

# The Age of the Vertically Integrated Electricity and Gas Provider

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## Abstract

Stakeholder pressure combined with advances in trading systems, are transforming New Zealand's, monopolistic energy industry, into one where buyers and sellers are able to trade a range of physical and financial products. The unbundling of delivered electricity and gas contracts and the creation of tradable property rights are key factors in allowing competition to develop in the gas and electricity markets.

Electricity and gas users are both becoming less captive to monopoly suppliers and demanding a more integrated approach to supplying their energy requirements. Tradability of energy entitlements reduces the ability of suppliers to cross subsidise, as their products have become commodities. Any market participant who over-prices a contestable product or service will eventually lose market share.

Providing they are price competitive, new players can now enter the energy market at any point(s). In order to maintain revenues, existing players must be prepared to compete and trade at all contestable points along the value chain. Meeting the needs of customers is becoming ever more important.

As a result some gas utilities have diversified vertically back along the gas supply chains or forward into electricity generation to become combined energy utilities. Electricity utilities are also offering gas to customers. The ultimate manifestation of this, is the trend towards gas fired cogeneration electricity plants. The changes that have taken place have put downward pressure on both gas and electricity prices.

There are a number of companies willing to enter, or increase their involvement in the gas and electricity markets. Energy trading requires careful risk management. Electricity trading risks are well understood but gas risks and the risks arising out of the interaction of gas and electricity are less familiar. Currently a market for trading gas entitlements does not exist in New Zealand, as it does for electricity.

## Introduction

New Zealand's gas and electricity markets are converging due to competition and market liberalisation. Key market players are vertically integrating their businesses in order to manage the additional risks inherent in newly deregulated energy markets, and to maximise investment opportunities.

The unbundling of energy and transmission charges for gas and electricity, the creation of tradable energy transmission property rights, and an oversupply of gas and base-load electricity capacity, are key drivers behind the vertical integration trend.

The paper covers the recent history of New Zealand's gas and electricity markets, outlining the reforms that started in the mid-1980s. A review of these two markets develops the reasons market players develop different business strategies. The paper concludes by questioning the importance of vertical integration in the longer term as all sectors of the gas and electricity markets become fully competitive.

## Historical Overview of the Electricity and Gas Markets

New Zealand's natural gas and electricity industries evolved along monopolistic lines, characterised by high levels of government ownership, regulation, and cross subsidisation. Monopolies were considered necessary in order to manage the risks associated with taking long term fixed price positions on capital intensive projects. This largely prevented or discouraged competition within and between energy sectors.

With the Crown effectively controlling New Zealand's gas markets, there was little incentive to increase reserves while their Maui and Kapuni contracts could more than meet New Zealand's demand. The Natural Gas Corporation's (NGC) monopoly control of the wholesale gas market and high-pressure transmission system, effectively prevented the entry of new gas wholesalers.

The Crown has an ongoing obligation to pay in excess of \$200 million per annum to the Maui Joint Venture Partners for take or pay gas. To cover this, the Crown entered into back to back gas contracts with the Electricity Corporation of New Zealand Ltd (ECNZ), Methanex New Zealand Limited and NGC. The ECNZ Maui contract was novated to Contact Energy Ltd on 1 February 1996. The Crown maintains an indirect gas market presence through Contact Energy's 48% ownership of the Crown's rights to Maui gas.

## Energy Market Reform

From the mid-1980s the Crown has been moving to both increase competition and reduce its exposure within New Zealand's energy market. The key planks of this strategy have been the sale of energy assets and associated trading activities, removal of some impediments to competitive entry, and corporatisation of remaining energy businesses.

Over the period 1987-88 the Crown sold the State-owned Petrocorp. In doing so it divested itself of NGC, the Petrochemical plants, and its 50% shareholding in the Maui Joint Venture. In 1993 the Crown removed retail gas franchise areas and all price controls on gas. In October 1997 the Gas Disclosure Regulations came into force, requiring gas prices to be unbundled by October 1997, and transport providers to provide information on the capacity of their systems.

In 1987 the Crown deregulated the electricity generation industry. In 1992 it deregulated the electricity retail and distribution companies, removing franchise areas, requiring separation of line and energy accounts, and information disclosure. In 1994 the Crown separated out Transpower (the national electricity grid owner and operator) from the generators.

The Crown has retained a dominant position in the electricity industry through its ownership of ECNZ and Contact Energy, which together have 90% market share, with ECNZ accounting for around 60%. To encourage competition, ECNZ cannot build and own more than 50% of new generation capacity, it cannot cross subsidise new capacity, and must offer 87% of its firm capacity as contracts to prevent gaming<sup>1</sup>.

A fully competitive wholesale electricity market (WEM) has been operational since 1 October 1996, and the gas industry is currently working through the issues associated with setting up a similar market. Both the electricity and gas industries are promoting, open non-discriminatory access to their markets, availability information, creation of tradable entitlements, and acceptable rules of engagement.

The Government is currently undertaking a wide ranging review of the electricity industry, with the goal of ensuring that the benefits of competition, namely lower prices and better service, are accessible by all consumers. Potential outcomes include the further split of ECNZ, and the full separation of electricity distribution and retail businesses.

## Outcomes of the Energy Market Reforms

The gas and electricity markets are now contestable at any point. In order to maintain revenues, existing players must be prepared to compete and trade at all points along the value chain. Meeting customer's needs is the key to maintaining revenues.

The risks associated with investing in generation plant, or taking a price position on gas or electricity, are considerably greater when operating liberalised energy markets. Management of this risk is a driver for upstream or downstream integration, and strategic partnerships. As gas and electricity markets increasingly converge at both the gas supply level and at the retail level, better risk management opportunities become available. An advantageous fuel position is the greatest strategic advantage a player can have in a competitive electricity and gas market.

The pressures from the new competitive market have resulted in a considerable improvement in efficiency within the industry. Wholesale electricity prices have fallen in real terms over the past five years, and margins on energy have been put under considerable pressure.

Market reforms such as separating lines and energy businesses will mean that captive customers currently supplied by vertically integrated suppliers will eventually be open to competition. Figure 1 shows the range of issues to be considered when making fuel related decisions.

Even with a background of reduced margins and lower prices, there are a number of companies willing to enter, or increase their involvement in both the electricity and gas markets. Some gas utilities have diversified vertically back along the gas supply chains or forward into electricity generation to become combined energy utilities. Electricity utilities are also offering gas to customers, and investing in gas assets.

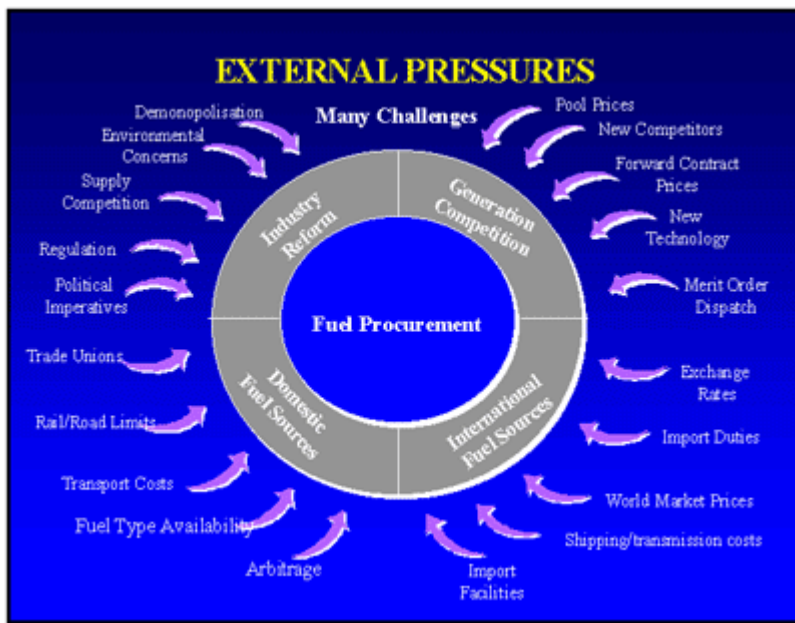


Figure 1. Factors Influencing Fuel Decision Making Source - KPMG New Zealand Ltd.

With the deregulation of the electricity market, a range of generation and cogeneration projects have been completed or are being developed. These developments require assured fuel, a market for their output, and finance, in order to be successful.

As it is in many other parts of the world, natural gas is the fuel of choice for the bulk of the new generation, with around 1,000 MW of new higher efficiency gas-fired capacity expected to be commissioned in the two years since the wholesale electricity market was created. This means that around 15% of the total installed capacity in New Zealand will be less than two years old by the end of 1998.

Figure 2 below shows that over 200 MW of gas fired cogeneration plant has been added to the existing generating plant since 1995. A further 100 plus MW of cogeneration has been committed or is currently being investigated.

In addition to the cogeneration projects there are a number of small low cost projects including geothermal, wind and hydro under different stages of development.

This rush to diversify by energy companies has contributed to an expected 30% oversupply in base-load electricity generation capacity by the end of 1998. The owners of these new generation projects represent almost all segments of the energy industry. The oversupply in generation capacity is expected to continue the downward pressure on wholesale electricity and gas prices.

The gas market targeted electricity generation as a sink where significant increases in gas consumption could occur. As a result, there is a considerable excess of baseload generation, and generators are now looking to offload surplus gas into the gas market. Future gas contracts will need to be more sensitive to the effects of competition in the electricity market and convergence than those entered into prior to the creation of the wholesale electricity market.

Natural Gas and Gas Turbine Cogeneration Systems Installed Since 1995 (>500 kW)			
Dairy Industry			
BOPE Located Bay Milk Products	Edgecombe	1996	2*4,900 kW
Kiwi CO-operative Dairies Ltd	Hawea	1996	4*10,000 kW
NZ Cop Dairy Ltd	Te Awamutu	1995	2*26,000 kW
Industrial Processes			
Natural Gas Processing Facility/Lactose	Kapuni	1997	25,000 kW
Natural Gas : Bottom Cycle Cogeneration Systems Installed Since 1995 (>500 kW)			
Industrial Process			
Petrochem Ltd	Kapuni	1997	3,500 kW
Steel Industry			
BHP NZ Steel	Glenbrook	1997	74,000 kW
Fertiliser Industry			
Farmers Fertiliser Ltd	New Plymouth	1996	1,750 kW

		Total	206,000 kW
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Figure 2. Large scale cogeneration installed since 1995.

## Operation of the Wholesale Electricity Market (WEM)

The Wholesale Electricity Market as we know it today began on 1 October 1996. The significance of the WEM is that the wholesale price of electricity is now competitive, open and responsive to both demand and supply side bidding. The pool price sets a hurdle for competitive entry in the generation business, while price volatility signals the risks involved.

A diagrammatic representation of the NZEM is given in Figure 3. The electricity market in New Zealand is modelled on a financial market. The diagram shows the financial contracts and the physical flows that exist in the market.

Trading is based on offers by generators, and bids by potential electricity purchasers, which are cleared each half hour on physical delivery. Spot prices for electricity are set each half hour.

Hedge contracts effectively determine a price for nominated quantities of electricity for each half-hour. By purchasing the hedges, electricity purchasers can lock in a forward price for electricity and protect themselves from the fluctuations of the weekly electricity spot price.

The hedge contracts may involve any combination of time periods such as monthly or seasonal hedges as a single package.

In recent months electricity pool prices have varied from zero to \$1200/MWh. The average pool price over the same period has been \$40/MWh. With revenue volatility of 30 times plus in the electricity market and no active gas market for mitigating this risk exposure, generators use a variety of both physical and financial electricity products to hedge their risk.

## Overview of the Current Gas Market

The New Zealand gas market is characterised by a small number of large producers and users who can manage field supply risks, and a near monopoly wholesaler and pipeline operator. The production-wholesale end of the market is characterised by medium to long term bundled fixed price take or pay contracts. As yet, no formal market for short term or on-demand energy or capacity exists.

The Maui gas pipeline that transports Maui gas from Oaonui (Taranaki) to Rotowaro, north of Hamilton forms the backbone of the high pressure gas system.<sup>2</sup> It is owned by the Maui Joint Venture partners and currently only carries Maui gas sold to the Crown under the terms and conditions of the 1973 Maui Gas Sale and Purchase Contract. The Crown pays the same price for Maui gas anywhere on the pipeline via its bundled take or pay gas price.

The Maui take or pay contracts and exclusive access to the Maui pipeline have provided the major gas users with a significant market advantage to date. The gas market is undergoing a major period of activity, with key changes described below.

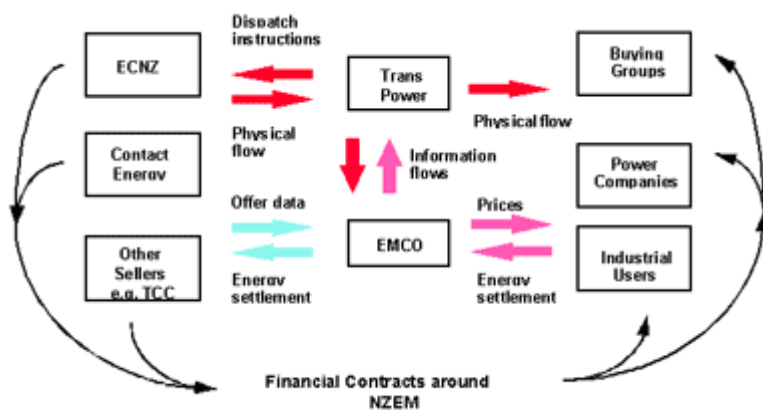


Figure 3. Schematic of the New Zealand electricity market.

- A growing number of companies are selling gas to end users in competition with the established gas utilities.
- Shell Petroleum Mining Ltd and Todd Corporation are marketing Kapuni gas, and electricity from their generation interests, including cogeneration.
- Contact Energy took possession of ECNZ's Maui and TAWN gas contracts in 1996. Due to the quantities involved, and ECNZ retaining the 1000 MW Huntly Power Station, Contact Energy is faced with the options of having to double its thermal generation capacity, or on-selling up to 50% of its gas, or financing prepaid gas.

- The Gas Disclosure Regulations required gas prices to be unbundled by October 1997, and transport providers to provide information on the capacity of their systems. The Maui pipeline was specifically excluded from having to comply with the regulations at this stage.
- Stakeholders in the gas industry formed Gas House to facilitate non discriminatory access to gas transport systems and lead establishment of a gas trading market.

With gas transmission now legally unbundled, gas producers are competing with traditional wholesalers in selling gas to end users and retailers. An oversupply of gas at the producer-wholesale end of the market, is creating downward pressure on energy prices.

With their recent gas sale to Enerco, Contact Energy have gained a 16% share of the wholesale reticulation market, traditionally 100% serviced by NGC. NGC has recently stepped out of its traditional markets by selling gas to ECNZ and Methanex.

Clearly there are a large number of companies willing to enter into what is a relatively small market. Increased competition should lead to reductions in gas prices and margins over the next five years and possibly longer.

Gas industry players have been vertically integrated using their gas transmission monopolies and existing bundled gas contracts, to anchor both their upstream and downstream expansions. Both these markets have now opened up with the energy market reforms.

With the availability of more cost efficient technologies to competitors, the on-going removal of market barriers, and the potential for regulation of natural monopolies, businesses cannot rely on vertical integration as their key strategy. The long-term success of vertically integrated businesses will depend on their continued competitiveness in each market segment.

## Risks Faced By Electricity And Gas Market Participants

Until 1996, ECNZ spread the risks associated with its Maui Gas contract over a portfolio of stations, and with 95% electricity market share, faced very little electricity demand risk. From a management point of view, forecasts of demand for electricity and hence demand for fuel were relatively straightforward compared with forecasting in today's electricity market. The flexibility of its take or pay Maui Gas contract allowed ECNZ to manage hydrological risks, seasonal electricity demands, and plant constraints on a least cost basis while maintaining a high level of supply security.

For the foreseeable future, generators face an electricity market with a surplus of base-load generation, leading to strong competition for market share. The financial effects on a generator that cannot generate when required due to breakdown or other constraints, or is not dispatched when it expected to, will depend on its electricity and gas contracts, and on the effect of the event on the electricity pool price.

The future price path for electricity has become a key issue for existing and potential market participants. The Taranaki Combined Cycle (TCC) and Southdown projects were presumably justified on the basis that generators would be able to sell the electricity generated from them at or above the entry cost of potential competitors. Today, analysts are predicting the market price for electricity might not even cover generator's gas costs for several years due to excess generation capacity<sup>3</sup>.

## Risk Management Strategies

Generators' market share strategies will be strongly influenced by their gas contracts. If they have "take it or lose it" gas contracts they may treat gas as a sunk cost and generate regardless of the electricity pool price, thereby maximising market share. Generators with more flexible gas contracts need only operate when the market is willing to cover their costs.

Generators may also employ fuel management strategies that avoid selling electricity below its production cost in times when there is an excess of "must run" generation. Depending on their gas contracts, generators can bank gas in anticipation of it having a higher future opportunity value, write off gas purchase liabilities as an accounting loss, or trade surplus gas.

In a converging gas and electricity market, the value of contracted gas is not dictated by its sunk cost, but by the higher of the value of another unit of generation, or its value if sold into the gas market. There is little point in storing surplus gas if there is no expectation of using it later, or getting a refund.

Electricity market participants have already faced deregulation and increasing competition for a number of years. Companies have or are, putting in place, appropriate risk management policies and procedures. As deregulation opens up markets, they are also investing more broadly.

The need for physical co-ordination between fuel supplies and electricity production is a strong driver for both upstream and downstream integration or partnering. Integrated gas and generation businesses have increased investment opportunities, and can diversify risks by trading electricity, gas, waste heat, and related financial products.

The United Kingdom is leading the world in converging its electricity and gas markets. Market participants can trade both electricity, which has posted half-hourly prices, and gas which is priced a day ahead. This significantly increases the range of options available to providers and users of electricity and gas.

Some of the above benefits are available to non vertically integrated businesses provided risks are properly shared through innovative contracts. Over time, market reforms and better access to customers will erode the remaining benefits that vertically integrated businesses currently enjoy in

New Zealand's new deregulated gas and electricity markets.

## Establishment Of A Gas Trading Market

Industry codes were used in the electricity market for achieving non-discriminatory access to monopoly transmission and distribution services. This approach was strongly promoted by ECNZ when the electricity market was being established. Although by no means perfect, industry codes adhered to by suppliers of monopoly services have provided an absolute minimum and (when compared to regulation) rapidly implementable level of access.

The Pipeline Access Code being prepared under the auspices of Gas House is a first step in developing an open gas trading market in New Zealand. The creation of tradable property rights, and the establishment of an agreed reconciliation and metering authority are the next steps.

The creation of tradable property rights, especially transmission entitlements, is a vexed issue for pipeline owners. With gas prices coming under competitive pressure at the production, wholesale, and retail levels, there is a strong incentive for companies to protect the returns from the transmission sides of their businesses. For a major gas user requiring both high and low pressure gas transmission services, the transport costs can be as much as 60% of the delivered gas price, and exceed 80% for a domestic gas user.

The creation of tradable transmission entitlements, and a market to trade them in, will allow gas users to trade capacity and energy as and when required. Pipeline owners need to be incentivised to sell as much capacity as possible rather than "manage" capacity.

The establishment of an open non-discriminatory gas market will take some time, and potentially require the threat, or reality, of separation of energy and transport into separate businesses and regulation of returns from gas transport. The gas industry believes it can work together to establish an open non discriminatory market without government intervention, and are committed to its development.

## Conclusions

New Zealand's gas and electricity markets evolved along monopolistic lines, characterised by high levels of Government ownership, regulation, and cross subsidisation. They are now converging due to competition and market liberalisation. Key market players are vertically integrating their businesses in order to manage the additional risks inherent in newly deregulated energy markets, and to maximise investment opportunities.

The following key conclusions can be drawn from this paper.

1. Liberalised energy markets create both additional risks for market players, and more investment opportunities.
2. Gas and electricity markets interact at both the wholesale and retail levels. An oversupply of base-load electricity capacity is increasing the downward pressure on wholesale electricity and gas prices.
3. Upstream and downstream integration is a strategy that allows businesses to manage their physical supply and demand risks in newly deregulated energy markets.
4. The establishment of the New Zealand Electricity Market has allowed the introduction and trading of financial risk management products. Trading of gas transmission capacity entitlements and gas trading mechanisms such as gas forwards and futures are only just being conceptualised.
5. With the availability of ever more cost efficient technologies and the on-going removal of market barriers, businesses cannot rely on vertical integration as their key strategy. The long-term success of vertically integrated businesses will depend on their continued competitiveness in each market segment.

## Footnotes

1. These restrictions remain in force as long as ECNZ has greater than 45% of New Zealand's generation capacity
2. The Maui system is referred to as the Maui Hub.
3. National Business Review, February 20, 1998.

## Authors

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