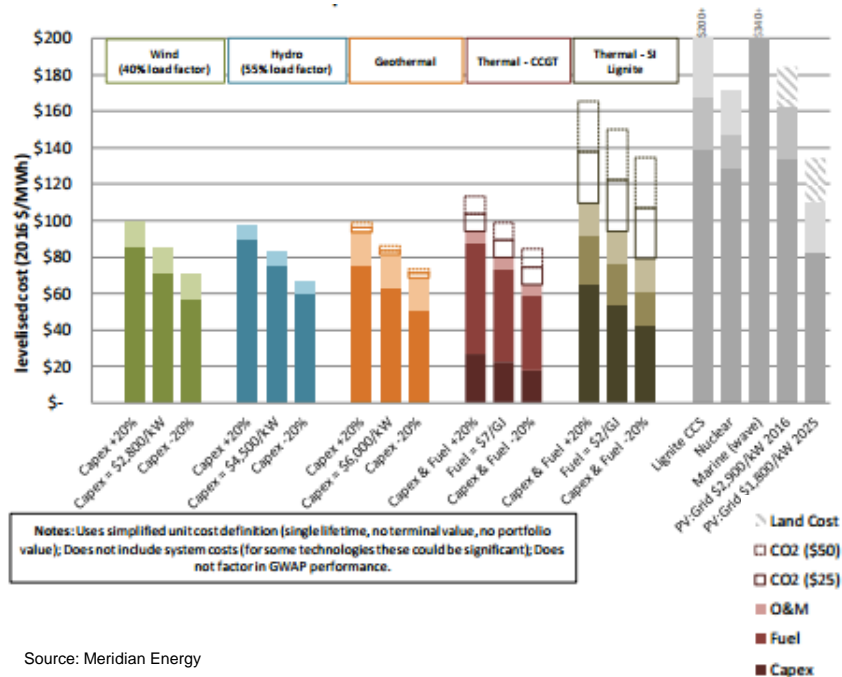


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### Levelised cost of energy (LCOE)



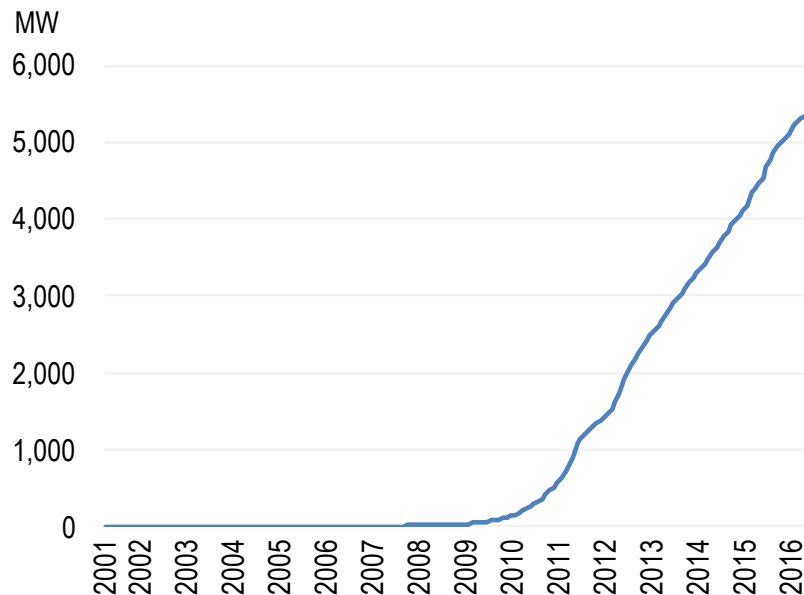
Source: Meridian Energy

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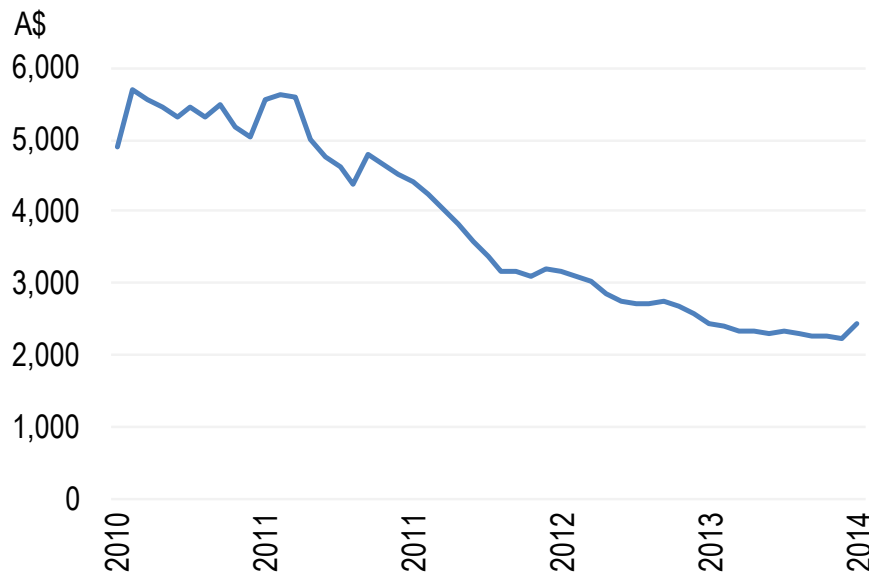


## Australian cumulative solar PV installed capacity



Source: APVI, Woodward Partners

## Australian solar PV installation cost, 2.5-4.5kW band



Source: APVI, Woodward Partners

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#### 2. Modulation

- EPC in fully controlled environment
- Supply chain standardisation, condensation

Then ....



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.... and now



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Source: Wrightspeed

- NZ Bus operates >1,000 buses in Auckland & Wellington, handling 60m passengers pa
- US\$30m deal to retrofit 60 trolley and 160 diesel buses with Wrightspeed drive trains
- \$100m investment programme to acquire 180 new double-deckers and extra-large buses designed to take Wrightspeed drive trains

*“We really want to move away from diesel completely. We will be expecting that to occur in four or five years anyway as battery technology improves.”*

- Zane Fulljames, CEO NZ Bus

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#### 3. Population

- Environment as societal priority
- Energy autonomy now a realistic goal
- Information ubiquity to drive uptake

**NZ SUPER FUND**  
*Te Kaitiaki Tāhua Penihana  
Kaumatua o Aotearoa*

### NZ SUPER FUND ANNOUNCES MULTI-FACETED CLIMATE CHANGE STRATEGY

Posted On: Wednesday, 19 October 2016

The NZ\$30 billion NZ Super Fund will become more resilient to climate change investment risk under a new strategy announced by the Guardians of New Zealand Superannuation today.

CEO Adrian Orr said climate change was a material investment issue with risks for long-horizon investors. "In coming years the global energy system will transition away from fossil fuels. Some assets we invest in today may become uneconomic, made obsolete or face a dwindling market."

"Reducing the Fund's exposure to these risks and to the physical impact of climate change is good for the portfolio, and consistent with our mandate to maximise returns without undue risk."

"Climate change, and the coming transition to a low-carbon energy system, also present investment opportunities for long-term investors that we intend to capture."

Mr Orr said the strategy represented a significant and fundamental shift for the NZ Super Fund.

Climate change strategy - [video](#) featuring CIO Matt Whineray

#### Downloads

- Climate Change Q&A**  
(PDF 322KB)
- NZ Super Fund 2015 Carbon Footprint**  
(PDF 356KB)

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**Demand-side**  
**"Power to the people"**



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# Gas as the transitional fuel



## Disaggregation to define forward energy thinking and doing

- Gas has been at the forefront of moves by industry to reduce carbon intensity, driven by economics. The result is particularly pronounced in North America where the 'shale gale' has driven the cost of gas sharply downwards. This has supported fuel switching and the retirement of 60 GW of coal-fired capacity since 2011. By 2020 gas-fired generation is expected to reach 140 GW, up from 75 GW in 2003, and GHG emissions from generation are expected to fall ~20%, to around 1995 levels.
- Post-GFC demand softness and LNG liquefaction over-build has also brought pressure to international gas price benchmarks, in both gaseous and liquids formats.
- Although demand growth remains modest in traditional markets, some less traditional gas-intensive markets such as methanol have shown very strong (~10% pa) growth on fuel blending and MTO.

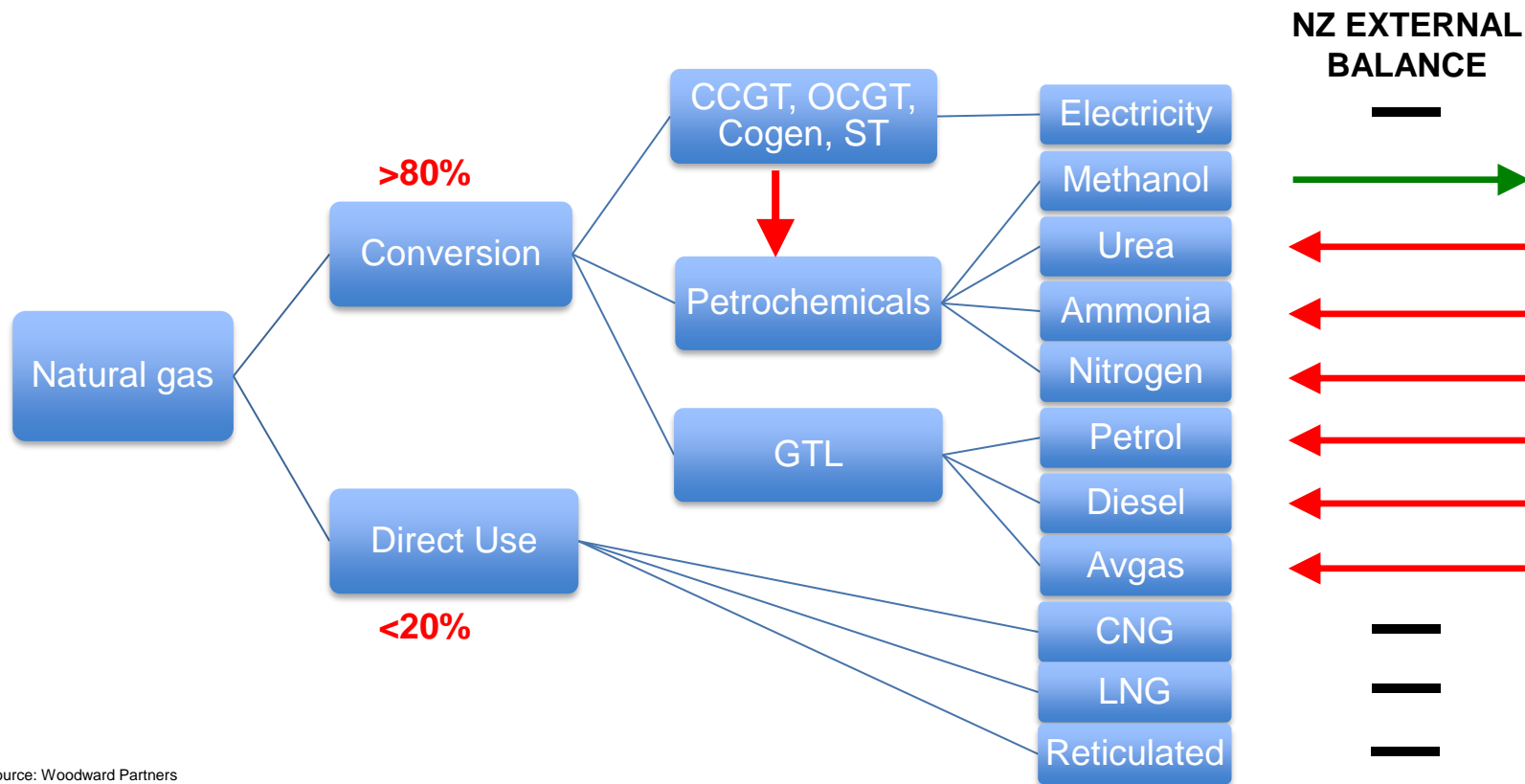


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# NZ Gas Inc

Demand: strong energy conversion end-use bias

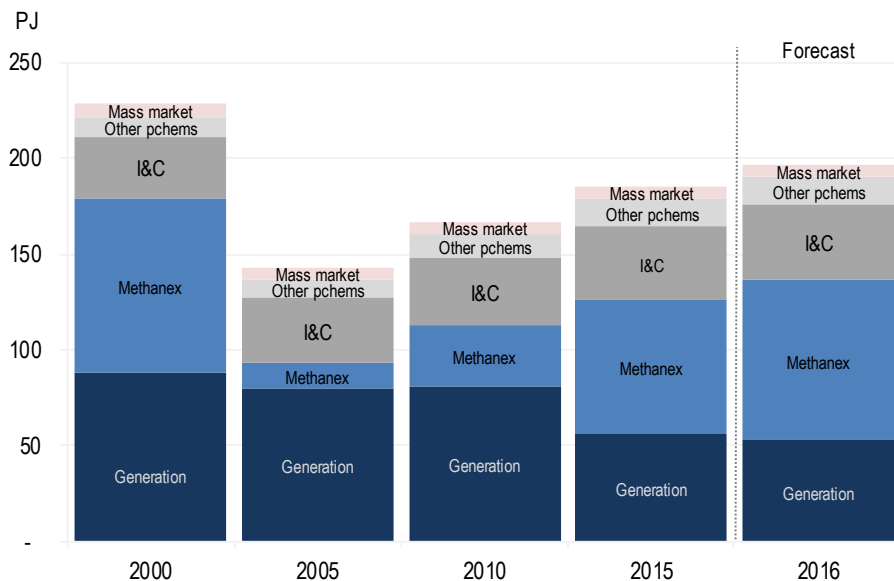


# NZ Gas Inc

Demand: Substitution of p'chem for generation gas still the central theme

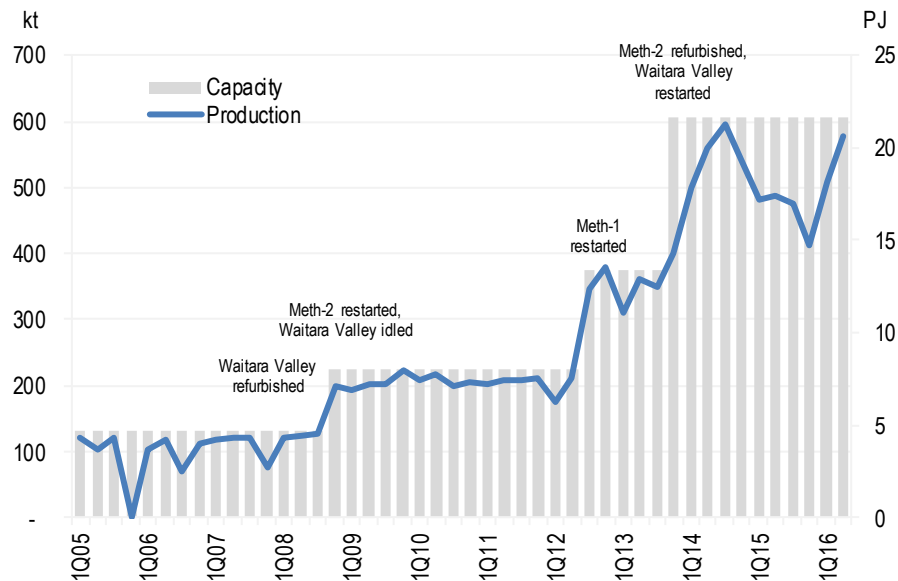


## NZ gas demand-side makeup



Source: Woodward Partners

## Methanex NZ quarterly production



Source: Woodward Partners

## Demand: Huntly Rankines a possible longer-term option?

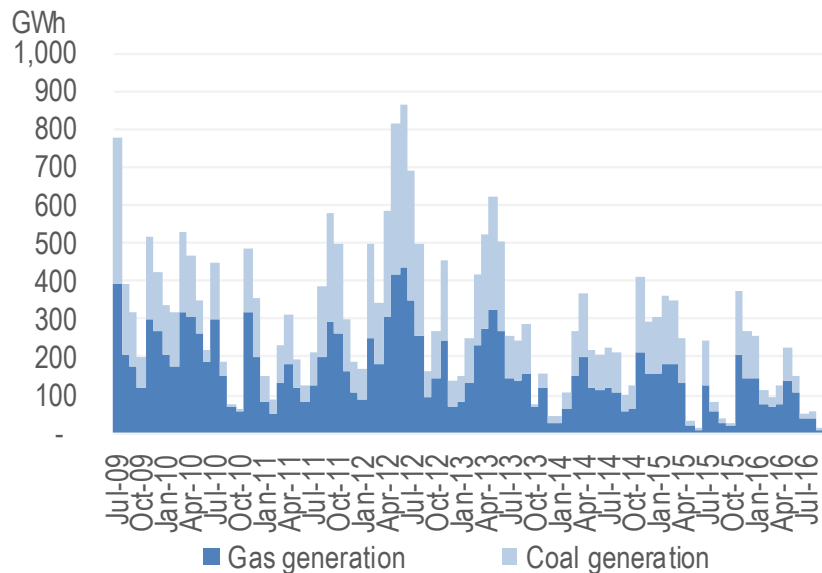
### Huntly thermal generating capacity

Unit	Format	Capacity	Commissioned	Heat rate kJ/kWh	Emissions tCO <sub>2</sub> /PJ	Status
1	Rankine	250MW	1982-85	10,900	Coal: 91,200 Gas: 53,500	Decommissioned 2013
2	Rankine	250MW	1982-85	10,900	Coal: 91,200 Gas: 53,500	Placed into storage 2013
3	Rankine	250MW	1982-85	10,900	Coal: 91,200 Gas: 53,500	Operating
4	Rankine	250MW	1982-85	10,900	Coal: 91,200 Gas: 53,500	Operating
5	CCGT	400MW	2007	7,300		Operating
6	OCGT	51MW	2004	10,525		Operating

Source: EA, Woodward Partners

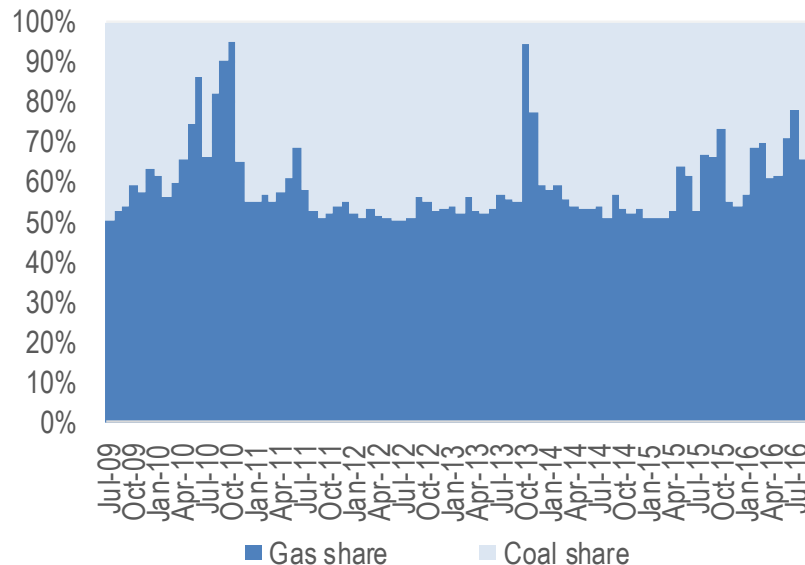
## Demand: Huntly Rankine fuel a material potential gas load option

### Huntly Rankine generation



Source: Genesis, Woodward Partners

### Huntly Rankine fuel-in split

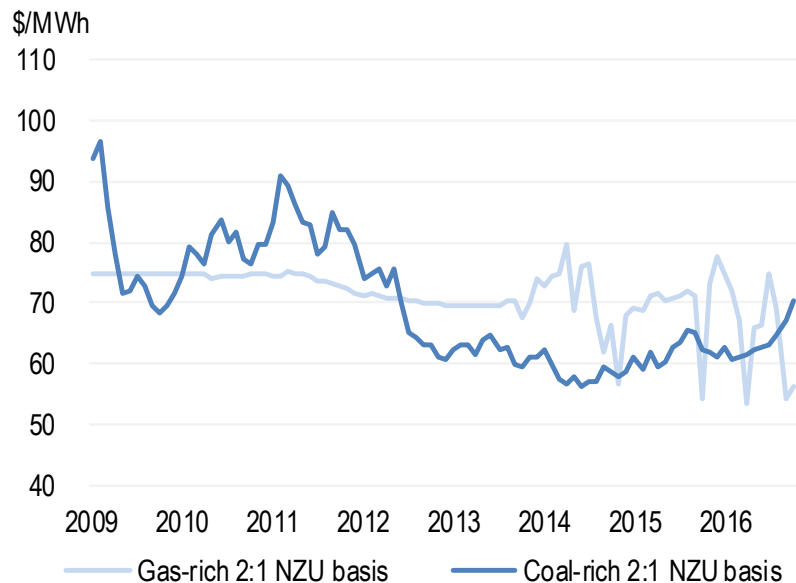


Source: Genesis, Woodward Partners



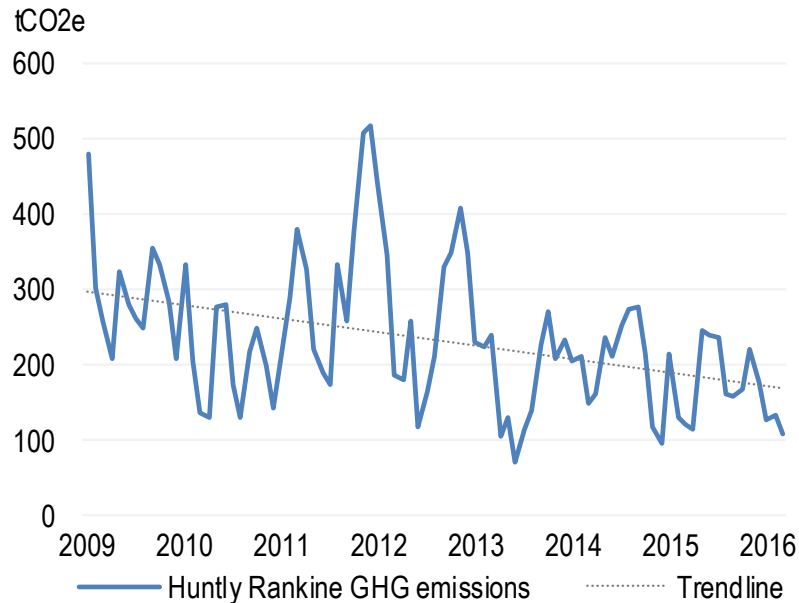
## Demand: Huntly Rankine fuel a material potential gas load option

### Coal vs gas price proxies



Source: Bloomberg, Woodward Partners

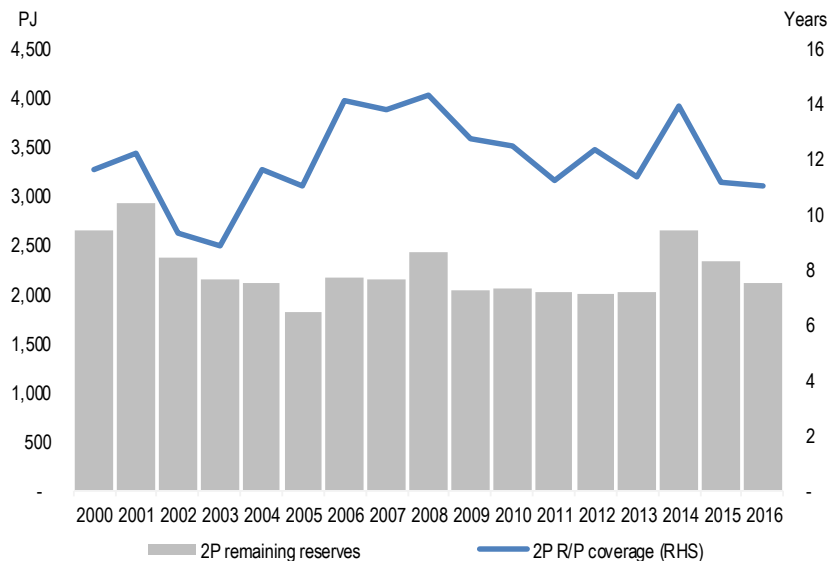
### Huntly Rankine GHG emissions



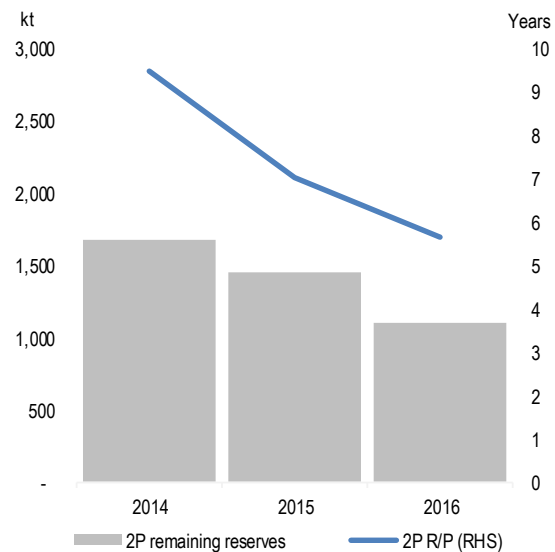
Source: Genesis, Woodward Partners



### Gas+LPG gross remaining 2P & R/P coverage



### LPG gross remaining 2P & R/P coverage



Source: MBIE, Woodward Partners

Note: there are significant interpretation caveats that apply in reconciling 2P LPG reporting with production data due to treatments of entitlements by field owners to Pohokura and Kapuni LPG within raw gas streams.

Source: MBIE, Woodward Partners



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