New Zealand
LPG supply and demand - Now and in the future

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Abstract

The paper concentrates on the current supply and demand situation in the New Zealand domestic market and looks at the impacts of new oil and gas field developments in the region on LPG supply. Domestic demand is broken down by market sectors and a brief review of the factors influencing each sector is presented.

The New Zealand market has historically relied on LPG production from the Maui and Kapuni fields and has to some extent been protected from the volatility of international pricing by "Legacy" contracts written in the early 1980s. The paper discusses the impact of declining Maui LPG production and the evolution of new supply contracts on "internationally competitive" terms.

A brief overview of international LPG pricing is presented along with some "predictions" on trends in future pricing.

Introduction

Prior to the discovery of the onshore Kapuni field, LPG use in New Zealand had developed slowly based on supplies of bottled LPG imported from Australia and the USA. Kapuni commenced local production of LPG in 1969, however it was not until LPG became available in much larger quantities from the offshore Maui field in 1979 that the LPG market in New Zealand really began to flourish.

LPG became part of Robert Muldoon's famous "Think Big" strategy. The National Government of the day underwrote the development of the Maui gas field by entering into the now legendary Maui Gas Contract. The Maui Gas Contract facilitated the development of the Taranaki synthetic petrol and methanol plants, the Huntly and New Plymouth power stations and the expansion of the North Island natural gas pipeline network (along with various other non-gas related facilities such as the Clyde hydroelectric power station).

Politicians need to keep their voters happy and with most of the "Think Big" development centred in the North Island they became acutely aware that there was a growing need to offer something to the South Island voters. At the time the country was experiencing the impacts of the "oil crises" and Compressed Natural Gas ("CNG") was being offered in the North Island as a gasoline alternative.

LPG was seen as an ideal gasoline alternative for the South Island. However, in order to supply sufficient quantities of LPG for "Autogas" use, a sea-fed distribution network was required involving significant capital expenditure for shipping and port storage facilities. The then current LPG distributors (Rockgas, NZIG, Shell and BP) agreed to form a new nation wide bulk distribution company called "Liquigas Limited" with the Government holding a 25% interest. The Government provided considerable funding to assist with the necessary infrastructure and to help promote a nation wide LPG Autogas business.

Liquigas built ship loading facilities in New Plymouth to allow shipping of Maui LPG to its new port terminals in Auckland, Christchurch and Dunedin and the company still plays a major role in local LPG distribution.

In the early 1980s, the autogas market boomed with Government subsidies available for vehicle conversions helping lift autogas sales to around 70% of the total demand. However the boom was short lived. A change to a Labour Government in 1986 saw the end of autogas subsidies and

Government support for LPG as an alternative fuel effectively disappeared.

Government policies allowing the import of cheap second hand diesel cars and four wheel drive vehicles and the removal of excise tax from diesel further undermined the LPG autogas market. The remaining LPG market sectors have developed to replace the decline in autogas sales to the extent that autogas now only makes up around 20% of total demand.

Maui and Kapuni continue to supply the bulk of the LPG consumed domestically, however additional supply has become available in Taranaki from Waihapa (1996) and supply from Rimu is expected to commence in Q2 this year.

Domestic LPG demand – current and forecast

In order to estimate future demand patterns, it is helpful to break the domestic demand down into several sectors. The key drivers for each of the market sectors can then be considered to assist with estimating the overall market demand.

The autogas market

As discussed above, the autogas sector saw rapid growth in the early to mid 1980s followed by an equally rapid decline toward the end of the decade consistent with the changing levels of Government support through the period. Government support for clean fuels is essential for a healthy autogas market. Current Government policies are unlikely to foster any significant increase in demand with continued support for cheap diesel vehicle imports and excise tax free fuel undermining demand for LPG vehicles. Government has indicated that they may review their excise tax policies and this may provide some future upside for the autogas sector.

The after-market conversion industry almost disappeared in the late 1980s/early 1990s as the demand for vehicle conversions collapsed. As a consequence many skilled converters changed focus leaving only a small number actively involved. Modern vehicles are becoming increasingly complicated and a great deal of research and development time is required to design a suitable conversion kit for each new vehicle. The low number of conversions means that there are fewer cars over which to apportion these development costs and this has in turn forced up the conversion costs to such a degree that only larger high mileage vehicles are likely to demonstrate an economic payback given current fuel prices.

On a more positive note the car manufacturers have recently become interested in alternative fuels (due mainly to overseas Government anti-pollution policies) and several manufacturers are now offering factory fitted LPG or factory developed conversion kits as an option at reasonable prices. As an example Ford currently offers an LPG option on the Falcon range and around 6% of all new Falcons sold in New Zealand are LPG capable (287 LPG Falcons sold in 2001). Holden and Mitsubishi are also actively involved in promoting LPG options.

A large proportion of these new factory fitted vehicles end up as taxis or in large company fleets.

The "Green" movement within Government has shown some support for LPG vehicles and several new Falcons/Fairlanes have found their way into the Government vehicle fleet.

The main driver for autogas demand is however likely to continue to be pure economics and some significant growth in autogas vehicles was seen as a consequence of the high gasoline prices over the last 12-18 months. Unfortunately the lower gasoline prices over recent times may again deter many potential users.

Current autogas demand is approximately 20% of the total demand and the forecast assumes static to negative sales at current oil prices (US$18-$22/bbl). Sustained high oil/gasoline prices would have a significant positive effect on autogas demand. Similarly, any significant change in Government policies in support of LPG would also lead to positive sales growth.

The industrial market

The industrial market sector is made up of a few very large customers with large on-site storage capable of receiving full road tanker loads of LPG. These customers tend to see LPG purely as an energy source and as such are extremely price sensitive.

This market has seen rapid growth over the last 12-18 months consistent with high prices for competing fuels such as fuel oil/diesel. LPG must compete either on price or some form of "clean fuel" advantage. Typically the customers are located in the North Island away from the natural gas pipeline network or in the South Island where they have a specific process need for a clean gaseous fuel.

From an LPG producers perspective, these customers tend to prefer butane and that helps provide some balance to the increasing demand for propane from domestic customers.

Current industrial demand is estimated to be 10% of total demand and the forecast for this sector again assumes static to negative growth at current oil prices.

The commercial market

The commercial market sector includes hotels, restaurants, forklift operators and a wide variety of other users who typically receive their LPG in cylinders or may have a small bulk tank on-site. It also includes those customers who receive their LPG via a reticulated LPG or LPG/Air system.

Several new LPG reticulation systems have been installed over the last year or so in Queenstown, Christchurch and Te Anau. These systems will add demand especially in the more heavily populated areas in central Queenstown and

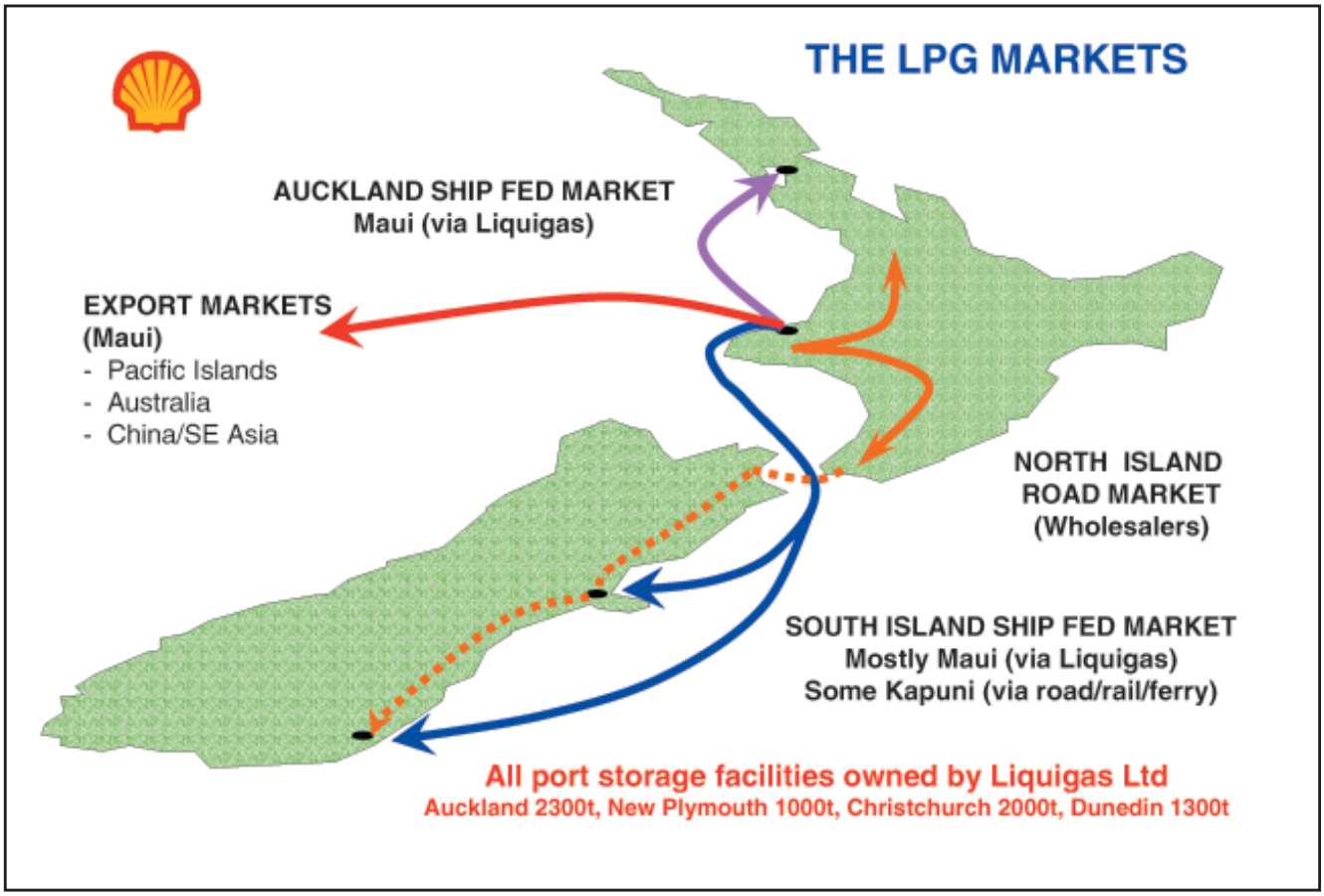

Figure 1: Current flows of LPG in the New Zealand market.

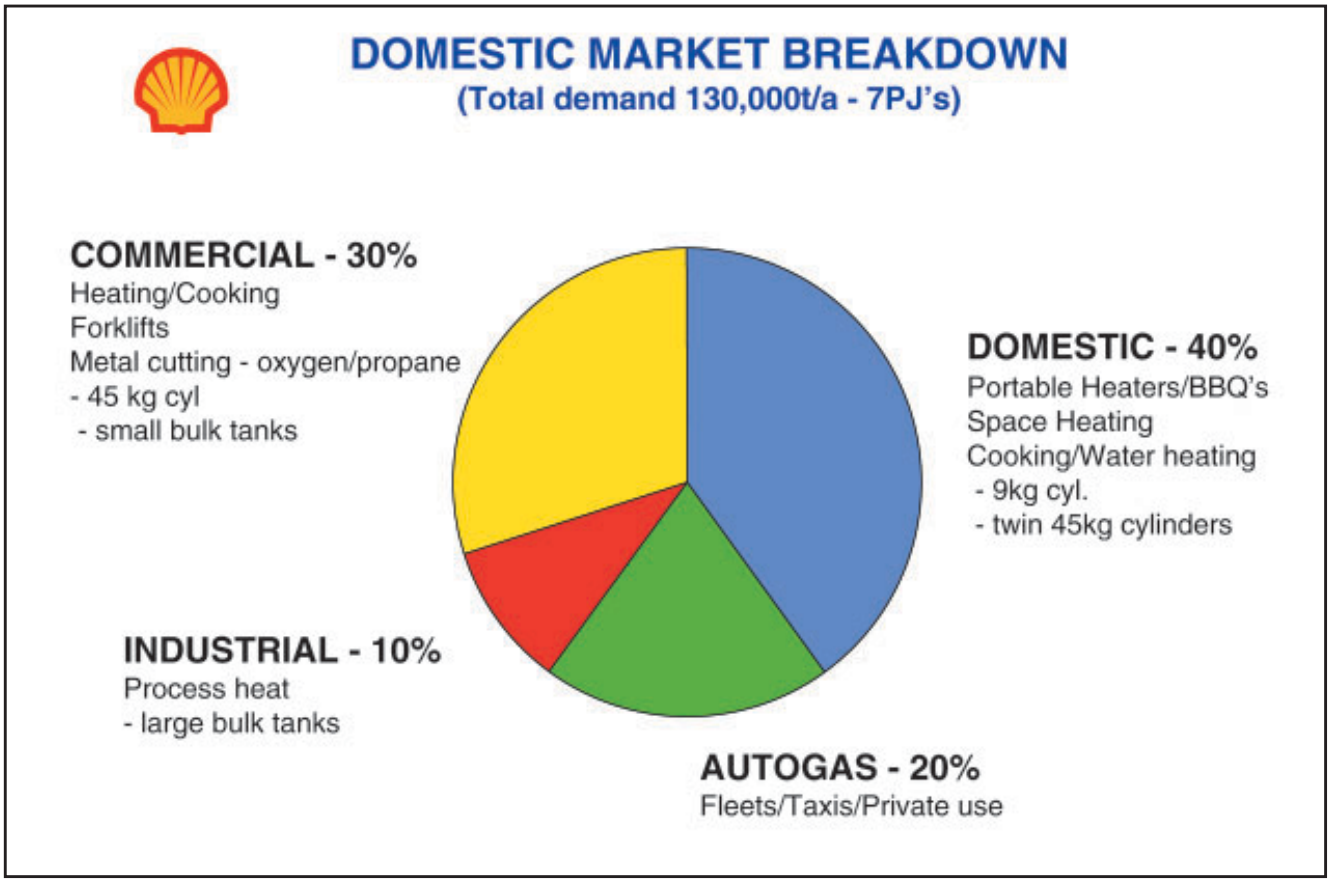

Figure 2: LPG demand in the domestic market broken down by major customer groups.

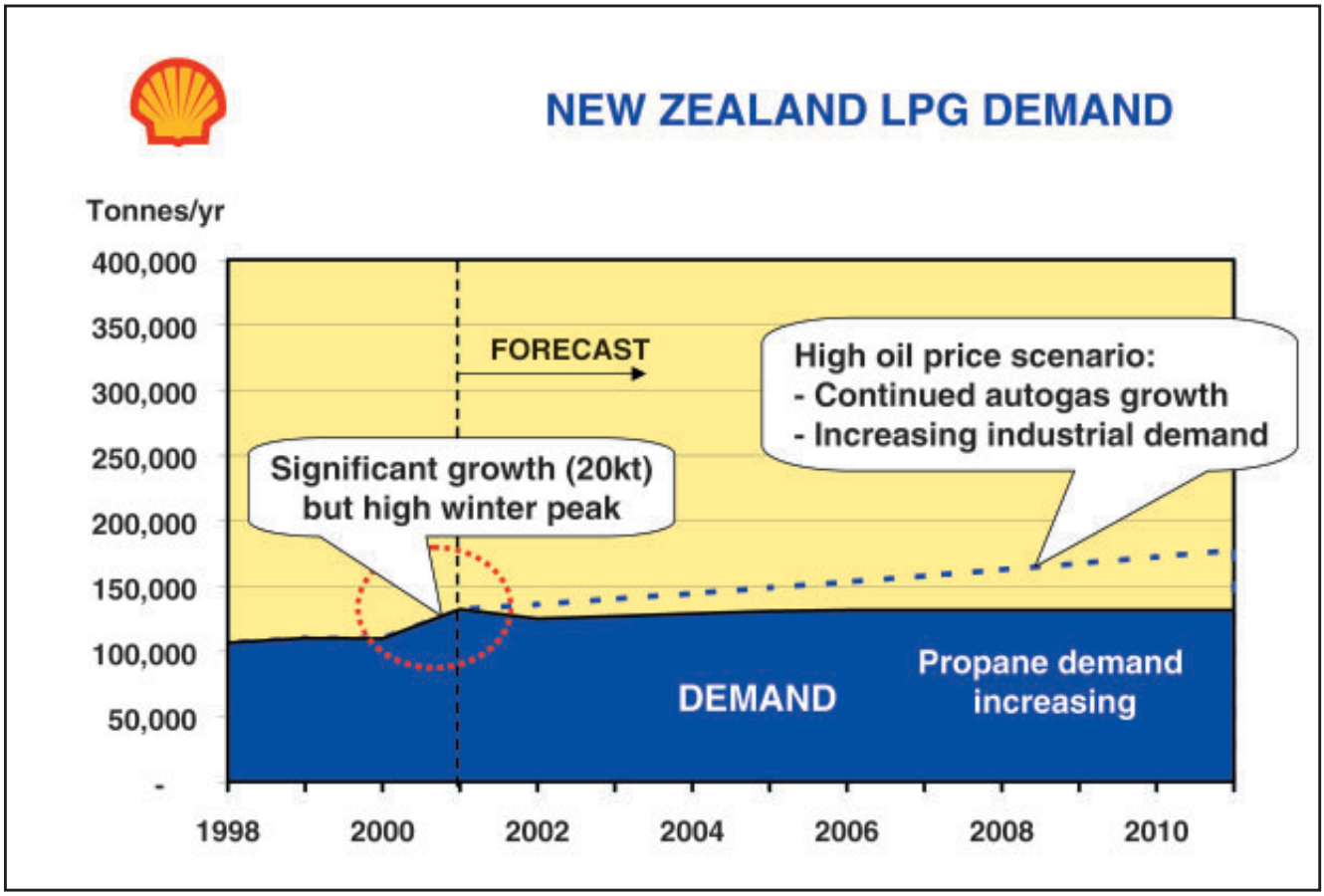

Figure 3: Forecast for total domestic LPG demand based on the analysis of the individual sectors above.

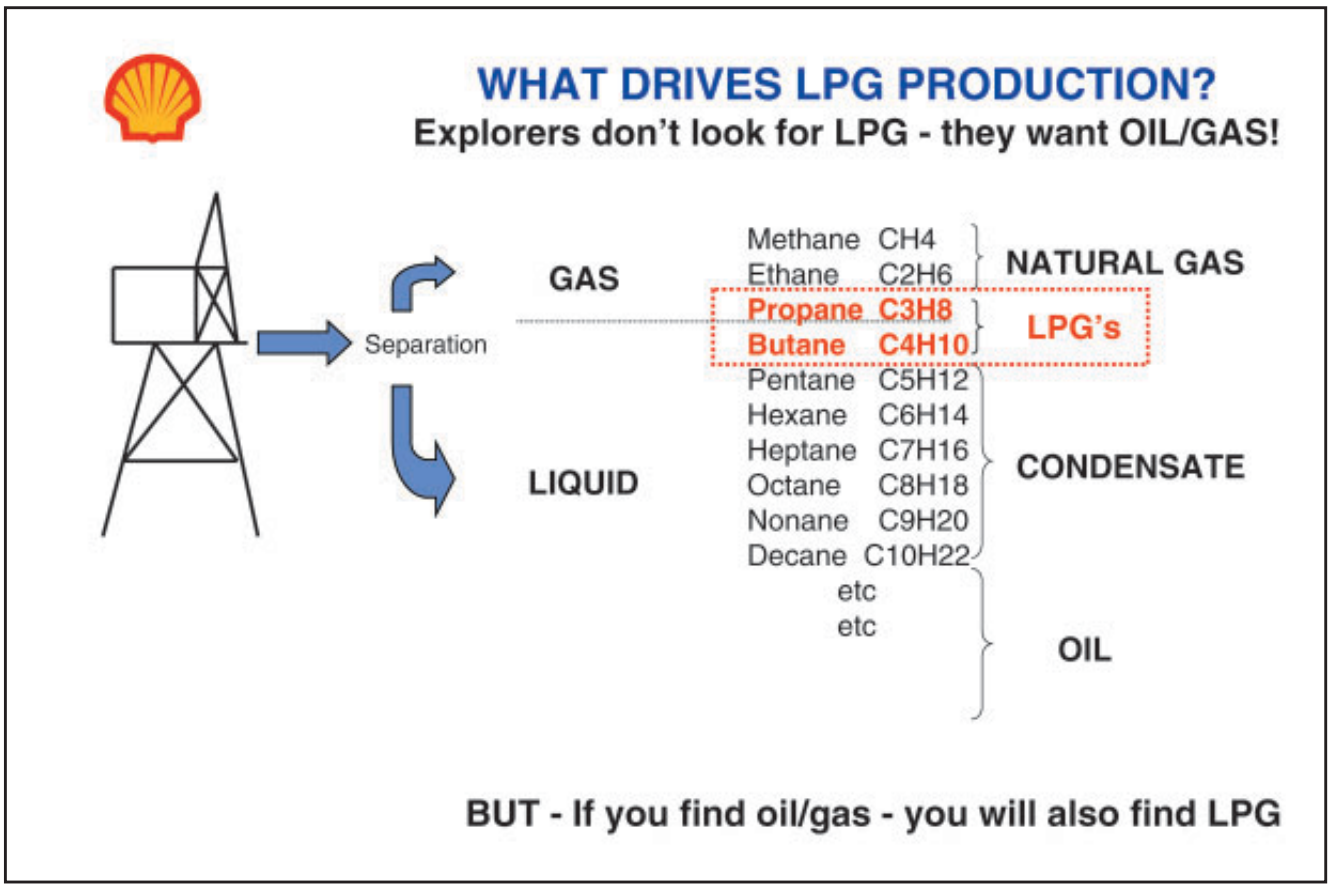

Figure 4: What drives LPG production?

Christchurch where town-planning restrictions may have previously prevented other forms of LPG storage.

Customers in this sector tend to prefer propane for its ease of use and consistent properties rather than LPG mix or butane and are typically price sensitive. The main competing fuels are electricity and diesel.

LPG is not usually competitive in this sector in the North Island where natural gas is available.

Recent increases in retail electricity prices are likely to have a positive impact on LPG demand.

As discussed later in this paper domestic propane pricing is also likely to increase in the future to be more line with the LPG producers export opportunities and this may have a negative impact on potential demand growth.

Current demand in this sector is estimated to be 30% of total with future demand forecast to keep pace with general growth rates in the domestic economy.

The domestic/residential market

This market sector again comprises a very wide range of customer types ranging from the lower socio-economic households using 9 kg cylinders in cheap but effective portable cabinet heaters, through to the more high tech customers with the latest remote controlled heating systems.

The 9 kg-cylinder market developed as the automotive sales volumes declined with the cylinders normally being filled at the service station forecourt. This market is now seen as mature with new heater sales only likely to be maintaining the current installed capacity.

New customers in this sector tend to install a twin 45 kg cylinder system and rely on a local distributor to supply and connect full cylinders, as demand requires.

Demand in this sector is becoming more seasonal consistent with the rapid growth in installed capacity. The new 45 kg cylinder customers together with around 500,000 unflued cabinet heaters users who rely on LPG for space heating have the ability to respond immediately to the onset of temperature extremes. The winter of 2001 saw a major demand spike that caught the industry off guard and almost over-stretched the distribution systems ability to meet the sudden demand swings.

As in the Commercial sector, the Domestic/Residential customers tend to prefer propane however the "high end" users are not as price sensitive and once they have chosen to install LPG heating/cooking systems would find it difficult to change energy forms at short notice.

The main competing fuel in this sector is electricity and again the recent increases in electricity prices should have a positive impact on longer-term LPG demand.

LPG's clean burning properties may provide further opportunities for future demand growth. As an example, Christchurch's Clean Air campaign may require existing wood and coal burning fires to be replaced in the near future with either LPG or electric fuelled heaters.

Current demand in this sector is estimated to be 40% of total demand. This sector has the highest growth rate of any of the four sectors considered, however the significant seasonal demand swings can make year on year comparisons difficult.

Domestic demand forecast

The chart above shows significant demand growth in 2001 however this may be partially due to increased industrial sector demand and to a cold winter with a high seasonal demand swing as described above.

The dotted line indicates the forecast for demand growth under a high oil price scenario.

LPG production

In order to complete the New Zealand supply/demand picture it is necessary to review the capabilities of existing and potential future LPG production sources and the factors influencing LPG production.

The production schematic shown in Figure 4 shows the position LPG occupies in the oil/gas field product line up. LPG has traditionally been seen as a by-product of oil and gas production. Natural gas typically needs to have most of the LPG's extracted to allow it to be piped without liquid dropout which would cause problems for pipeline compressors. Similarly, the condensate/oil streams need to have most of the LPG extracted to prevent excessive vapour boil off during shipping/storage. New Zealand hydrocarbon reservoirs have predominantly been gas rich.

Any factor that increases demand for either oil and/or gas will therefore influence the production of LPG. LPG can be injected back into the gas stream however this would typically cause the gas to fall outside of the New Zealand pipeline gas specification and require a dedicated pipeline to a gas consumer. The location of any hydrocarbon discovery has a major bearing on how the LPG stream can be marketed. Currently Maui is the only domestic producer capable of loading LPG onto ships and hence is the only producer with ready access to the export market. Kapuni and Waihapa both rely on road/rail tankers for local distribution.

Current LPG production sources

Three fields currently produce LPG.

Maui

Maui is capable of producing around 185,000 t/a. Around 90,000 t/a was exported in 2001. Maui also typically supplies around 75,000t/a into the domestic market and through its historical contract with Liquigas (written in 1981) effectively

sets the local pricing benchmark. The Maui/Liquigas contract runs through to 2009, however the price for LPG mix sold to Liquigas last changed in 1986!. The field has passed its peak production and is now in a slow decline.

Kapuni

The Kapuni field currently produces around 35,000 t/a of which 18,500 t/a is sold to Shell and Todd under a long term contract that runs through to 2009. Kapuni production is also in a gradual decline with rates expected to slowly reduce over the next 10-15 years.

Waihapa

Waihapa commenced production in 1996 and currently produces around 18,000 t/a

Factors influencing future LPG supply

LPG production at the three existing facilities is effectively determined by the volumes of natural gas sold. Natural gas sales are in turn are linked to demand from three main customer sectors:

- petrochemical production (mainly methanol from the two production plants at Waitara where natural gas is used as the main feedstock)
- electricity generation
- natural gas reticulated network demand.

Reticulated natural gas demand is expected to continue to grow at steady rates of around 3% to 5% per annum. The petrochemical and electricity generation sector demands are likely to be more volatile and could have the most significant impact on future LPG production rates.

Methanol production relies on access to supplies of large volumes of cheap gas. The current contract for supply of Maui gas to Methanex is due to expire in 2005/6. Unless a new contract can be finalised with a new producer, Methanex may be forced to close its methanol plants post 2005/6 and/or significantly reduce production rates. This provides a large degree of uncertainty over future LPG production volumes.

Electricity demand is forecast to grow consistent with economic development and population growth in the near term. This electricity demand growth will be magnified in terms of gas demand as most new electricity generation is expected to be fuelled by gas. The uncertainty in this sector will come from the timing of new generation projects and the potential negative impact from new higher efficiency generators and Government conservation policies aimed at reductions in energy consumption.

Additional sources of LPG could be made available from various other existing facilities such as the McKee oil field (doesn't currently extract LPG's from the gas stream) and the New Zealand Refinery at Whangarei (currently uses butane for gasoline blending or as fuel gas).

Two new oil/gas fields, Rimu/Kauri and Pohokura, are also expected to commence production of LPG's in the near term.

Rimu / Kauri

LPG production from Swift Energy's new discovery at Rimu is due to start early in 2002. Initial production is forecast to be around 10,000 t/a however there is potential for significantly higher production as exploration and development of both Rimu and the adjacent Kauri field is progressed. Given the location of the Rimu/Kauri fields, most of this product is expected to be sold into the local market in the short term.

Pohokura

The Pohokura field, located offshore Waitara in northern Taranaki, was discovered by a consortium of FCE, Shell, Preussag and Todd in 2000. Appraisal of the field is still ongoing, however initial estimates suggest that large quantities of LPG are likely to be available from 2005.

Field development proposals being considered include for deep chilling of the natural gas stream to around –60 degrees Celsius gas which will produce a much higher quantity of LPG and a much higher proportion of propane compared to the more usual –29 degrees Celsius used at the existing facilities.

The current LPG ship loading infrastructure in Taranaki limits ship cargo size to around 3,000 t and this in turn limits the returns available to producers from export sales to the distant but rapidly growing SE Asian markets. The LPG production volumes available from Pohokura are expected to justify the necessary pipeline and large scale storage facilities that will enable Pohokura LPG's to be loaded onto midsize gas carriers (around 10,000-20,000 t) for export distribution. The improved freight economics for exports will enable LPG to add significant value to the overall project.

The improved export opportunities available to the Pohokura producers will however inevitably lead to upward pressure on domestic prices especially for propane as the marginal export opportunity value improves.

Onshore producers who do not have access to export facilities may also look to increase their prices as volumes available from Maui decline.

New Zealand supply/demand balance

Combining the supply and demand side analysis gives a picture of the net LPG position in the local market.

As shown in the chart, the New Zealand market is likely to benefit from a continuing net surplus of LPG throughout the forecast period. The dotted lines indicate the high case scenarios for both supply and demand. Even if actual Pohokura production were to be significantly below current estimates it is unlikely that New Zealand would suffer from a shortage of LPG in the near future.

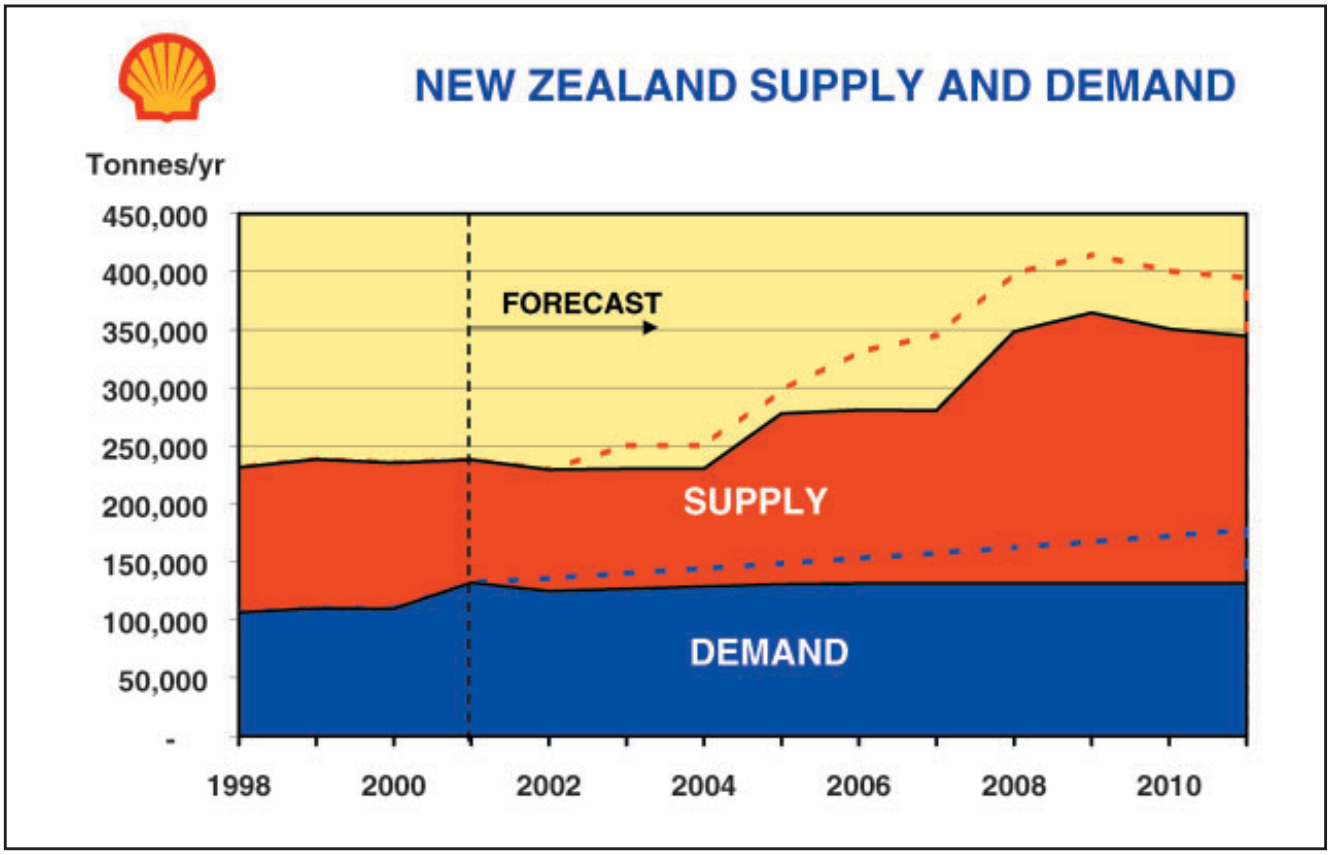

Figure 5: New Zealand LPG supply and demand

Regional trading overview

The ongoing LPG surplus provides significant opportunities for export marketing. Maui LPG is currently exported throughout the South Pacific Islands, the East Coast of Australia and South East Asia.

Maui satisfies essentially all of the South Pacific Islands demand for LPG from Papua New Guinea to Tahiti. LPG demand in the South Pacific Islands East of the New Caledonia market is predominantly for butane due to the high ambient temperatures in the area. This preference for butane helps balance the greater preference for propane in the domestic market.

Papua New Guinea and the Solomon Islands have traditionally used either propane or LPG mix.

The limited Liquigas/Maui storage facilities are ideally suited for supplying the South Pacific region as ships trading in the area are typically 500 to 1500 t capacity and receiving terminals are also small, typically around 300 t to 1000 t but ranging in size from 60 t through to 2500 t.

Australia is a net exporter of LPG, however this position is made up of numerous product trade flows with producers and marketers exporting and importing product at various locations.

The East Coast Australia market is predominantly propane. The preference for propane as the "traditional" heating and cooking fuel is based to some extent on historical supply constraints and has become reinforced over time through legislation and distribution logistics. LPG mix is accepted for use as autogas and some butane is used in industrial applications and for aerosol manufacture.

Maui has exported LPG mix to Brisbane and Sydney and has more recently developed contracts for supply of propane to various destinations.

East Coast Australian demand far exceeds Maui's ability to supply and most imported propane is sourced from either SE Asia or the Middle East. This market provides significant opportunities for the additional production volumes.

The SE Asian market for LPG is extremely large and growing rapidly especially in the South China region. China currently imports over 5 million tonnes of LPG each year, up from almost zero in 1990. Maui exports significant quantities of LPG mix to the region, however producer netbacks are typically much lower than for other export markets due to the high freight costs for small shipments. Again this region provides significant opportunities for additional NZ production.

Other potential export markets could include India and South America assuming mid size or larger ships could be loaded.

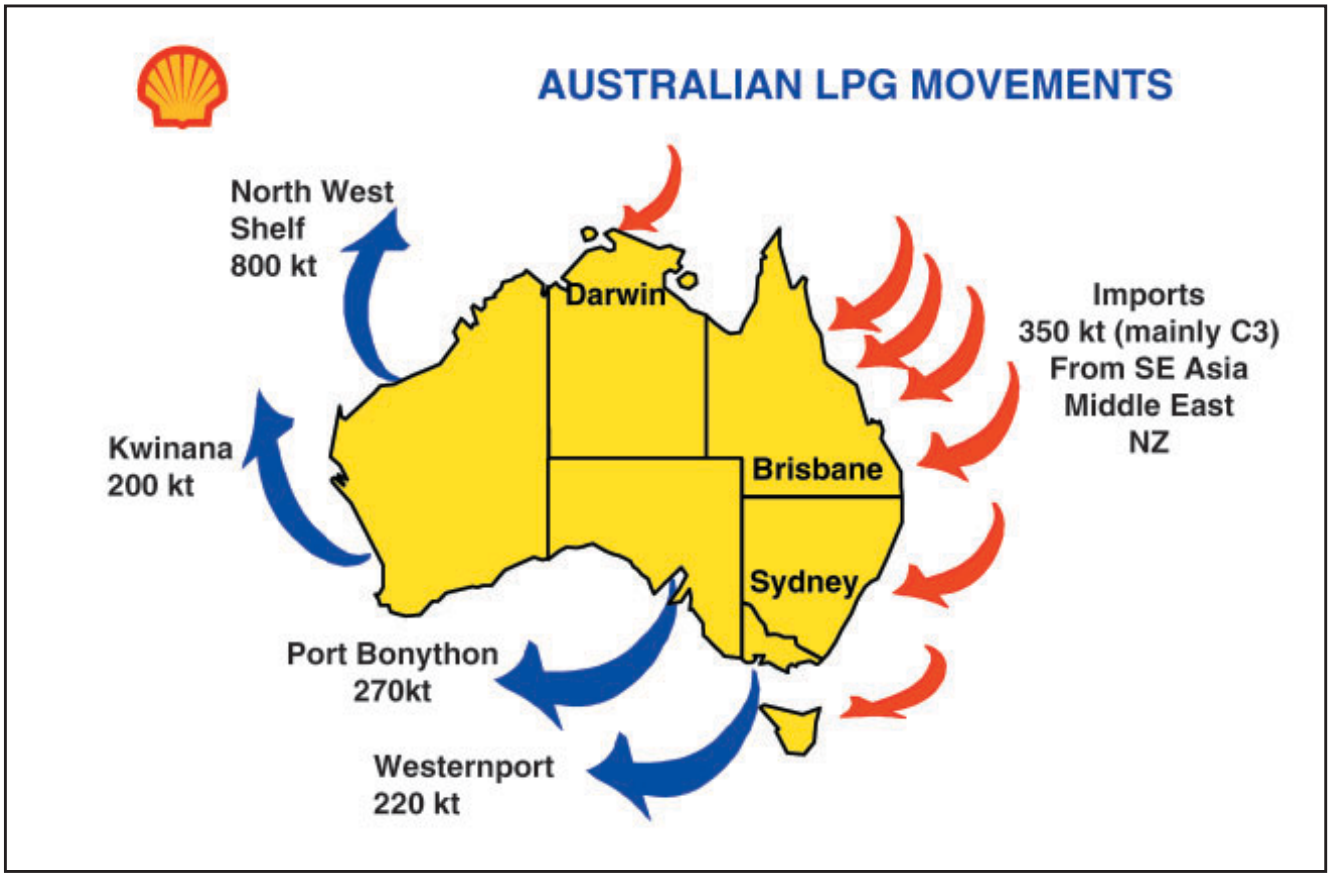

Figure 6: Major LPG trade flows around Australia.

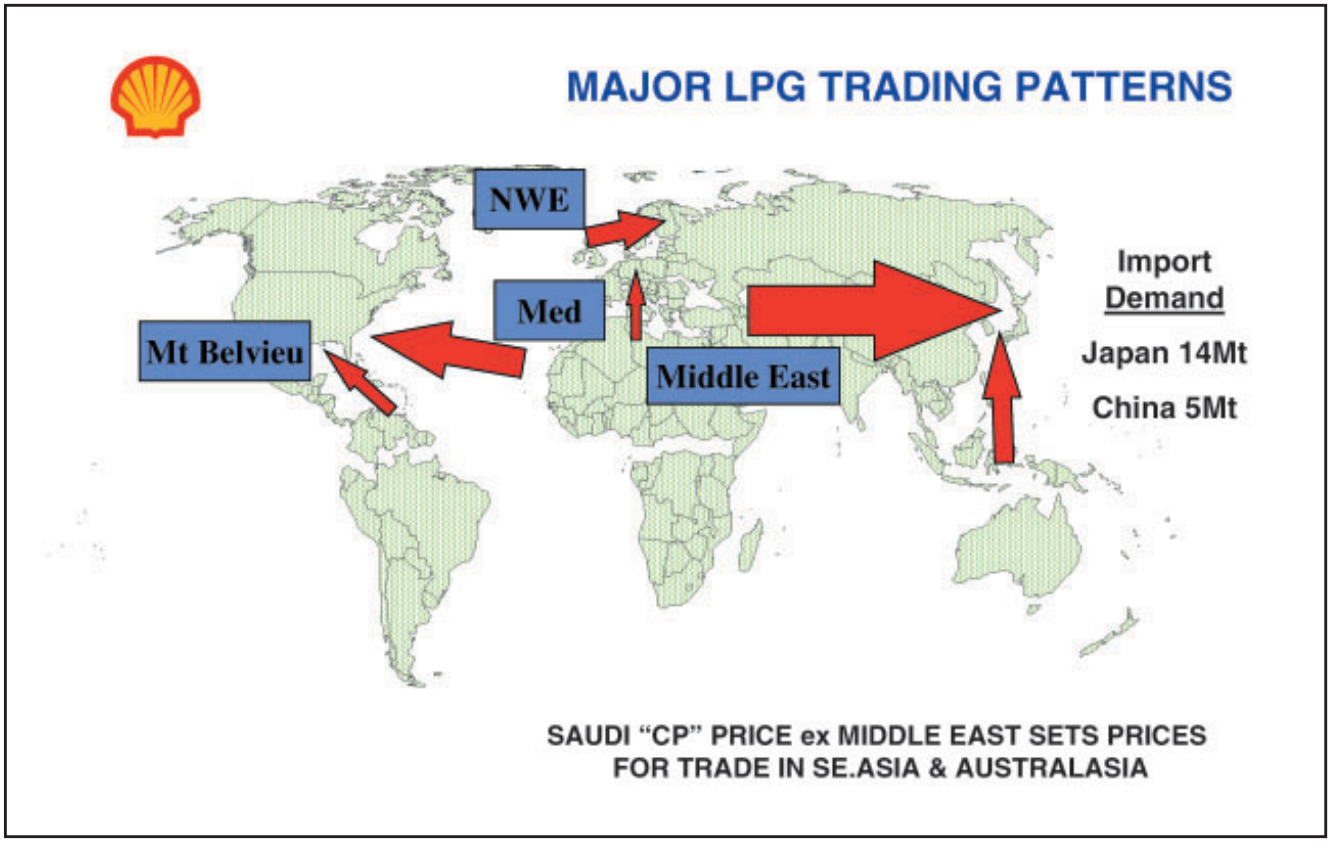

Figure 7: Major LPG Trading Patterns

International LPG pricing

There are four major international trading hubs for LPG; Mt Belvieu – Texas (location of the largest storage facilities for LPG in the world), the Middle East (the largest producing region), the Mediterranean and NW Europe. Figure 7.

The trade between the Middle East producers and Japanese Trading companies typically sets the benchmark for pricing in the Australasian region. The benchmark price is referred to as the Saudi Arabian Contract Price or "CP".

New Zealand exports are typically priced on a CFR basis to compete with alternative supplies from the Middle East. This gives a variable netback to the local NZ producer depending on export product destination. Figure 8 shows the current netback cascade for the various domestic and export LPG markets.

This hierarchy clearly shows that domestic producer prices in general, and the Liquigas/Maui contract price in particular, have failed to keep pace with changes in international pricing. This pricing dislocation must inevitably lead to a significant readjustment in domestic pricing as Maui production declines and the influence of the Maui/Liquigas contract is reduced. The increasing demand for propane has already seen some upward movement in the domestic propane prices over recent months.

Unfortunately this pricing readjustment is likely to have a negative impact on domestic LPG demand and this has been factored into the demand forecasts shown above from 2005 onwards when Pohokura production is assumed to commence. As the domestic market prices trend toward international price parity, the domestic market is also likely to face significant price volatility. Historically the domestic prices have been essentially fixed, with no linkage to international price fluctuations.

Figure 9 compares recent CP prices to the typical range for domestic producer prices and highlights this issue.

International LPG prices have increased significantly over the last 15 years when compared to oil prices. In the mid 1980s, the Saudi "CP" was set by formula at 90% of the energy equivalent value of Arab Light oil. "CP" is now commonly set at levels well above the equivalent oil price especially in the Northern Hemisphere winter "heating" season.

Summary

The success of the recent Rimu/Kauri and Pohokura discoveries has ensured that New Zealand will continue to have access to more than adequate supplies of LPG for at least the next decade.

Local demand is unlikely to grow at significant rates with both the autogas and industrial market sectors being adversely affected by low oil prices in the near term. Good growth rates are expected initially in the domestic/residential sector however the preference for propane and the inevitable upward

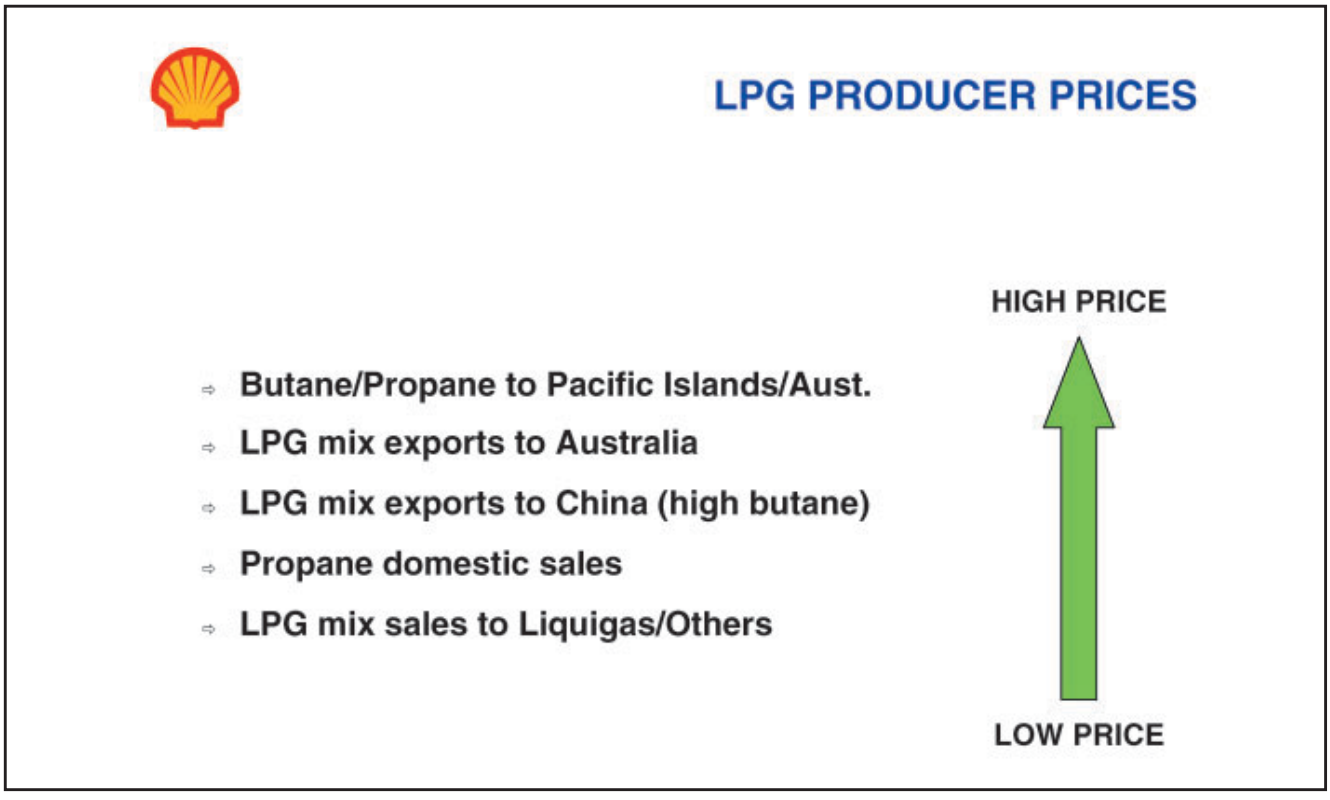

Figure 8: LPG Producer Prices

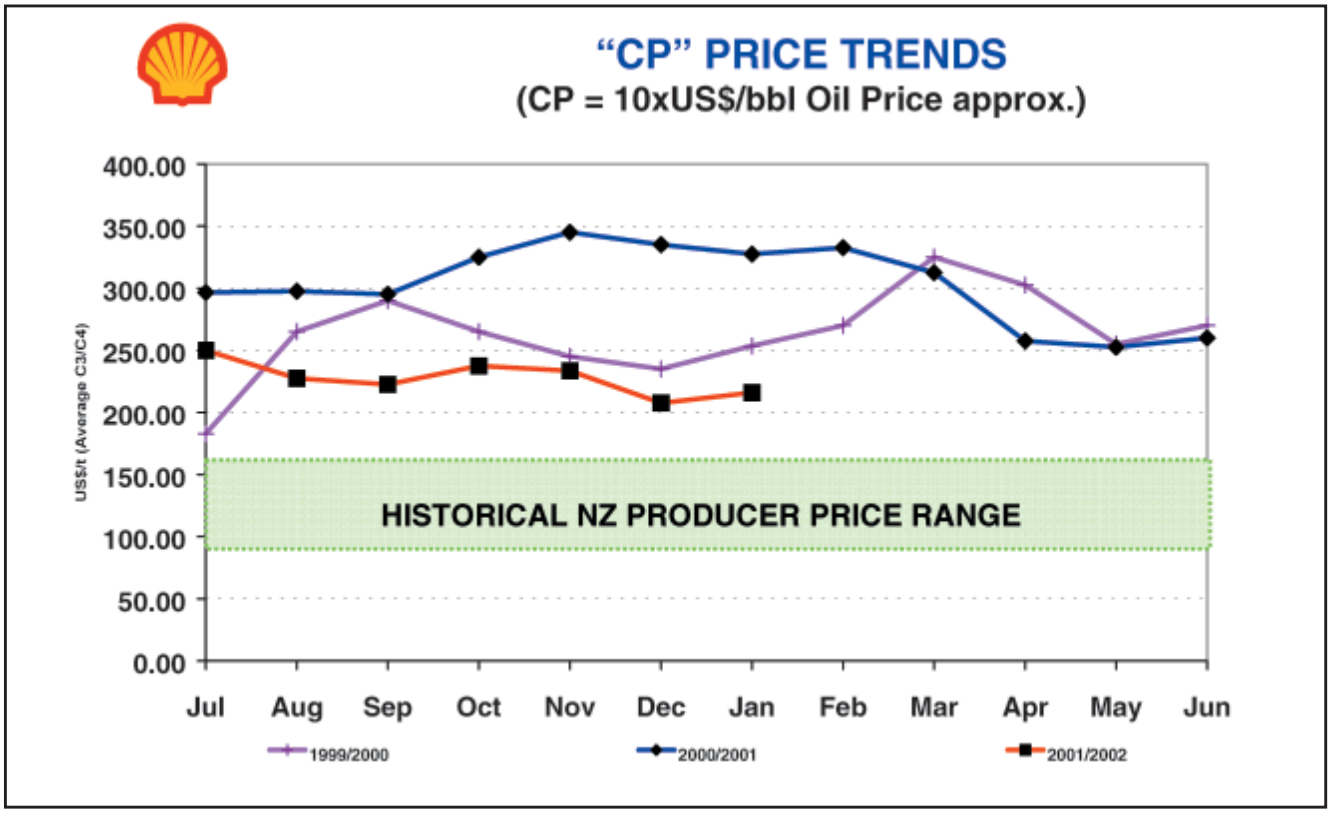

Figure 9: "CP" Price Trends

movement in local propane pricing may slow this growth in the medium term. The likely increase in the competing electricity prices may help offset the propane price rise to some extent.

Deeper chilling proposed for the Pohokura gas stream will produce a significant surplus of product from 2005 onwards and this additional production will be biased toward propane which will help balance the increasing demand for propane in the domestic market.

The downside of this additional production (for the domestic market) will be the improved export scale economies that will inevitably lead to higher local prices as the historical "fixed" price domestic contracts expire. Price volatility is also likely to become a feature in future domestic supply contracts.

The upward trend in international pricing has forced producers to rethink their historical attitudes to the LPG portion of the oil barrel. LPG is no longer seen as a "by-product" of oil and gas production, but as a separate tradable commodity that is capable of adding significant value to oil and gas field developments.

The local region is short of LPG, especially propane, and producers should be able to achieve FOB prices comparable to oil for large-scale LPG exports. The proposed Pohokura storage and ship loading facilities will mark a significant step upward in New Zealand's export scale economy and may also allow other smaller onshore producers to participate in the lucrative export markets if delivery costs between the various production facilities can be minimised.

Author

Chris Mulvena has 18 years experience in the New Zealand LPG industry, starting his career as a junior engineer with Liquigas Ltd in the early 1980's.

Chris subsequently moved to Fletcher Challenge Energy where he was responsible for managing the export marketing of Maui LPG on behalf of the Maui Joint Venture. Following Shell's successful acquisition of FCE in 2001, Chris moved to his current position in Shell (Petroleum Mining)

Chris' current role focus' on marketing Shell's Maui and Kapuni LPG interests and he is involved in developing marketing options for Pohokura LPG.

Chris is also currently the Chairman of Liquigas Limited.