



Gas: Current headlines and what's coming at us....

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Let's talk gas in Queenstown...



- Superb location for the Conference.
- We have no natural gas in the South Island, but Queenstown and other South Island centres are well supplied with reticulated and/or bottled LPG.
- Allows us to step back a bit and talk about the current headlines in the NZ Gas Story, and look ahead to what is coming at us...
- To begin with, let's take a big step back from the lovely Queenstown setting and update the global energy story, particularly gas's role in that.
- The following slides utilise some personal reflections from my past year, including a couple of overseas travel opportunities this year.

World 1: population/economy growing; energy demand increasing (Indonesia)



- I travelled to Jakarta this year, as part of an International Energy Agency review team.
- While there, presidential elections took place, with energy one of the biggest issues.
- The photo captures both a regular weekday commute in Jakarta and the substantial energy issues the nation faces.
- Indonesia is transforming from a third world economy and wants to improve its standards of living.
- Providing basic energy to its approximately 17,000 islands (or at least the inhabited ones) is well advanced, but is still a priority.
- This has been driven by substantial fuel subsidies, that can aid less developed communities but also contribute to the sorts of issues seen in this photo.
- The total costs of these energy subsidies are now a major issue for the Indonesian economy, and it needs to find a more balanced path forward.

World 2: use of coal increasing (Indonesia/Australia)



Suralaya coal-fired power station (4,025MW) - Indonesia

- Indonesia has large gas reserves, but has committed much of these in export contracts.
- To fuel its growing economy, and support energy self sufficiency policies, it is proposing to rapidly grow its use of coal, especially for electricity generation.
- Indonesia and Australia are the world's largest coal exporters.
- Coal use is a major factor in growing concerns around climate change.

World 3: response to pollution and climate challenges growing (China)...



- I didn't travel to China this year, but was in Tienamen Square 25 years ago. And I don't recall it was so hard to see Chairman Mao's enormous portrait through the smog.
- The photo widens the focus on current Asian issues, and reflects recent media commentary about effects of air pollution resulting from economic growth on China's increasingly wealthy urban populations.
- Another highlight of my year was hearing from the Chinese delegation at the Asia Pacific Energy Regulators Forum in Auckland (organised by the Electricity Authority) on that nation's growing response to those issues.

World 4: renewables increasing (China)...



Three Gorges Dam hydroelectric power plant, Hubei province, China

- This photo is of the world's largest hydroelectric plant in terms of installed capacity, the Three Gorges Dam in China's Hubei province.
- China is the nation with the world's largest hydroelectric generation, wind generation and total renewable generation.
- But it still generates around 65% of its electricity from coal and is grappling with how to fuel its economic growth and associated impacts on its cities, climate, etc.

World 5: renewables are challenging global systems/investment (Europe)...



Residential photovoltaic installations - Germany



- I also visited Europe during the year, and found the biggest topic of energy discussion was around what is shown in these photos.
- Amongst other things, these demonstrate that Europe is at a quite different stage to much of Asia in its energy and economic development.
- Europe is much more intensely focussed on environmental issues and increasing renewable electricity generation.
- The current headline issue is the rapid growth in residential solar/photovoltaic installations, particularly in Germany, as shown in these photos.
- The installations have a number of advantages, but also a number of issues.
- They are expensive, and only economic for wealthier consumers and if supported by subsidies.
- Those subsidies, called 'feed-in tariffs', are typical of the European approach to government and policy.
- They have been widely criticised as distorting the market, including because less wealthy consumers who do not have these rooftop installations can essentially end up cross-subsidising those who do.
- There are also the increasingly-recognised issues for energy network owners, both technical issues of accommodating variable supply and challenges to traditional network investment models if increasing amounts of load go 'off grid'.
- The second main energy issue being discussed in Europe was threats to gas supply security resulting from the Ukraine crisis.
- European nations had already begun addressing such political risks by diversifying gas supply options, including through construction of LNG import facilities.

World 6: 'Shale gas revolution' is rapid and transformative (U.S.)...



Accessing unconventional gas can be intensive. Over 15,000 wells have been drilled in the Barnett Shale resources, Texas.



Shale gas drilling on the outskirts of downtown Fort Worth, Texas

- To complete the global tour, and to bring this narrative increasingly towards gas issues, arguably the biggest current energy headline of all is about the transformative developments in unconventional gas.
- This is occurring especially in the U.S., with what has been called the 'shale gale'.
- That term imports the remarkable rapidity with which the Americans have not only brought unconventional gas to market but with huge scale.
- The first photo shows over 15,000 wells drilled in the Barnett Shales.
- And while European and other nations are still debating the potential impacts on populations, including from fracking, the second photo exemplifies a U.S. willingness to drill right next to cities.
- Shale gas has transformed the U.S. economy and energy security. The U.S. is turning from a large energy importer to a potentially large exporter (it is still working through historical controls on energy export, imposed to promote national energy security).
- And it has had global implications. Another remarkable story during my European trip was about how a CCGT plant had been both commissioned and shut down on the same day. The cause was a surge in cheap coal imports from the U.S. and a resulting surge in coal-fired generation displacing gas-fired capacity. The U.S. exports were to some extent justified as a help to Europe in mitigating threats to gas supply from the Ukraine crisis, but were certainly facilitated by the U.S. energy surplus arising from shale gas production.

...gas use is expanding and changing the global energy debate...



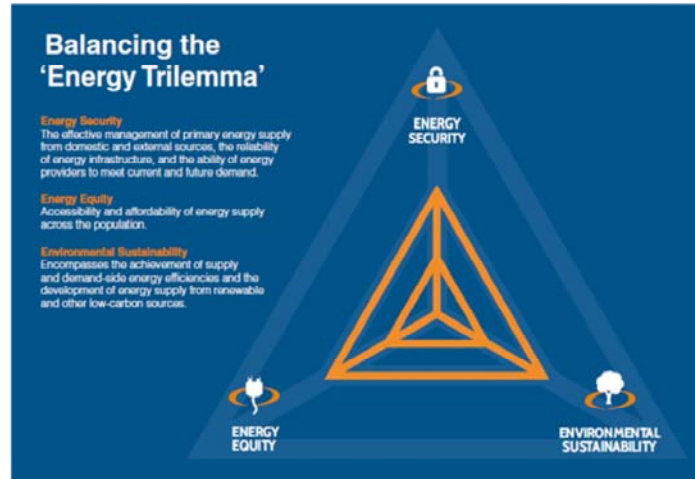
- The U.S. unconventional gas story is developing in other countries.
- Our neighbours in Australia are well-advanced with \$80billion investments in east coast LNG plant designed to draw on coal seam gas (although they are striking a number of problems, such as concerns about fracking, land access and domestic gas prices rising to match export prices).
- The International Energy Agency has characterised this as 'a golden age of gas'.
- The IEA has also reported, consistent with other agencies including NZ's Parliamentary Commissioner for the Environment, that the reliance on fracking and similar technologies is also appropriate providing it is subject to good regulation and in accordance with industry best practice.

...and gas has a key role in the sustainability/climate challenge...



- The other key aspect of the global gas story is its part in the sustainability/climate challenge.
- As NZ's Parliamentary Commissioner for the Environment has said in her recent report, addressing environmental management aspects of fracking does not give the industry a 'clean bill of health', insofar as the sustainability/climate challenge remains to be addressed.
- It is not possible to deal with that challenge fully in this presentation, but it is a key part of my narrative reviewing gas's part in the current global energy issues.
- The IEA's 'golden age of gas' incorporates the important idea that gas can particularly replace coal and reduce global carbon emissions.
- A remarkable example is in suggestions that the U.S., having refused to sign the Framework Convention on Climate Change or its protocols, is expected to meet targeted 1990 emission levels regardless as a result principally of shale gas.
- The challenge remains enormous, with the IPCC's most recent report highlighting calling for a halt to use of carbon-based fuels by the end of the century to avoid the 2-degree temperature increase that would result in catastrophic climate impacts.
- And leading oil companies are also recognising the need to a transition away from carbon fuels. The issues are around how quickly that transition can occur.
- And it is important to acknowledge that NZ has its own issues and solutions to find – in relation to gas, we already have a high percentage of renewables, and not as much coal to displace as the U.S., Indonesia or China. I will turn to the NZ story shortly.

World Energy Council's 'Energy Trilemma' offers a view of a 'balanced' future



- This photo narrative has only quickly sketched the current global gas and other energy headlines. These are so complex that they can be hard to get our heads around.
- One useful way to at least frame the global story is to refer to the World Energy Council's 'Energy Trilemma'.
- I have touched today on aspects of the energy security and environmental sustainability; the Trilemma also covers the key issue of energy equity (or affordability or energy poverty) which I will touch on shortly in the Auckland context.
- Rob Whitney will talk in more detail at this conference about the work of the Council and also Business NZ's Business Energy Council.
- But we need to turn next to current NZ headlines and where the NZ Gas Story may head in future...

So let's talk about New Zealand...



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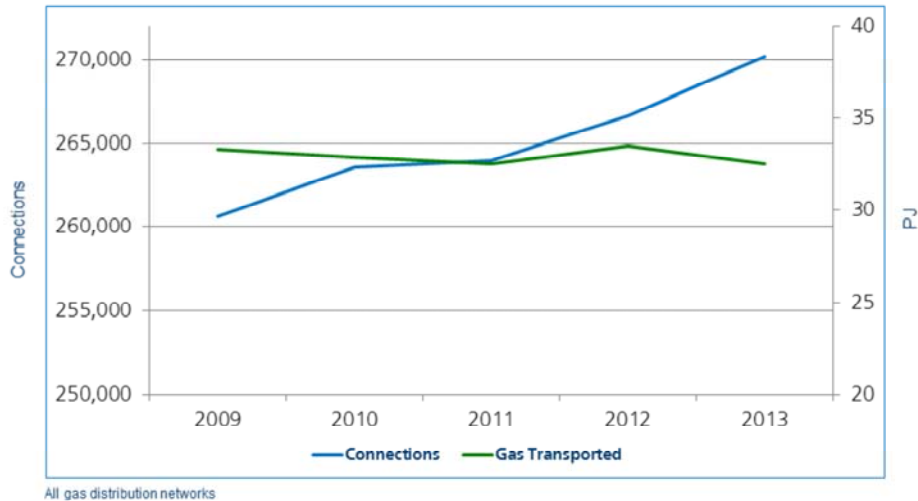
- Bringing the global energy story back to NZ, these photos of an Auckland traffic jam capture some of our peak issues.
- These can cause genuine frustration for Aucklanders.
- But compared with my opening photo of the Jakarta traffic jam, they are a reminder that we have much to be thankful for in lifestyle and energy terms.

Auckland City's new 'low carbon' plan challenges role of gas...



- The new Auckland City provides us with an interesting link between the global gas story and the NZ gas story.
- The City is developing its new identity and strategies.
- It has a vision to be 'the world's most liveable city'.
- And it has rightly identified that energy and energy infrastructure are key inputs to the City's strategy and success.
- In scanning international cities to find those who can serve as the best comparators, Auckland City has developed a 'low carbon' energy goal, which it has now incorporated into a 'Low Carbon Auckland Plan'.
- The Plan obviously challenges gas and other carbon fuels, and in a similar way to the global energy challenges we have discussed.
- How that fits with national energy policy and energy markets, and also the City's other strategies and plans, is interesting.
- The Plan's development led to an important opportunity for Gas Industry Co to work with the LPGA and GANZ in making submissions that reworked and recomunicated the NZ Gas Story for Auckland.
- Following representations to the relevant City working group, I'm pleased to say the Plan broadly provides for gas appropriately within a 'low carbon' framework. It essentially boils down to a list of actions that the City can take to promote a low carbon future for Auckland, while providing for the current reliance of around 100,000 consumers on gas and recognising it is a legitimate consumer energy option in coming years, including as a carbon fuel within a low carbon plan.
- I emphasise carefully that it was not appropriate for our coalition to argue to remove the 'low carbon' goal, and it is important that the industry understands that.
- Our submissions also ensured consistency with the City's other strategy and planning documents that recognised elements like the need to ensure energy choices for Auckland communities and businesses, including providing for maintenance and development of the pipeline and other infrastructure needed to support that.
- Another facet, which I referred to earlier, was that the City's goals include addressing energy equity or affordability issues – a number of the low carbon alternatives referred to in the Plan would likely increase consumer costs, and that had not been fully analysed.
- Most importantly, we needed to ensure the up-to-date NZ Gas Story was understood and provided for appropriately. The following slides summarise the key elements of that Story.

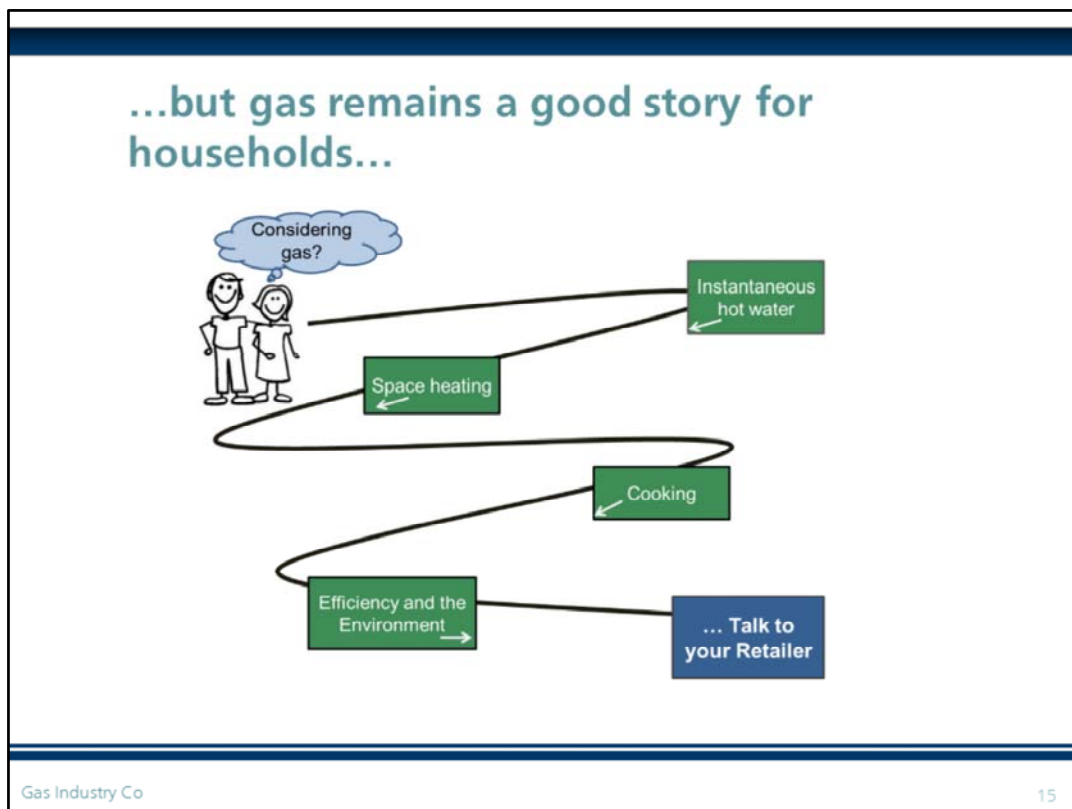
Auckland has 100,000 gas consumers, although trends are mixed...



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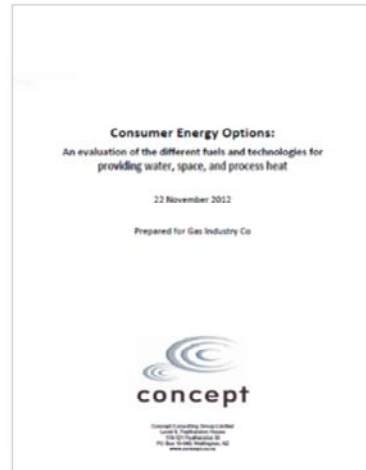
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- This chart shows connections on national distribution networks on the left hand axis and the blue line.
- Gas volumes transported on those networks are then shown on the right hand axis and the green line.
- This shows that connections have continued to increase in recent years, and distribution pipeline kilometres show a similar trend.
- This is principally based on new subdivision connections, particularly as part of Auckland's population and housing growth, but also in key regional centres.
- But the contrasting trend is that gas transported and consumed has been flat-to-dropping.
- This is consistent with national energy consumption trends – electricity moved away some years ago from the traditional paradigm of 2% demand growth per annum.
- And it is increasingly recognized that the traditional NZ correlation between economic and energy demand growth has been disjuncted.
- This trend is also seen in Europe and other developed economies, and is particularly interpreted as consumer response to rising energy costs, including in markets increasingly exposed to competition; and particularly through companies seeking increased energy efficiency.



- Gas Industry Co is not tasked with promoting or marketing gas, but we play a role in providing independent analysis.
- At the residential level, this has shown that gas continues to be a good story.
- The simple question is 'should Mr and Mrs Jones consider investing in gas for their home, whether building a new home or refitting their existing home, compared with their other energy options?'
- The answer to that is dependent on the individual house and family, but the following traditional narrative remains true.
- First, it still makes sense to invest in an instantaneous gas hot water system, including covering the cost of a new gas connection.
- The traditional story that 'once connected to gas, connecting more appliances is more efficient' also holds true, and at this point a gas space heater competes very well with a heat pump.
- This point is particularly poorly understood, but is also supported by EECA's analysis and reporting.
- Many people focus on think heat pumps are fuelled by '75% renewable electricity generation' and that heat pumps are '300% efficient'. A proper analysis finds that whether heat pumps or gas space heaters are best is very close in many cases, and again depends on the individual household.
- And then Mr and Mrs Jones should also look at gas cooking.
- The independent analysis done for us also confirms that 'direct use of gas' continues to be competitive in terms of carbon footprint, and that the traditional lifestyle benefits of gas (hot showers that don't run out, gas heater 'visible flame', preference of chefs for gas cooking) are all additional benefits.

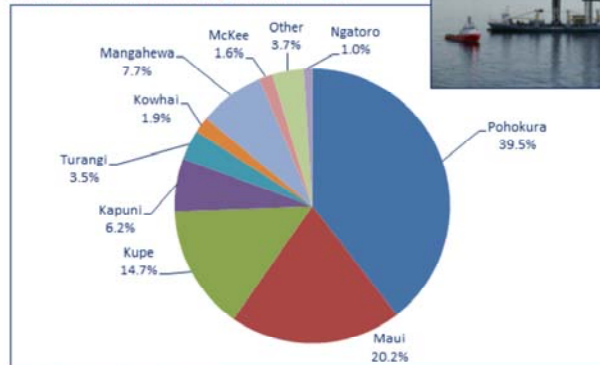
...and gas remains the leading option for industrial/commercial 'process heat'...



- The independent analysis also confirms that gas remains the preferred option (and in many cases the only realistic option) for process heat in industrial and commercial applications.
- The analysis can be found on Gas Industry Co's website in the *Consumer Energy Options* report from Concept Consulting.

Before looking ahead, let's remind ourselves we now have diversity of supply...

Net Natural Gas Production by Field 2013 – 181PJ

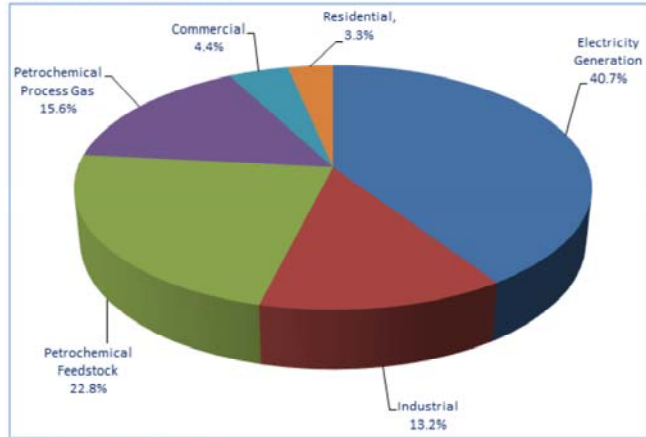


Source: 2014 Energy in New Zealand
Other includes Cheal, Sidewinder, Rimu

- There are a few other current NZ headlines to highlight before we move to 'what's coming at us?'
- NZ has moved from a strong reliance on just the Maui and Kapuni fields to 15 current producing fields, albeit all in Taranaki.
- That's much greater diversity of supply.

80% of gas used as a transition energy for electricity/petrochemicals; 248,000 households use just 3.3%

Consumer Gas Use 2013 (174PJ)

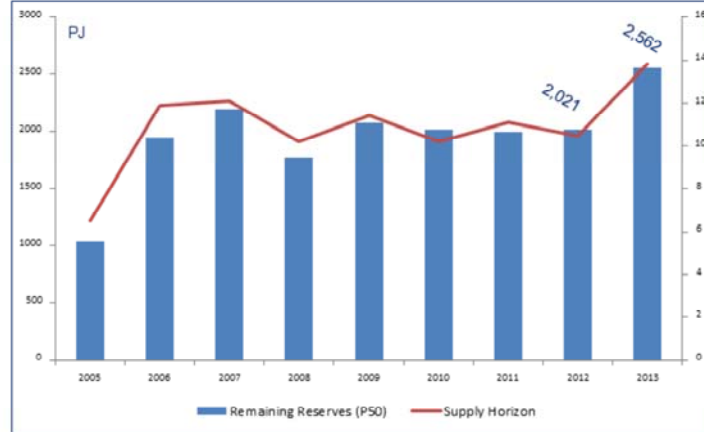


Source: 2014 Energy in New Zealand
Petrochemical usage accounts for 38.4% of total

- Currently 80% of NZ's gas is used in transformation to electricity or petrochemicals.
- Those two industries use about equal proportions of that 80% (40% + 40%), although gas-fired electricity generation has been dropping as new renewable capacity has displaced it and petrochemical manufacture has increased, particularly as a result of Methanex restarting its third methanol production train.
- Methanex alone now takes around 40% of NZ gas. This has large benefits, including in incentivising new exploration and production investment, such as at Mangahewa in recent years. And Methanex has indicated a potential appetite to take more gas in future, including possibly through development of a new fourth train. However, having one consumer taking 40% of supply also has some risk attached; as with the country's current reliance on the Pohokura field for 40% of supply.
- In contrast to most overseas jurisdictions, our 248,000 households continue to consume only a small proportion of NZ's gas (3.3%)
- The remaining proportion is used in industry and commerce, including some of NZ's largest industries (dairy, steel, oil refining and forestry).

We have good reserves currently, and...

Remaining Reserves/Supply Horizon 2005-2013



Source: 2014 Energy in New Zealand – P50 reserves

- A key recent headline was the increase in MBIE's gas reserves figures.
- As the chart shows, NZ reserves hit a low in 2005 of only around 6 years' P50 reserves-to-supply ratio.
- It grew back to around 10-12 years, which is close to the sort of traditional levels seen internationally, where further upstream investment may not be warranted.
- The jump in the 2013 reserves figures shown on the chart is equivalent to nearly 3 years' supply at current levels of approximately 190PJ per annum.
- The important sub-theme was that the increased reserves came not from new fields but from new investment in the key existing fields, including Maui, Kapuni, Pohokura and Mangahewa.

...a lot of investment is going into finding new petroleum resources...



Drillship, Noble Bob Douglas,
drilling Anadarko's deep water
Taranaki Basin well in 2014

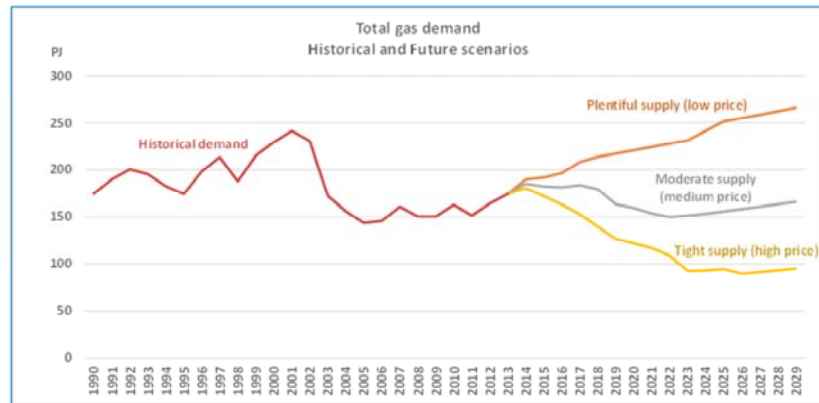
- And beyond those current reserves figures, there remain healthy levels of upstream investment, which have flowed from the Government's Petroleum Action Plan.
- There have been some disappointments in the recent period, for example around Anadarko's lack of success in its recent drilling programme.
- But there remains ongoing confidence around the good levels of committed investment, and more prospects beyond through the Block Offers Programme.

But there are some important questions...

- How long will current 'supply overhang' remain?
- Would Tiwai Point closure free up more gas?
- Where is the next Pohokura or Maui?
- How could New Zealand use a lot of new/excess gas?

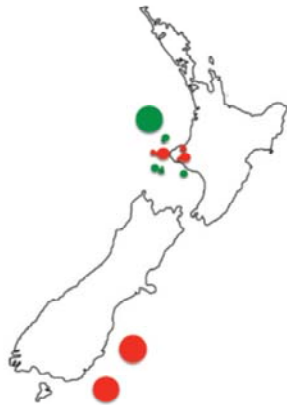
- There are a number of issues in behind the current NZ headlines.
- The gas market has been characterised for some time as having a 'supply overhang', which has led to take or pay issues for some, and should see softening of prices. There are also relatively high levels of gas reinjection at some fields.
- There are a number of risk scenarios that could see significant market changes. One that has been in the headlines is the implications of the possible Tiwai Point aluminium smelter closure, including potential closure of gas-fired generators and resulting freeing up of significant gas on the market.
- While the increased 2013 reserves figures are heartening, some commentators see this as only a short-term alleviation of concerns that a new field is not yet in view, especially given that significant new fields typically take around 10 years to commercialise. A comparison is the similar concerns around 2000 when Maui was expected to deplete, and there was industry relief when Pohokura emerged as the replacement and Kupe also became economic to develop. Hence the question 'where is the next Pohokura?', and explorers are certainly targeting a new field of Maui size or more.
- Finally, even if NZ was to have excess gas beyond current demand levels, there is a question how NZ could utilise that. In other words 'would the NZ market grow or would it be demand-side constrained?'
- With those issues in mind, let's turn from the current headlines to look at the future NZ gas scenarios.

So there's a range of future NZ gas supply scenarios...



- One of Gas Industry Co's key contributions is development of NZ's first gas supply/demand study.
- This was first developed in 2012 to help diagnose whether there was a need to build new transmission capacity for Auckland and Northland. It was built on input from key consumers and other market participants, so has been updated and serves as a valuable wider tool for investment decisions.
- The recently updated second edition of the study posits a moderate supply scenario that essentially sees a continuation of supply around current levels; a tight supply if we cannot continue to replace reserves; and a plentiful supply scenario particularly if significant new reserves can supply the domestic market.
- The plentiful supply scenario would see NZ back around our historical peak in 2004 when Maui was at its peak.
- That plentiful supply scenario is not a maximum case, nor are any of the scenarios predictions – they are three reasonable scenarios amongst the range of all possible ones, that can usefully promote thinking and discussion.

...and a range of scenarios for commercialising new gas discoveries...



- During the year Gas Industry Co commissioned a 'thinkpiece' paper from John Kidd of Woodward Partners on how any new gas discoveries could be commercialised in NZ.
- The slide illustrates a few of the key points.
- The green circles on the map at left identify 'oil plays', while the red circles are 'gas plays'. The size of the circles indicates the size of the play.
- The map shows that most gas plays remain around Taranaki, and that those are likely to be small-to-medium in size. Any larger gas plays are likely offshore deep south.
- This leads to the photo on the right. This is the Shell floating LNG vessel *Prelude* that is being referred to as the largest ship ever constructed. The smaller vessel is an LNG tanker. Although the Shell vessel is still in construction and is the first of its kind (certainly at this scale), the technology and cost improvements mean that there are around another 30 being constructed.
- The point for NZ is that a large offshore gas find could be exported as LNG, because this is likely to provide the best commercial return.
- The thinkpiece suggested that there are still prospects, for finds smaller than those which are economic to export, for new South Island supply to be commercial.
- This is especially if there is no associated export linking NZ to international pricing, an issue that Australia is currently confronting.
- To take just one example of South Island potential, I mentioned briefly earlier that Methanex has indicated an interest in further methanol production. It has spoken recently about potential for a 20-year gas contract to underwrite a greenfield South Island fourth production train.

...including some developing new technologies



Duel diesel/LNG powered train - USA



LNG-powered truck



Shell LNG refuelling station - Canada

- And there is scope for gas demand to grow in other areas.
- The photos illustrate interesting new transport LNG applications being commercialized internationally.
- NZ's reliance on imported oil for the 50% of primary energy consumed by the transport sector means this is a fertile area to explore.
- Although there has been a focus in recent years on electric-powered vehicles, LNG is finding a role internationally with larger transport (including trains, ferries and barges).
- There is also a growing focus on blending methanol in petrol internationally.
- A primary issue for NZ is the limited scale of transport fleets compared with the cost of infrastructure.
- But technologies are developing rapidly and this is a space to watch.

So where are we up to?

- Gas is becoming increasingly important to global energy/environment challenges
- It has made a major 45-year contribution to New Zealand and has more to offer
- Supply horizon is encouraging and ongoing investment is high
- Gas remains a competitive form of energy for residents through to large industrial, but use is changing
- Current discussion is around what future role for New Zealand gas will be
- There are opportunities to expand its use in New Zealand, but also export scenarios

- So summing up....
- NZ is a relatively isolated place, including in terms of gas supply. It is important that we understand the rapidly growing importance of gas globally, including in the context of the global climate challenge. Those global aspects may affect us going forward in a number of ways.
- The NZ Gas Story is still not well understood, in particular its remarkable 45-year history and ongoing contribution. Developing and sharing that Story has become a key role for Gas Industry Co.
- The current headlines for the NZ Gas Story are generally good, particularly with increased reserves and good ongoing upstream investment.
- In contexts like development of Auckland City's vision and plans, the Gas Story remains a good one for residential through to large consumers.
- There are a number of scenarios going forward, with potential for domestic supply/demand growth but also for export.
- And there are new technologies and other opportunities that could see new demand if we have excess supply in future years.
- Key industry players, including Gas Industry Co's shareholders, are thinking hard about the future of the NZ Gas Story. Again, Gas Industry Co has a key role in informing and guiding that process.

and where are we going?

*After 45 years, developing the second phase
of the NZ Gas Story...*