

Gas Industry Co Briefing to Incoming Minister of Energy and Resources - Hon Judith Collins

January 2017

1 Key Points Summary

1. The Government has played a key role in the development of an indigenous gas industry from the 1950s, supporting national energy diversity and security, and gas continues to provide around 21 percent of the country's primary energy supply. The gas industry has undergone significant transformation in recent years as it has moved from a reliance on a single dominant field – Maui – to supply from multiple smaller fields. This has brought greater complexity to gas markets, more participants and a greater range of governance requirements.

2. In this context, Gas Industry Co was established as:

- the 'industry body' and 'co-regulator' under Part 4A of the Gas Act 1992 (the Act) to develop governance arrangements for the downstream gas industry.

In essence, 'co-regulation' requires Gas Industry Co to work closely with the industry; prefer developing non-regulatory options to address industry governance issues; and recommend any regulatory governance arrangements to the Minister for her approval.

- a special-purpose company, owned by industry shareholders and governed by a Board of Directors appointed by the shareholders. The Board has a maximum of seven Directors, the majority of whom, including the Chair, are required to be independent of the industry. It has been chaired since inception by the Right Honourable Jim Bolger, ONZ.

Gas Industry Co continues to fulfil the original intention to provide a 'right-sized' vehicle to reflect New Zealand's small downstream gas industry and its unique features. It relies on Gas Industry Co's owners remaining 'broadly inclusive' of the industry. Gas Industry Co's share register has grown in recent years, and its shareholders represent the majority interests at each level of 'industry participants' – e.g. gas production; gas pipeline ownership; gas retailing; etc

3. Gas Industry Co's role is to:

- develop downstream gas governance arrangements that improve:
 - the operation of gas markets;
 - access to gas infrastructure; and
 - consumer outcomes.
- develop these arrangements with the principal objective to ensure that *gas is delivered to existing and new customers in a safe, efficient, reliable, fair and environmentally sustainable manner*; and
- oversee compliance with, and review, such arrangements.

Gas Industry Co is required to have regard to the Government's policy objectives and outcomes for the gas sector, and to report on the achievement of those objectives and on the performance and current state of the New Zealand gas industry.

4. Gas contributes to New Zealand's energy supply as a direct fuel source, supporting electricity supply security and providing energy choice for around 268,800 consumers. Apart from a portion of imported LPG supply, New Zealand remains an 'islanded' market supplied entirely from Taranaki oil/gas fields, so gas supply and demand need to balance.
5. Gas fuels around 15 percent of electricity generation and underpins the New Zealand operations of sectors that make a major contribution to the nation's economy. Around half of domestic supply is used for petrochemical production and other key users include dairy, pulp & paper, refining and food production sectors.
6. The industry is on track to meet both Government and consumer expectations for the downstream gas sector. In particular, gas markets are more efficient and competitive, resulting in growing connection and customer numbers. Significant work remains for Gas Industry Co in the coming period. The current Work Programme focusses on development of a single new multilateral code for gas transmission and associated issues of gas balancing, gas quality, transmission security & reliability and gas reconciliation.
7. Gas's role is changing significantly. A key example is the reducing use of gas for electricity generation, although gas has also developed an important 'peaking' generation role (especially to meet growing morning and evening peak demand in Auckland) facilitated by new gas turbine technologies.
8. Looking to the future, significant ongoing change will be driven by a combination of factors:
 - The fall in global oil prices has seen a corresponding drop in the upstream investment required to replenish gas reserves, which has been reflected in lower responses to the annual Block Offers in recent years. Long term gas supply/demand scenarios commissioned by Gas Industry Co identify that gas supply conditions will most likely tighten over the next several years due to the current low levels of exploration coupled with relatively high levels of demand (although residential and commercial gas users are unlikely to be affected in that period).
 - The gas industry is being indirectly affected by new electricity technologies, such as electric vehicles, solar/photovoltaic panels and imbedded generation.
 - As a carbon fuel, gas's role is affected by climate change issues and responses. While gas is already playing a key role globally in reducing coal use, and can offer a lower carbon footprint in New Zealand than other alternatives (e.g. home hot water heating), both consumer choice and meeting the Government's commitments under the 2015 Paris Agreement will entail further change.

- It is important that gas's current role and its future role in the transition to a lower carbon future are well communicated and understood, rather than grouping it with other 'fossil fuels'. Chapter 6 below discusses this in more detail.
9. Gas Industry Co looks forward to maintaining regular meetings with you, particularly to report on the performance and current state of the industry and on specific matters which will be the subject of Gas Industry Co recommendations and advice to you.

2 Key Gas Industry Background

'Natural Gas' includes 'LPG'

The gas industry, and most of the following Briefing, focuses on 'natural gas' extracted from oil fields along with oil and condensates, and transported in pipelines around the North Island. It also refers to 'liquified petroleum gas' or 'LPG', which is a mix of propane and butane gases extracted from natural gas, and which is distributed nationally.

Key Gas Industry Statistics

Gas in New Zealand

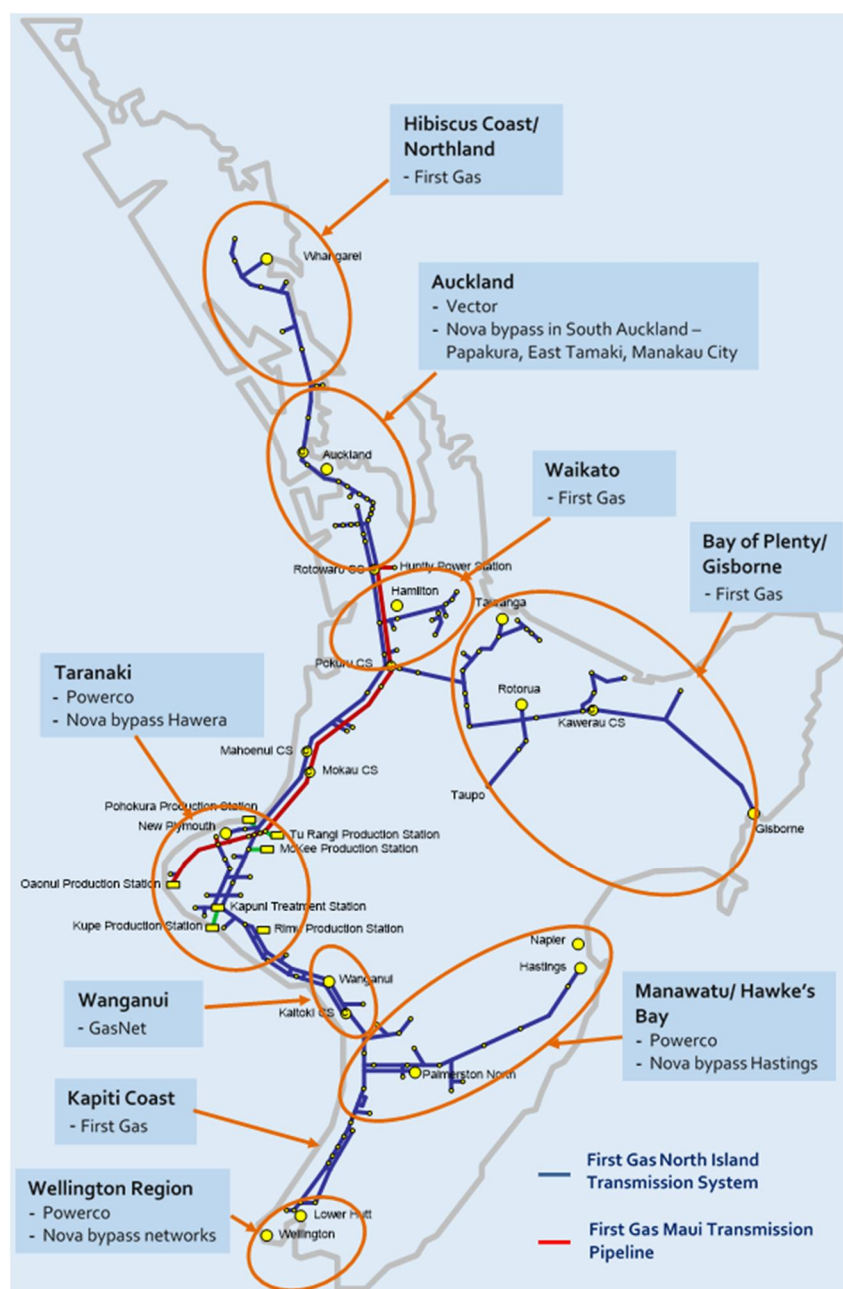
- Natural gas has contributed to New Zealand's energy supply for over 40 years. By its nature, the gas industry is dependent on a range of players, from upstream explorers and producers through to customers, as well as on competitive markets and ongoing investment at all stages.
- Natural gas is produced from 15 fields, all onshore or offshore Taranaki, and is available only in the North Island.
- The forecast gas reserves-to-production (RTP) ratio for January 2017 is 9 years. This is down from the 10-12 years range experienced over the last four years. The fall reflects a drop in P50 gas reserves together with strong gas demand.
- Total gas market demand in the most recent calendar year (2016) was approximately 190 petajoules¹ (PJ).
- Natural gas accounts for 21 percent of total primary energy supply and 14 percent of consumer energy.
- Gas is used by approximately 268,800 consumers (253,000 residential; 14,000 commercial; 1,800 industrial).
- Gas underpins electricity supply security. Around 27 percent of natural gas production is used for electricity generation. Gas fuels 15 percent of total electricity generation, which remains strategically important in terms of security of supply, including in a context of growing renewable generation.
- Nearly half of natural gas is used in petrochemicals manufacture (methanol and urea fertiliser), as feedstock and as process fuel.
- Industrial customers, who include many of New Zealand's key export industries (such as dairy, steel manufacture, oil refining and forestry) consume around 16 percent of annual natural gas production.
- The commercial and residential consumer groups respectively account for about 5 percent and 4 percent of annual natural gas consumption.
- LPG market demand is approximately 152,000 tonnes a year. LPG is imported from and exported to Australia at different times, depending on whether domestic consumption meets or exceeds supply.

¹ petajoule = 1 million gigajoules (GJ). Based on average residential consumption of 23 GJ/year, 1 PJ equates to the annual gas consumption of approximately 43,500 households.

Gas Transportation Systems

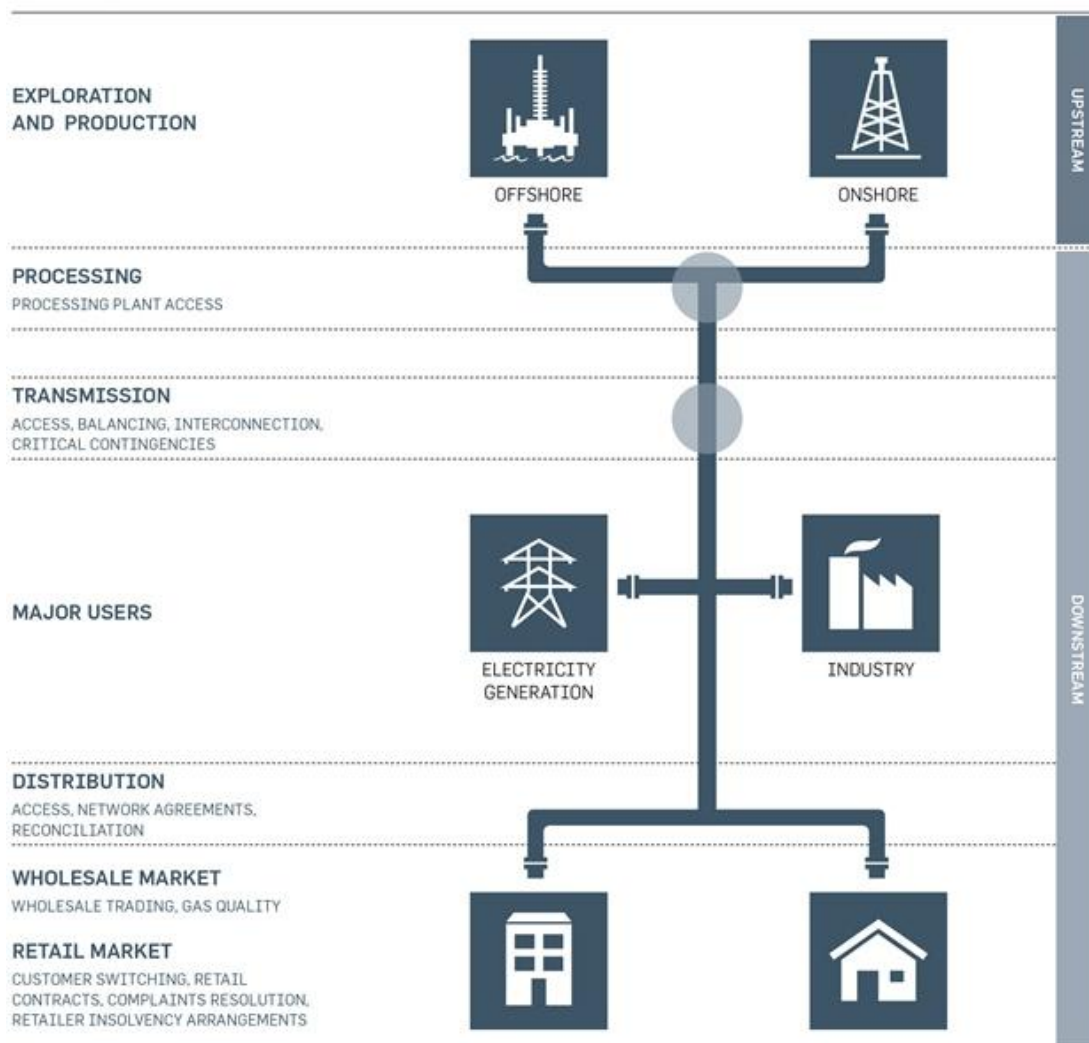
Natural gas is transported throughout the North Island through around 20,000km of pipelines, made up of:

- Two open access high pressure transmission systems (total length: 2,520km) owned by First Gas Limited (previously owned by Maui Development Limited and Vector Limited).
- Open access lower pressure gas distribution networks owned by First Gas Limited, Vector Limited, Powerco Limited, and GasNet; and a number of 'private' pipelines owned by Nova Energy Limited (total length: 17,352km).



LPG is supplied nationally, including to residents via 9kg and 45kg cylinders and to businesses in larger cylinders. Transport includes maritime import/export, trucking and interisland ferry. There are also small LPG pipeline networks in Christchurch, Queenstown and Wanaka operated by Vector Limited and Contact Energy Limited.

Industry Makeup



Gas Industry Co's role commences where gas enters gas processing facilities and the gas transmission system, through to the point of customer delivery. However, Gas Industry Co's corporate strategy recognises the complexity and interdependence of the gas industry, and takes an 'end to end' leadership role in 'telling the whole New Zealand gas story'.

3 Gas Industry Co's Role and Current Gas Governance Arrangements

The co-regulatory model for the downstream gas industry stems from the Government's desire for industry involvement in developing the industry as it has become more complex, as well as an industry desire to avoid any undue regulatory burden on a comparatively small 'challenger' gas industry. The model provides a greater opportunity for the Government and industry, facilitated by an industry body, to work together on developing market arrangements.

Gas governance arrangements provide for the operation of gas markets, access to key infrastructure, and protection of consumers; and for compliance and enforcement. Gas governance arrangements may take the form of voluntary arrangements or rules and regulations.

Gas Industry Co has progressed a long way towards completing the objectives and tasks required by the Act and the Government Policy Statement on Gas Governance 2008 (GPS). For example, in relation to consumer market arrangements. Industry participants can now trade with the confidence that there are robust systems for switching customers, accurately reconciling downstream quantities of gas, and managing critical contingencies.

Company Shareholders

The Constitution of Gas Industry Co provides eligibility for all 'gas industry participants' to become shareholders in the Company. The shareholding is diverse, representing the majority interests at each level of 'industry participants' – gas production, gas pipeline ownership, gas retailing, etc

Shareholders as at January 2017 are:

- Contact Energy Limited
- emsTradepoint Limited
- First Gas Limited
- Genesis Energy Limited
- Greymouth Gas New Zealand Limited
- Mercury NZ Limited
- Methanex New Zealand Limited
- New Zealand Oil & Gas Limited
- Nova Energy Limited
- OMV New Zealand Limited
- Powerco Limited
- Shell (Petroleum Mining) Limited
- Vector Limited

Board of Directors and Management

The Board of Gas Industry Co is a mix of independent and non-independent (industry) directors appointed by shareholders, a majority of whom (including the Chair) must be independent of the gas industry.

The composition of the Board is currently:

Name	Role
Rt Hon. James Bolger, ONZ	Independent Chair
Robin Hill	Independent Deputy Chair
Andrew Brown	Independent Director
Keith Davis	Independent Director
Nigel Barbour (Powerco Limited)	Non-independent Director
Dennis Barnes (Contact Energy)	Non-independent Director
Gabriel Selischi (OMV)	Non-independent Director

The Management team is:

Name	Role
Steve Bielby	Chief Executive
Ian Dempster	General Manager Operations
Glenda MacBain	Corporate Services Manager

Funding

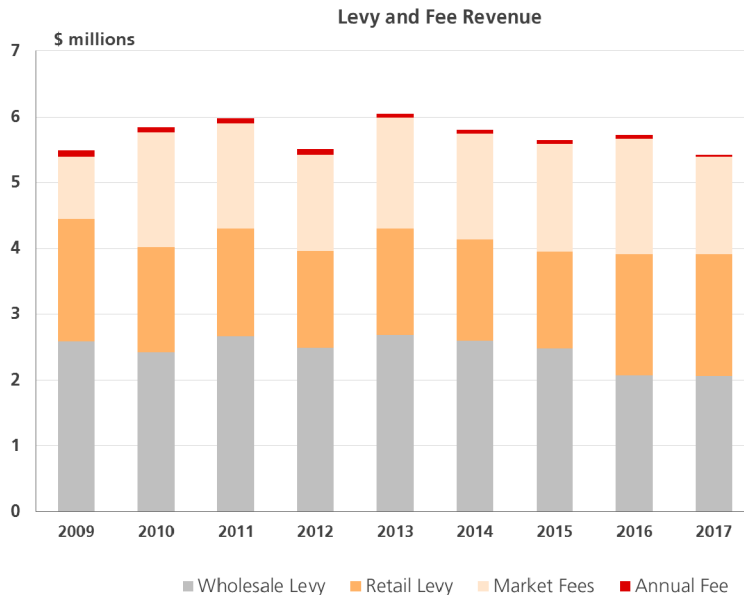
Gas Industry Co's funding of \$5.75 million for the current year comes principally from two sources: an annual levy and market fees.

Each year, Gas Industry Co consults with stakeholders on its proposed strategy, work programme and costs for the following year. There has been a high level of concurrence from stakeholders on these matters in recent years.

Gas Industry Co then makes a recommendation to the Minister for levy regulations for the next financial year.

The graph below illustrates the composition of Gas Industry Co's costs over the past nine financial years to FY2017. We are currently consulting on the strategy, work programme and levy for FY2018.

Levy and Fee Revenue



Strategy

In fulfilling its statutory role, Gas Industry Co's Board, in annual consultation with the industry, has adopted the following corporate strategy:

- The Company's strategic goal is to *optimise the contribution of gas to New Zealand* ;
- Its mission seeks to provide leadership for the gas industry; and
- The Company's strategic objectives are to:
 - Promote efficient, competitive and confident gas markets
 - Facilitate efficient use of, and investment in gas infrastructure
 - Deliver effectively on Gas Industry Co's accountabilities as the gas industry body
 - Develop and communicate the role of gas in meeting New Zealand's energy needs

Developing Governance Arrangements

In recommending arrangements to the Minister, Gas Industry Co is directed by the objectives of the Gas Act, and must also take account of the objectives and outcomes set out in the GPS. The principal objective of any gas governance regulation is ensuring 'that gas is delivered to existing and new customers in a safe, efficient and reliable manner'. Other objectives include:

- Providing access to essential infrastructure;
- Providing competitive market arrangements;
- Minimising barriers to competition in the gas industry;
- Enhancing incentives for investment in gas processing facilities, transmission and distribution;
- Ensuring that delivered gas costs and prices are subject to downward pressure;
- Risks to security of supply are properly and efficiently managed; and
- Ensuring there is consistency with the Government's gas safety regime.

The GPS applies these objectives also to non-regulated arrangements, and adds two further objectives: fairness and environmental sustainability.

Regulatory and Non-regulatory options

A preference for developing non-regulatory arrangements is a key feature of the co-regulatory model. The Gas Act provides that before making a recommendation for regulations or rules, Gas Industry Co will 'ensure that the objective of the regulation is unlikely to be achieved by any reasonably practicable means other than the making of the regulation (for example by education, information, or voluntary compliance)'. In other words, there is a preference for non-regulatory options where possible.

Current Governance Arrangements

Current regulatory and non-regulatory gas governance arrangements developed and administered by Gas Industry Co are as follows. All resulted from industry consultation and either formal approval (in the case of rules and regulations) or endorsement (in the case of non-regulatory arrangements) by the Minister:

- The Gas (Switching Arrangements) Rules 2008 enable consumers to choose and efficiently switch between competing gas retailers.

Substantial strengthening of market competition and higher levels of contestability has seen 99 percent of customers with a choice of at least seven retailers (there are a total of 10 gas retailers);

Since 2009, the switching rate has more than tripled to around 4,500 per month. The churn rate for the 12 months to June 2016 is 19.7%, one of the highest rates of retail utility switching worldwide.

Switching times have reduced from weeks or months. It now takes about two business days on average, for a switch to be completed.

- The Gas (Downstream Reconciliation) Rules 2008 reconcile volumes of gas leaving the high pressure transmission system against the volumes sold by retailers. The difference between the gas leaving the high pressure transmission system and the sum of all volumes sold by retailers is calculated as unaccounted-for gas (UFG). High levels of UFG is inefficient as the costs associated with UFG are paid by all gas retailers which is ultimately charged to consumers.

The new arrangements have been instrumental in reducing UFG to 1 percent of total allocated volumes. The industry is currently developing an alternative methodology to improve downstream reconciliation process. This includes a day-after delivery (D+1) trial where it is intended to provide shippers with more timely information on their daily allocated quantities on the day gas has flowed.

- The Gas Governance (Critical Contingency Management) Regulations 2008 have standardised and improved the industry's management of critical gas outages and other security of supply contingencies without compromising long-term security of supply – essentially failure of one of the main gas fields or gas transmission pipelines.

The Regulations were successful in managing the major outage on the Maui Pipeline in October 2011, and have subsequently been fine-tuned.

Significant critical contingencies are rare events and robust arrangements for management of them are in place. But, as in October 2011, the Minister may have a role in managing media responses or other flow-on effects of a major event.

The Gas Governance (Compliance) Regulations 2008 provides a formal compliance regime that deals with alleged breaches of gas governance regulations and gas governance rules.

The level of compliance has increased markedly as participants have adjusted to the various requirements and instituted internal compliance processes.

- The Retail Gas Contracts Oversight Scheme provides a non-regulated process for reviewing retailers' supply contracts with small consumers.

In the first three years of this Scheme's operation, the alignment of retailers' supply contracts with small consumers improved to overall 'Substantial' compliance with Scheme benchmarks.

- The Gas Distribution Contracts Oversight Scheme provides a process for reviewing gas distribution contracts between distributors and retailers.

In the first two years of this Scheme's operation, the alignment of distributors' contract offerings to retailers also improved to overall 'Substantial' compliance with the principles.

- Transmission Pipeline Interconnection Guidelines provide for efficient interconnections to the transmission pipelines, both for injecting new gas and for consumers wishing to take gas; and

- Backstop arrangements for possible regulation of a gas retailer insolvency event.

The above arrangements already in place have been successful in achieving improved industry efficiency, market contestability, and enhanced consumer outcomes:

- arrangements for customer switching between retailers and gas reconciliation have (together with the Electricity Authority's 'What's My Number' campaign) seen customer switching rates more than triple and switches being effected more quickly, to facilitate greater retail market competition.
- Much greater market transparency as a result of data on switching and reconciliation that is now published, and which promotes competition;
- Effective and rigorous monitoring and audit processes, which revealed serious and systematic consumption misreporting by one retailer, E-Gas, leading to it exiting the market. In October 2010, regulations were introduced to protect the supply of gas to E-Gas customers if the commercial liquidation process was unable to see them transferred to a new retailer. E-Gas's liquidation in late 2010 reflected issues going back some years, but which were only identified following introduction by Gas Industry Co in 2008 of new gas reconciliation systems.

Reporting

Gas Industry Co is required by the Gas Act to publish annually a Statement of Intent and Annual Reports. It also publishes Quarterly Reports, regular Bulletins and the regularly-updated *New Zealand Gas Story*. Collectively these also meet the requirement in the GPS to report to the Minister on the performance and current state of the industry.

4 Performance and Current State of the Gas Industry

Gas Industry Co's responsibilities include reporting to the Minister of Energy and Resources on the 'performance and current state of' the gas industry. We do this on an ongoing basis, including through the detailed publication [The New Zealand Gas Story](#). The following highlights key developments and issues.

The Government played a key role in the development of an indigenous gas industry, as a key part of national energy security and competition. In the past decade the gas industry has undergone significant transformation as it has moved from a reliance on a single dominant field – Maui – to supply from multiple smaller fields. This has brought greater complexity to the gas markets, more participants and a greater range of governance requirements.

The following simplified figure captures the more significant changes to the industry over recent years:

...in 2004	..today
Dominant Maui field in steep decline; only 6.5 years' p50 reserves	15 producing fields (incl Maui); 9 years' P50 reserves
Total gas use 156PJ	Total gas use 185PJ
238,000 gas consumers	268,800 gas consumers
Methanex cuts production to one methanol production train	3-train methanol production reinstated using around 50% of NZ supply
Gas meets baseload electricity generation (21% of generation)	Reduced 'peaking' role for gas in electricity generation (15% of generation)
Maui pipeline not open access; dual ownership of gas transmission systems	All gas transmission open access transmission and under single ownership of First Gas Limited
Regulation of transmission/distribution pricing emerging	Commerce Commission's price/quality regime in place
Retail competition emerging from historical local monopoly retailers	10 gas retailers
Consumer protection focus emerging	Consumer protection legislation reforms
Downstream gas industry governance through voluntary codes	Formal regulation/rules around critical contingency management, downstream reconciliation and consumer switching

Important recent developments and future issues include the following:

1. Gas makes a key contribution to New Zealand's energy supply, including 21% of primary energy supply. It is a direct fuel source; supports electricity supply security; and provides a competitive energy choice for around 268,000 consumers.
2. Gas fuels around 15 percent of electricity generation and underpins the New Zealand operations of companies that make a major contribution to the nation's economy. Around half of domestic supply is used for petrochemical production and other key users include the dairy, pulp & paper, refining and food production sectors.
3. Ownership of the two transmission pipeline systems has consolidated into First Gas ownership.
4. Development of a new gas spot (or wholesale) market by emsTradepoint, a subsidiary of Transpower.
5. Gas retail markets are more efficient and competitive, resulting in growing connection and customer numbers.
6. Gas's current role is changing significantly. A key example is reducing use of gas for electricity generation, although gas has also developed an important 'peaking' role (especially to meet growing morning and evening peak demand in Auckland) facilitated by new gas turbine technologies, which remains important for security of electricity supply. Growth in petrochemical production has compensated for reduced gas use in electricity generation.
7. Looking to the future, significant ongoing change is expected due to a combination of factors:
 - the fall in global oil prices has seen a corresponding drop in the upstream investment required to replenish gas reserves, which has been reflected in lower responses to the annual Block Offers in recent years. Long term gas supply/demand scenarios commissioned by Gas Industry Co identify that gas supply conditions will most likely tighten over the next several years due to the current low levels of exploration coupled with relatively high levels of demand (although residential and commercial gas users are unlikely to be affected in that period).
 - The gas industry is being indirectly affected by new electricity technologies, such as electric vehicles, solar/photovoltaic panels and imbedded generation.
 - As a carbon fuel, gas's role is affected by climate change issues and responses. While gas is already playing a key role globally in reducing coal use, and can offer a lower carbon footprint in New Zealand than other alternatives (e.g. home hot water heating), both consumer choice and meeting the Government's commitments under the 2015 Paris Agreement will entail further change.

It is important that gas's ongoing current role and its future role in the transition to a lower future are well communicated and understood, rather than grouping it with other 'fossil fuels'. Chapter 6 below discusses this in more detail.

8. Underpinning market developments are a number of gas governance developments, including:
 - Market performance indicators published by Gas Industry Co reflect on the success of gas governance arrangements and indicate gas markets are more efficient and competitive.
 - First Gas Limited and Gas Industry Co are co-leading development of a single new gas transmission code.
 - The introduction of the Market-based Balancing (MBB) arrangements on 1 October 2015 to improve on the (then) balancing arrangements, including introducing trading of balancing gas to the emsTradepoint wholesale gas market for the first time. Gas Industry Co is conducting a review following the first year of MBB operations.
 - A 'D+1' (day after delivery) pilot scheme that has been put in place to provide retailers with improved information to operate successfully under market-based balancing. Based on the outcomes of this pilot and the form of any new single transmission code, Gas Industry Co may propose to codify D+1 allocation process into the Downstream Reconciliation Rules.
9. The industry nonetheless has a number of ongoing governance issues that are being actively addressed, including:
 - Further improving transmission system balancing arrangements;
 - Finding more efficient transmission access and pricing arrangements;
 - Identifying an appropriate investment path for strengthening the gas delivery infrastructure as market demand dictates; and
 - Improving industry gas quality responsibilities along the supply chain.

5 Gas Industry Co Work Programme for FY2017 and beyond

Strategic priorities FY2017-FY2019

The strategic priorities set for the current financial year and beyond are detailed in Gas Industry Co's *Statement of Intent 2017-19* and in essence fall into three categories:

- Progress priority issues developed in consultation with industry and MBIE.
- Complete currently committed workstreams.
- Maintain core industry systems to ensure the ongoing smooth operation of market arrangements and recommend improvements where required.

Specific workstreams include:

- Co-lead with First Gas the development of a single transmission access code. In FY2018 and beyond we will continue to work with First Gas and industry stakeholders on the detailed design of this single new transmission code. Work with and support industry-led efforts to improve transmission balancing arrangements;
- Process consumer applications for newly-defined special designations under the Gas Governance (Critical Contingency Management) Regulations 2008;
- Consider outcomes of the Commerce Commission's planned work relevant to gas transmission disclosure and whether any further improvements are appropriate/necessary to achieve relevant objectives/outcomes of the Gas Act and GPS. In the unlikely event that agreed arrangements are inadequate, consider the need for additional governance arrangements;
- Oversee industry-led work on gas quality, and determine actions to address any remaining gas quality issues. Update the *Gas Quality Requirements and Procedures* document as required;
- Assess the ongoing performance of the Gas (Downstream Reconciliation) Rules 2008;
- Monitor and report on switching statistics. Assess the ongoing performance of the Gas (Switching Arrangements) Rules 2008;
- Monitor the ongoing performance of the Gas Governance (Compliance) Regulations 2008, and compliance trends for indications of regulatory inefficiency.
- Implement the new retailer insolvency arrangements as necessary in the unlikely event of a gas retailer insolvency;

- Monitor arrangements governing the Retail Gas Contracts Oversight Scheme. Review retailers' contracts on an exceptions basis and provide additional information to assist new entrant retailers to understand their obligations and governance processes;
- Continue to assess progress with executing new distribution contracts consistent with the Gas Distribution Contracts Oversight Scheme principles. Undertake preliminary work seeking the views of retailers and network owners about whether currently 'closed' LPG reticulated networks should be available to other parties under open access arrangements.
- Assess and report upon any new interconnections to the high pressure gas transmission pipelines;
- Update *The New Zealand Gas Story* so it is maintained as a current information resource for the Minister, the industry, and the public generally;
- Further develop and implement the Company's broader strategy to optimise gas's contribution to New Zealand, and to increase general awareness of gas's role in the economy.

FY2018 Work Programme Development

In November 2016, Gas Industry Co commenced the process of developing a detailed work programme and levy proposal for FY2018. The process began with an annual Co-Regulatory Forum, in which the proposed work programme was presented to stakeholders for initial discussion. This led to the *Consultation on Gas Industry Co FY2018 Statement of Intent and Levy (Consultation Paper)* published in December 2016 for further industry engagement. A Statement of Intent for the 2018-2020 three-year planning cycle will be prepared in the first quarter of calendar year 2017 and presented to the Minister for comment. The process will culminate in a recommendation to the Minister in respect of the FY2018 levy, which comes into force on 1 July each year.

6. Roles for New Zealand Gas in the context of Climate Change Response

The United Nations Secretary General has said that climate change is the major, overriding environmental issue of our time². Countries have recognised that unified action is required to meet this challenge. In December 2015, 195 countries adopted the landmark 'Paris Agreement': a legally binding climate agreement that sets out a plan to limit global warming to well below 2°C (compared with pre-industrial levels) and to pursue efforts to restrict the increase to below 1.5°C. The Agreement came into effect in November 2016, having been ratified with unexpected speed. As part of the Paris Agreement, New Zealand has committed to a 'Nationally Determined Contribution' (NDC) target of a 30 percent reduction in total greenhouse gas (GHG) emissions below the 2005 level.

The International Energy Agency (IEA) has said that delivery of the Paris Agreement targets will require an unprecedented change in global energy systems, both to implement the existing NDCs and to meet the Agreement targets³. There will need to be a decarbonisation of the world's energy sector to meet the Agreement's goals. For instance, the IEA estimates that overall GHG emissions from fossil-fired electricity generation may need to fall by almost 90 percent by 2050 to meet the 2°C target. Meeting the 'well below' target would require a much greater reduction in emissions. The actions required to meet these changes are all the more substantial when we consider that the world's population and economic activity is expected to continue to increase over the period.

So what are the roles for gas in New Zealand given the change that is required in the world's energy system? Natural gas is a fossil fuel and a GHG in its own right. The combustion of gas to produce energy or electricity results in CO₂ emissions albeit at much lower levels than other fossil fuels. The use of gas over the long term will change as the energy sector transforms to meet the Paris Agreement challenge. This change will include the introduction of new technologies and processes such as carbon capture and storage (CCS), together with technologies that are yet to be commercially developed. The consumption of gas will adjust as it finds a place in a low-carbon energy ecosystem.

The current uses of gas in New Zealand are broadly consistent with the initial steps in the transition to a decarbonised energy system. There are four main groups of gas demand in New Zealand: electricity generation, industry, petrochemicals and commercial & residential. These are discussed below.

² www.unep.org

³ IEA (2016) "*Energy, Climate Change & Environment*"; OECD/IEA, Paris.

The electricity sector used around 30 percent of gas in 2015 in the production of electricity. Concept Consulting⁴ notes in its *Long Term Gas Supply and Demand scenarios – 2016 Update* report (Scenarios 2016) that gas demand in the sector has been trending down in recent times (particularly with the recent closure of the Southdown and Otahuhu B Combined Cycle Gas Turbines (CCGT) stations). The central scenario projection in Scenarios 2016 forecasts gas generation to gradually fall over the long term, due to the improved economics of baseload renewable generation and the potential for higher CO₂ prices. However, gas-fired generation plays a key complementary role to renewable generation over both the short and longer terms, augmenting renewable generation production during seasonal and peak periods. Gas generation is a relatively low GHG emitting fossil fuel that will enable New Zealand’s predominantly renewable electricity generation sector both now and into the future.

The major use of gas in the industrial sector (excluding petrochemicals) is for intermediate (100°C – 300 °C) process heat, mainly in the form of boilers. Electricity is not a practicable option for process heat given the high temperatures that are required and underlying economics. Renewable fuels (including wood, geothermal and biofuels) are used for process heat but they are very location dependent; plants using geothermal or wood for process heat must be located adjacent to the energy resource. Given this location dependency, process heat in New Zealand is fuelled mostly by coal and gas. Concept Consulting notes in its *Consumer Energy Options in New Zealand – 2016 Update*⁵ (Consumer Energy Options 2016) that gas is in a very competitive position, such that it would make sense for consumers with an existing non-gas fired boiler (with a sunk capital cost) to switch to gas and incur the cost of a new boiler. The economics of gas-fired boilers, relative to other fossil-fuelled boilers, improve as CO₂ prices increase.

The government’s draft New Zealand Energy Efficiency and Conservation Strategy 2017-2022 (NZE ECS) identifies process heat as an area where there is significant potential to reduce carbon emissions and improve energy efficiency. The draft NZE ECS states that the government will implement a plan to improve the efficiency of existing process heat plant and encourage investment in efficient and renewable plant. Given the previous discussion, gas-fired process heat (where gas supply is available), has the potential to meet many of the objectives of this plan. As previously noted, gas-fired process heat as a replacement for other fossil-fuelled plant, provides the opportunity for improved efficiency while also delivering a lower carbon footprint. Gas is not a renewable option; however, it can displace coal and complement renewable process heat in locations where renewable fuels are unavailable or impractical. This role for gas in process heat is highlighted in the New Zealand Energy Strategy 2011 -2021 which notes that gas “... is an important direct source of energy in industry and homes”.

The petrochemical sector currently consumes around 45 percent of New Zealand’s gas supply, with Methanex using over 90 percent of gas in the sector (when operating at full capacity) to produce methanol. The production of methanol using natural gas creates significant amounts of CO₂, albeit

⁴ Concept Consulting (2016) “*Long term gas supply and demand scenarios – 2016 update*”, Concept Consulting Group Limited, Wellington.

⁵ Concept Consulting (2016) “*Consumer Energy Options in New Zealand – 2016 Update*”, Concept Consulting Group Limited, Wellington.

at much lower levels than in situations where coal is used as a feedstock⁶. Furthermore, a significant portion of CO₂ is 'locked in' to products made with petrochemicals such as plastics, rather than emitted to the atmosphere. The Government recognises Methanex as an emissions-intensive trade exposed (EITE) business in the NZ Emissions Trading Scheme (ETS), allocating Methanex free NZUs (an 'industrial allocation'). This policy recognises that if Methanex faced a carbon price in New Zealand, it may close local operations and increase production in jurisdictions that do not have an ETS (this is known as 'carbon leakage'). As world carbon markets develop, this form of local support may no longer be required.

Residential consumers use natural gas for three main purposes: space heating, water heating and cooking, with the first two categories using most of the gas. Consumer Energy Options 2016 finds that the carbon footprint of gas-fired space and water heating options is half that of standard resistance electric heating options, but a gas-fired heater's footprint is greater than high-efficiency electric heat pumps. These results stem from the fact that, during periods of peak energy demand, the marginal form of electricity generation is likely to be fossil-fuelled. Given these findings, a house with gas-fired water and space heating is likely to have a similar carbon footprint to a house with standard resistance water heating and a heat pump.

In summary, natural gas currently plays a key role in New Zealand's economy and will continue to do so in the transition to the low carbon economy. It complements renewable options in delivering predominantly renewable-sourced electricity. In the industrial sector, gas is an important fuel in the processes of many energy-intensive businesses and has a carbon footprint lower than other fossil fuels. For many residential consumers, gas-fired water and space heating is likely to have a similar carbon footprint to a house with standard resistance water heating and a heat pump. As the world transforms to meet the target agreed in Paris, the roles of gas will also change. Ultimately, gas in New Zealand will need to be justified in the context of New Zealand's Nationally Determined Contribution and the Paris Agreement.

⁶ China produces around a half of the world's methanol, with over 60 percent of this production using coal as the feedstock in methanol production.