

Report to:  
**Petroleum Exploration and Production Association New Zealand  
(PEPANZ)**

# **ECONOMIC IMPACT OF THE OIL AND GAS SECTOR ON THE TARANAKI REGION AND NEW ZEALAND**



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# 1 Executive summary

This report shows the economic impact of the oil and gas sector on the Taranaki and national economies. Activity and multiplier analysis<sup>1</sup> numbers are for the year ended March 2006.

## *Economic impact analysis*

In the year to March 2006, the oil and gas sector employed 817 Full Time Equivalents (FTEs) and generated NZ\$741 million of GDP in the Taranaki region. It accounted for 17 percent of the region's GDP.

Nationally, the oil and gas sector employed 904 FTEs and generated NZ\$827 million of GDP. The sector accounted for around 0.5 percent of national GDP.

Applying multiplier analysis, the oil and gas sector contributed a total of:

- NZ\$1.0 billion to the Taranaki economy and employed close to 3,000 FTEs.
- NZ\$1.6 billion to the New Zealand economy and employed over 8,600 FTEs.

Construction costs for projects should be considered separately from, and additional to, the operational costs identified above. These costs vary, depending on the size and location of the field, with offshore fields usually considerably more expensive to develop than those onshore; the number of wells considered necessary to drain the field of its recoverable reserves; and the types of wells, whether vertical or horizontal, which is more complex and costly. This will impact both the total cost of the project and the proportion of that cost which can be captured locally.

For example, the offshore Kupe gas/condensate field has a total project cost of around NZ\$1.08 billion). Of this, around NZ\$618 million is expected to be spent in the Taranaki region in total. Applying multiplier analysis, this project can be expected to generate NZ\$240 million in regional GDP and employ 3,000 FTEs for one year.

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<sup>1</sup> Multiplier analysis is explained in detail in the Appendices. Regional input-output tables are derived from the Statistics New Zealand official input output-tables released in 1995. While these have been updated to 2003 by Butcher and Associates, a recognised source for regional input-output tables and multipliers, they should be considered unofficial estimates as the regional composition and industry input-output compositions are likely to have changed over that period. For a discussion on regional input output tables and the validity and reliability of the Butcher input-output tables see *Statistics New Zealand (2003) Regional Input Output Study*.

Total costs for the onshore Cheal oil field development were about NZ\$30 million. However, a relatively higher proportion of the expenditure was likely to have been spent locally.

#### *Strategic importance to the Taranaki region*

Taranaki is the centre of the oil and gas sector in New Zealand, accounting for 90 percent of all employment and GDP activity.

The oil and gas sector in Taranaki is a world-class industry applying cutting-edge technology and proprietary intellectual property. This has had flow on effects into the industries and businesses in the region but also into the wider community.

- The sector has developed the capability in a number of industries such as engineering and construction, which can then be applied in other areas such as boatbuilding.
- The sector attracts international people to the region who bring wider benefits through participation in the local economy through governance and social participation.

The oil and gas sector is a cornerstone of the Taranaki economy, generating 17 percent of the region's GDP but, more importantly, contributing to the capability and capacity within a number of key industries and businesses in the region.

There has been significant investment in infrastructure through gas pipelines such as the Maui pipeline, production facilities and Port Taranaki. It would be very costly and difficult to replicate this infrastructure in another region. Similarly, businesses that require a significant amount of gas for production (Methanex, Ballance) are located in the region. The sector has been operating in the region for a long time. There is an understanding in the community and local government of the importance of the oil and gas sector to the economy. This long-term relationship and understanding makes it easier for the sector to operate in the region.

Several industries in Taranaki rely on the oil and gas sector for a significant portion of their activity. For example, close to 30 percent of computer services output is to the oil and gas sector. For non-building construction the proportion is 20 percent and for other business services, 19 percent.

The oil and gas sector is a significant export earner. An estimated 85 percent of output generated in the sector is exported. This is close to 18 percent of the region's total exports.

Businesses that provide dedicated services to the industry are based in the Taranaki region. Similarly, the expertise and resources needed in the sector tend to be based in the Taranaki region.

Therefore, any future activity in the oil and gas sector, whether it be exploration or extraction, in Taranaki or nationally (for example, the Great South Basin), is likely to require significant contributions from, and generate activity in, the Taranaki region.

#### *Strategic importance to the National economy*

The sector plays a necessary role in providing secure energy supply for economic activity and growth. There is a significant gas network in the North Island and a number of businesses and households rely on gas for their energy needs. Gas is also used to generate electricity and plays an important role in complementing hydro and wind generation, especially as these are subject to the whims of nature.

The sector contributes new technology, improves work practices, and demands high skilled labour – all key drivers of economic growth and transformation. The oil and gas sector is capital intensive. It employs cutting edge technology and best practice processes. Employees are generally highly skilled. The labour productivity of workers in the oil and gas sector is significantly higher than the national average.

The oil and gas sector makes significant contributions to the government by way of royalties. Between 1970 and 2005, over NZ\$2.8 billion was collected through petroleum royalties.

#### *Constraints to growth*

Exploration intentions are high and new production fields have recently come on-stream, with several more in construction. . Increasing demand for energy, combined with government efforts to increase exploration, has seen activity increase noticeably over the last few years.

In a tight labour market, particularly for skilled labour, attracting the necessary labour will be the key constraint on growth in the oil and gas sector. The sector employs skilled labour, with these skills being applicable anywhere in the world. Increasing activity means that the demand for skilled labour will also increase, with much of this demand being global as well as local.

# Oil and gas sector EIA

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## 2 Introduction and methodology

This economic impact assessment identifies the contribution of the oil and gas sector to the New Zealand and, in particular, the Taranaki economy. The information in this report will provide a clear indication of the value, and therefore, relative importance of the industry to the Taranaki and New Zealand economies.

The report provides a quantitative description of the oil and gas sector in Taranaki and New Zealand in terms of employment, GDP and output and relates this in context to total employment, GDP and output in Taranaki and New Zealand. It also provides a qualitative discussion of the sector's impact on a range of related industries and businesses.

The oil and gas sector in New Zealand is made up of petroleum exploration and production companies. These are well-defined industries from a statistical and a descriptive perspective. For the purpose of this report we have confined the oil and gas sector to the exploration and extraction of oil and gas. The sector consists of four industries at the ANZSIC<sup>2</sup> 114 industry level, namely:

- oil and gas exploration
- oil and gas extraction (production)
- services to mining (Taranaki region only)
- other mining and quarrying (Taranaki region only).

These four sectors capture the majority of activity that we analysed.

The analysis provides an economic impact assessment of the oil and gas sector in Taranaki and New Zealand. To provide further context, it also discusses the:

- oil and gas sector's contribution to regional and national employment, GDP and business units
- industries which provide the most input into the oil and gas sector at a regional and national level (i.e. industries on which oil and gas depends for its inputs)

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<sup>2</sup> The ANZSIC code is the Australian and New Zealand Standard Industrial Classification. It provides a hierarchical classification of all industries within the economy, from a very broad 17-industry level (eg mining) to a detailed 440-industry level (eg oil and gas extraction). Multiplier and input-output tables are available at the 47 and 114-industry level of detail. The 114-industry level was chosen in order to provide the most detail possible.

- input industries which contribute the largest portions of their own output to the oil and gas sector (i.e. industries that rely on the oil and gas sector for a significant proportion of their work)
- portion of inputs into the oil and gas sector that is imported and the portion of the sector's output that is exported.

The economic impact analysis is based on output in the year to March 2006 and does not take account of any activity after then. Employment is based on Statistics New Zealand's business frame and BERL has used national GDP statistics to determine regional GDP. All currency values are in New Zealand dollars.

Employment and output multipliers developed by Butcher and Associates were applied to calculate the total impact of the sector on these indicators. The input-output tables associated with the multipliers were used to determine the industry composition of inputs into the oil and gas sector. In addition, these tables were used to calculate the importance of the oil and gas sector to industries in the region and nationally.<sup>3</sup>

For example, of all inputs required by the oil and gas sector in Taranaki, 1.3 percent is from the non-building construction industry. Meanwhile, the non-building construction industry's contribution to the Taranaki oil and gas sector accounts for 14 percent of all output by the non-building construction industry in Taranaki.

Input-output tables were also used to calculate what portion of an industry's inputs came from outside the region (i.e. imports). For example, 17 percent of inputs required by the oil and gas sector in Taranaki were imported from other parts of New Zealand or overseas. This accounted for 4.2 percent of total imports in the Taranaki region. The Taranaki oil and gas sector exported 85 percent of its output to the rest of New Zealand or overseas. This accounted for 18 percent of all exports from the Taranaki region.

Capital expenditure on the construction phase does not appear to be captured in the operational expenditures used to determine the economic impacts. This expenditure tends to occur between the exploration phase and the extraction phase. It is ad hoc and is dependent firstly upon a successful find, and then on a number of other factors such as the location and the type of find. For example, to move to the production phase, an onshore well

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<sup>3</sup> The regional input-output tables are derived from the Statistics New Zealand official input output tables released in 1995. While these have been updated to 2003 by Butcher and Associates, they should be considered unofficial estimates as the regional composition and industry input-output compositions are likely to have changed over that period.

field close to existing infrastructure could cost around \$30 million<sup>4</sup> whereas an offshore field could cost up to \$1 billion<sup>5</sup> or more. Section 6 provides a range of examples of oil and gas fields that have been developed both onshore and offshore, and indicative measures of the impacts of their construction.

Section 7 presents Crown Minerals data on royalties collected by government from the oil and gas sector, while section 8 highlights a number of industries and businesses for whom the oil and gas sector is either essential or provides the most cost-effective energy source.<sup>6</sup> While these industries are not included in the definition of the oil and gas sector and, therefore the economic impact analysis, their links to the sector are undeniable.

Examples include the main energy generators, who are now vertically integrated into the oil and gas sector from exploration through to retailing. The report also discusses major gas users such as the Methanex Methanol plant at the Waitara Valley, Ballance Agri-Nutrients' Ammonia-Urea plant at Kapuni and Fonterra's gas-fired cogeneration facilities at it giant Whareroa dairy complex, the largest single-site dairy complex in the world.

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<sup>4</sup> Estimated project cost for Cheal, contained in company release.

<sup>5</sup> Estimated project cost for Kupe is \$1,080 million, provided by Origin Energy.

<sup>6</sup> There are also a number of companies that service these industries, often exclusively, providing specialised services to meet the needs of the oil and gas sector. However, these do not need to be added to the sector separately as they are captured through input-output analysis.

### 3 Overview of the oil and gas sector

This section provides an overview of the oil and gas sector in New Zealand. Production and activity figures are for the year ended 2006. Most of this data is sourced from the Crown Minerals website<sup>7</sup> and publications. Discussion on future activity is taken from a number of sources, largely unofficial.

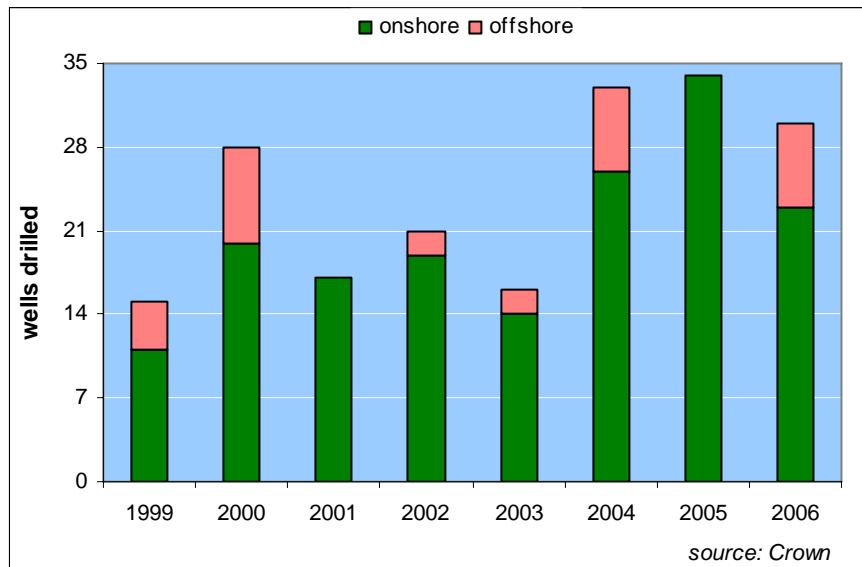
#### 3.1 Geography, activity and production

There are eight sedimentary basins with known or potential hydrocarbons onshore and across the continental shelf of New Zealand, as well as several deepwater basins within its Exclusive Economic Zone.

The extraction of oil and gas in New Zealand is currently limited to the Taranaki Basin.

Figure 3.1 shows the number of petroleum wells drilled in New Zealand broken down by year and whether they were drilled onshore or offshore.

Figure 3.1 Wells drilled, 1999 – 2006



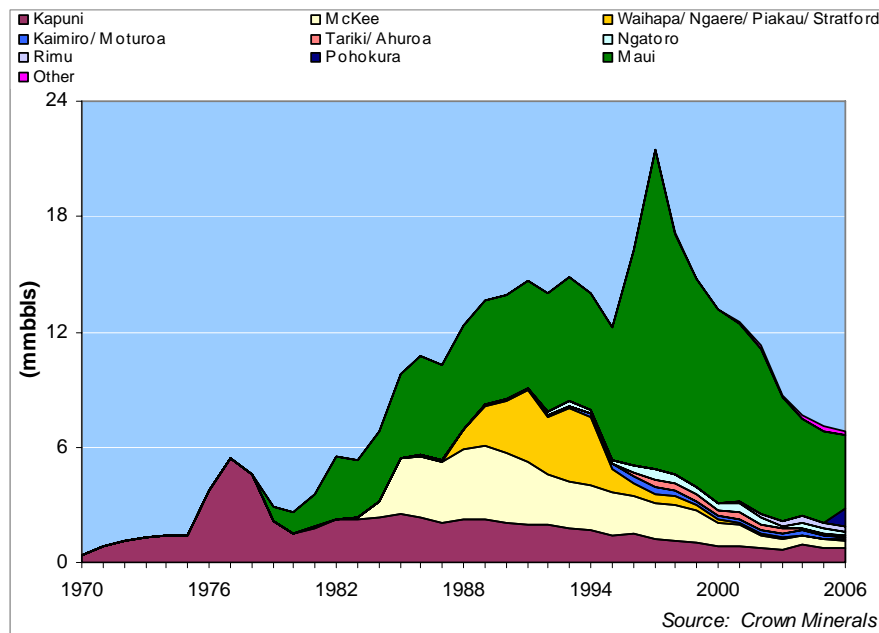
Of the 30 wells drilled in 2006, 29 were in Taranaki while one was in Canterbury. Of the 30, 23 were onshore. Activity roughly doubled between 2003 and 2004, and has remained at the higher level since.

<sup>7</sup> [www.crownminerals.govt.nz/cms](http://www.crownminerals.govt.nz/cms)

New Zealand estimates of known reserves from producing and non-producing wells are around 200 million barrels of oil and 2,200 billion cubic feet of gas.<sup>8</sup>

Figure 3.2 and Figure 3.3 show oil and gas production in New Zealand between 1970 and 2006.

**Figure 3.2 Crude oil, condensate and naphtha production by field, 1970 – 2006**

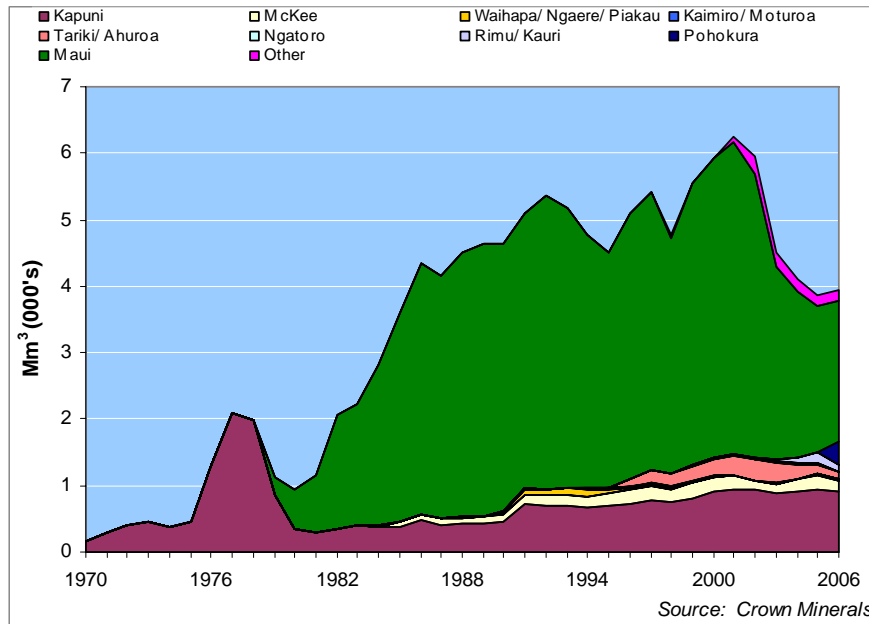


There are 12 fields currently producing in New Zealand, all of which are in the Taranaki region. Kapuni is the longest serving field, followed by Maui, which is the most significant producer. The recent production from Pohokura can be seen in the latest year.

Oil production rose steadily from 1970 to 1977 as output from the Kapuni field peaked. Maui came on-stream in 1979, followed by McKee and then the Waihapa/Ngaere fields. Maui was dominant from the early 1980s when oil-condensate production peaked in 1997. Production has fallen steadily since, levelling off in 2006 with the introduction of Pohokura. In the 2006 calendar year, oil production stood at 6.81 million barrels, down from the 1997 peak of 21.5 million barrels.

<sup>8</sup> Crown Minerals Data – as at 1 January 2006. Several fields have subsequently re-graded their estimates.

**Figure 3.3 Net gas production by field**



Kapuni and Maui are the main gas producing fields in New Zealand. There has been a contribution from a number of other fields including McKee, Tariki/Ahuroa and Rimu/Kauri and then a number of smaller wells. First gas from Pohokura was introduced in August 2006 and there has been solid input from smaller fields<sup>9</sup> since 2000.

Gas production has followed a similar pattern to that of oil production, rising to 1977 as the Kapuni field gas production peaked, before the Maui field became the dominant producer. Gas production topped out in 2001, and has dipped substantially since.

Recent oil discoveries have been made offshore with the Tui and Maari fields, along with gas discoveries in the Kupe and Pohokura fields. There have also been a number of smaller discoveries onshore in Taranaki with Rimu-Kauri, Turangi, Cheal, and Moturoa 5 (all being discovered since the turn of the century. These discoveries are expected to see oil and gas production briefly equal (or exceed in the case of oil) the previous peaks attained in 1997 and 2001 respectively.

<sup>9</sup> Mangahewa, Cheal, Turangi, Surrey, and Radnor

### 3.2 Future activity

With two new fields having come on-stream since 2006 and two more expected to be on-stream by 2009, production growth is likely to return to positive. High oil prices and drilling intentions<sup>10</sup> mean that recent exploration trends can be expected to continue.

The recent increase in oil prices has seen interest in exploration in New Zealand rise.<sup>11</sup> Recently, five permits were granted in the Great Southern Basin. These are expected to cost more than \$1 billion to explore and may generate significant activity and income if there are any commercial discoveries.

Any large finds are likely to generate construction and extraction activities as well as contribute to exports, value added and royalties that will benefit the New Zealand economy.

Any increase in exploration or extraction is also likely to have a positive impact on the Taranaki economy. The Taranaki region is recognised as the oil and gas capital of New Zealand.<sup>12</sup> It has world class technology, capability and capacity to service the industry. It offers infrastructure, businesses, and individual expertise not available in other parts of New Zealand.

Most, if not all, other regions in New Zealand are simply not geared to provide the required inputs into the oil and gas sector, nor do they have the infrastructure to deal with the outputs generated by the industry.

It is, therefore, likely that any future exploration and/or discoveries, regardless of where they occur in New Zealand, will require at least some contribution from Taranaki, be it the Port, the engineering and construction businesses, the dedicated support businesses, individual expertise, or the pipeline infrastructure.

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<sup>10</sup> Approximately 30 wells are confirmed to be drilled between 2007 and 2009 with a further 10 drilling options.

<sup>11</sup> Exploration has been and is continuing to occur in many basins around New Zealand including Southland, East Coast/Wairarapa, Northland, Canterbury and offshore Taranaki.

L&M Petroleum recently drilled three wells in Southland, none of which was successful.

On the East Coast/Wairarapa Discovery Geo plans to drill the first onshore well in the Wairarapa (Ranui 1). An offshore exploration drill is likely with Trans-Orient Petroleum undertaking significant geochemical sampling. Energy Corporation of America (Westech) recently drilled and suspended the Watohora well.

Substantial seismic work is being done on the edge of the Taranaki/Northland basin by OMV.

In Canterbury, there was an offshore drilling in late 2006 (Cutter 1 by Tap Oil) which found nothing worthwhile. Meanwhile, Origin Energy has two offshore licences and has done some substantial 2D and 3D seismic survey work.

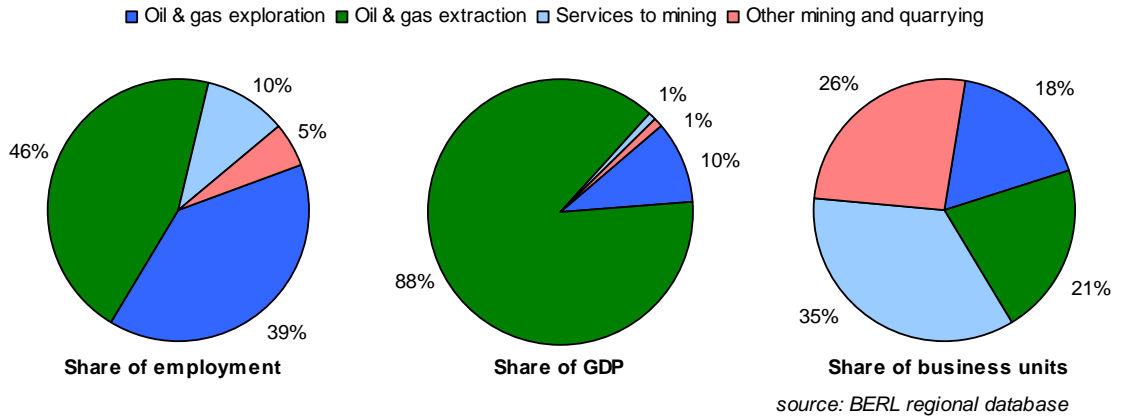
<sup>12</sup> Practically the entire industry (as defined in this report) is based in either Taranaki or Wellington.

### 3.3 Oil and gas sector industries

This sub-section looks at the four industries that make up the oil and gas sector in Taranaki.

Figure 3.4 shows the contribution to oil and gas employment, GDP and business units provided by each of the four component industries.

**Figure 3.4 Contributions to oil and gas employment, GDP and business units**

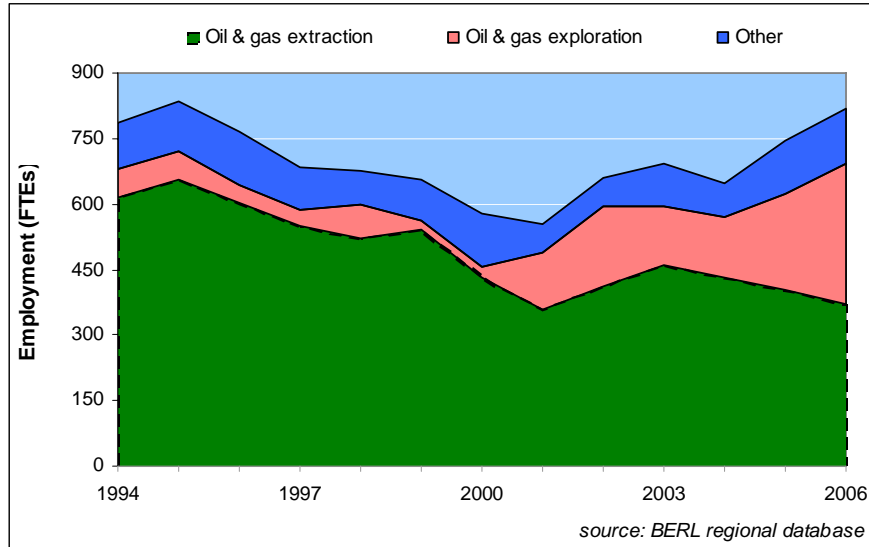


Oil and gas extraction (production) provides almost half of all employment, while exploration provides a further two-fifths.

The picture for GDP is even more lopsided, with extraction providing 88 percent, while each of the four industries provides a substantial portion of the business units. This indicates that the number of FTEs per business is far higher in extraction and exploration than in services to mining and other mining and quarrying.

Activity in the oil and gas sector is improving as exploration picks up and recently-drilled development wells come on-stream. Employment activity over the past twelve years is shown in Figure 3.5.

Figure 3.5 Employment growth in the oil and gas sector, Taranaki



Total employment in the sector has been picking up from around 2001, according to official statistics. The driver of the sector over the last few years has been exploration, while extraction has fallen off. Employment in other mining and quarrying and services (“Other” in the figure) has remained relatively constant.

## 4 The oil and gas sector in Taranaki

This section provides an economic impact analysis of the oil and gas sector on the Taranaki region.

The Taranaki region is currently home to all New Zealand's oil and gas production. As a result, it accounted for 90 percent of all the oil and gas sector's employment and GDP in New Zealand in 2006.

The oil and gas sector in Taranaki is made up of four industries at the ANZSIC<sup>13</sup> 114 industry level. The industries are oil and gas exploration, oil and gas extraction, services to mining, and other mining and quarrying.<sup>14</sup>

### 4.1 Economic Impacts

Table 4.1 shows the direct contribution of the Taranaki oil and gas sector to the Taranaki economy and to the national oil and gas sector in 2006 in terms of employment, GDP and business units.

**Table 4.1 Taranaki oil and gas sector**

<b>Taranaki oil &amp; gas sector</b>	<b>Total</b>	<b>% of regional</b>	<b>% of national oil and gas</b>
Employment (FTEs)	817	1.81	90.45
GDP (NZ\$m)	741	16.93	89.68
Business units	57	0.45	41.01

*source: BERL regional database, Statistics NZ*

The sector directly employed 817 FTEs in the region. It provided a relatively small proportion of all employment (1.8 percent) and business units (0.45 percent) in Taranaki. However, its direct contribution to regional GDP was large, at \$741 million, or 17 percent of the region's GDP in 2006.

The GDP and employment numbers above only consider the activity in the four industries that make up the oil and gas sector. Using input-output analysis we can identify the indirect

<sup>13</sup> Australia New Zealand Standard Industrial Classification

<sup>14</sup> Services to mining and other mining and quarrying are included in the Taranaki region as 98 percent and 75 percent of these industries' respective output feeds directly into the oil and gas exploration and extraction industries. Other mining and quarrying in Taranaki is almost exclusively involved in gravel and sand quarrying; and construction materials mining.

and induced effects of the oil and gas sector on the Taranaki economy.<sup>15</sup> The multiplier effects are shown in Table 4.2.

**Table 4.2 Taranaki oil and gas sector direct, indirect and induced impacts**

Taranaki oil & gas sector	Direct	Direct + indirect	Total
Output (NZ\$m)	1,321	1,751	1,845
GDP (NZ\$m)	741	946	1,003
Employment (FTEs)	817	2,457	2,991

*source: BERL regional database, Statistics NZ*

Indirect employment in the oil and gas sector in the Taranaki region is estimated at 1,640 FTEs. This suggests that the oil and gas sector and related industries employ a total of 2,457 FTEs. Induced employment adds a further 534 FTEs, bringing total employment in the region linked to oil and gas to just under 3,000 FTEs.

Meanwhile, GDP increases from \$741 million to close to \$950 million once indirect industries are included, and to just over \$1.00 billion including induced effects.

#### **4.2 Input-output analysis**

This section shows the makeup of the oil and gas sector by dissecting the inputs into, and outputs generated by, the sector into the various sub-components.

Table 4.3 presents the make-up of the Taranaki oil and gas sector's inputs and outputs, as determined by input-output analysis. It also shows the sector's contribution to each category of regional inputs and outputs.

<sup>15</sup> Indirect effects is effects on businesses that provide inputs into the production process of an industry. As shown below, there are a number of industries where a significant portion of output (and therefore GDP and employment) is an input into the oil and gas sector. Similarly, these industries would have inputs from a number of other industries, and intuitively, a portion of these could also be apportioned to the oil and gas sector. This is often referred to as indirect effects as the activity is not directly in the sector but is indirectly attributable to the sector.

Induced effects relate to the impact of private spending by workers employed in the industry under consideration.

**Table 4.3 Taranaki oil and gas sector total inputs and outputs**

<b>Taranaki oil &amp; gas sector</b>	<b>% of industry</b>	<b>% of regional</b>
<b>Inputs</b>		
Intermediate inputs	20.34	2.55
Imports	17.35	4.16
Wages and other household income	6.45	3.87
Other inputs	55.87	24.92
<b>Outputs</b>		
Intermediate outputs	14.20	1.78
Exports	85.48	17.54
Household and government consumption	0.07	0.03
Other outputs	0.25	0.29

*source: BERL, Butcher & Associates*

Input-output analysis indicates that “other inputs”, which includes depreciation, taxes and profits, make up 56 percent of the sector’s inputs. A little over 20 percent of the sector’s inputs come from industries within the region, as explained in more detail below.

A significant proportion of the sectors inputs are imported from outside the region, at around 17 percent. To put this into perspective, this figure is more than all the inputs supplied by the top ten input industries in the region put together.<sup>16</sup> Imports by the oil and gas sector account for 4.2 percent of all Taranaki imports.

However, the input-output tables also suggest that the oil and gas sector exports more than 85 percent of its output to the rest of New Zealand and overseas. Oil and gas sector exports account for close to 18 percent of all Taranaki exports.

The sector supplied a further 14 percent of its outputs to industries in the region.

Table 4.4 presents the top-ten industries by contribution to oil and gas sector inputs in Taranaki.

<sup>16</sup> See Table 4.4.

**Table 4.4 Industries that provide significant inputs into the Taranaki oil and gas sector**

<b>Taranaki oil &amp; gas sector</b>		<b>% of sector's inputs</b>
1	Oil & gas extraction	6.77
2	Anc. Services to Construction	2.44
3	Non building construction	1.31
4	Oil & gas exploration	1.21
5	Other mining and quarrying	0.89
6	Wholesale trade	0.85
7	Technical services	0.84
8	Services to mining	0.82
9	Road freight transport	0.65
10	Electricity generation	0.63

*source: BERL, Butcher & Associates*

The oil and gas extraction industry provides the largest proportion of intermediate inputs to the oil and gas sector, at 6.8 percent. In other words, 6.8 percent of all inputs required by the oil and gas sector are provided by the oil and gas extraction industry.

The second and third-largest contributors to the oil and gas sector's inputs are ancillary services to construction and non-building construction.<sup>17</sup> These two industries contribute 2.4 percent and 1.3 percent of the oil and gas sectors inputs respectively.

The oil and gas exploration industry provides 1.2 percent of all inputs to the oil and gas sector.

The top ten input industries into the oil and gas sector are rounded out by various mining, technical, business, and transport services, as well as wholesale trade. Together they supply 16.4 percent<sup>18</sup> of all inputs into the oil and gas sector.

Table 4.5 presents the ten industries most reliant on the oil and gas sector in terms of the portion of their total output going into the oil and gas sector in Taranaki. It also shows the number of FTEs in that industry that can be attributed to the oil and gas sector.<sup>19</sup>

<sup>17</sup> Ancillary services to construction includes plumbing, electrical, site preparation, concreting, structural steel, fire and security system services as well as several other construction trade services. Non-building construction includes the construction of oil refineries, pipelines, harbour works and mine site construction.

<sup>18</sup> Note that intermediate inputs in total only accounts for 20 percent of total inputs, the vast majority of inputs being made up of value added (salaries, profits, and taxes).

<sup>19</sup> We have then taken the industries output proportion and multiplied it by total employment in that industry to estimate the employment reliant on the Taranaki oil and gas sector.

**Table 4.5 Industries reliant on the Taranaki oil and gas sector**

<b>Taranaki oil &amp; gas sector</b>		<b>% of contributor industry output</b>	<b>contributor industry FTEs</b>
1	Services to mining	98.31	82.1
2	Other mining and quarrying	74.76	43.8
3	Computer services	28.63	62.6
4	Non building construction	20.36	118.5
5	Other business services	18.76	237.2
6	Insurance	14.77	5.9
7	Anc. Services to Construction	14.36	253.3
8	Other non-metallic mineral product manufacturing	13.71	12.3
9	Air transport, services to transport and storage	10.68	44.9
10	Technical services	9.83	99.1

*source: BERL, Butcher & Associates*

As they are a part of the defined oil and gas sector, both services to mining and other mining and quarrying industries are very reliant on the oil and gas sector. These two industries are dependent on the oil and gas sector in Taranaki, with 98 percent and 75 percent respectively of all output in these industries acting as inputs to the oil and gas sector.

Computer services, non-building construction, and other business services each contribute more than one-sixth of their output to the oil and gas sector in Taranaki.

#### **4.3 Social and other impacts**

The oil and gas sector has had a noticeable impact on the Taranaki region, largely due to the cosmopolitan nature of its employees and the specialist, high specificity of inputs into the industry. Moreover, the required infrastructure to process, store and transport oil and gas has resulted in significant investment in the Taranaki region, which would be expensive and difficult to replicate elsewhere in New Zealand.

A large proportion of the oil and gas workforce are overseas experts, often with international experience. A number of these people apply these skills in areas other than the oil and gas sector and in the community. They become participants in the community and often, because of their expertise, take social and community corporate governance roles. In a smaller, rural region such as Taranaki it would be extremely difficult to attract people of this calibre otherwise.

In terms of the quality of the inputs into the industry, the specialist requirements of the industry have seen the capability of a number of industries and businesses that provide goods and services improve.

For example, the engineering industry has benefited significantly from the oil and gas industry being in Taranaki. The complexity and high specifications required by the sector have enabled the engineering industry to upskill and develop new techniques and capabilities. This has allowed them to apply and adopt these in other industries and for other purposes. For example, Fitzroy Engineering Group Ltd (FEGGL) now has a division making superyachts (Fitzroy Yachts). While the connection is not intuitive, their involvement in meeting the exacting demands of the oil and gas sector has given them skills and capability that can be applied in a totally different industry.

Finally, the infrastructure investment that has occurred to accommodate the oil and gas sector has positioned Taranaki as the hub of oil and gas exploration and extraction in New Zealand.

The gas network in the North Island, including the Maui pipeline, starts from Taranaki. Port Taranaki has been geared to provide storage and services to the oil exploration and extraction industry. Similarly, production and storage facilities are a feature of the Taranaki industry landscape.

#### **4.4 Comparison with other industries in Taranaki**

This section puts the contribution of the oil and gas sector in perspective by comparing it with two other major players in the Taranaki region – dairy and other manufacturing – across a range of indicators. Totals for the region are also shown.

The dairy sector consists of dairy cattle farming and dairy product manufacturing. Other manufacturing consists of all manufacturing except meat processing, dairy product manufacturing and engineering. Engineering was excluded because of possible linkages between the oil and gas sector and engineering, which would make the distinction between sectors less clear.

Table 4.6 compares the oil and gas, dairy, and other manufacturing sectors across several economic indicators.

**Table 4.6 Comparison of major Taranaki sectors**

Indicator	Oil and gas	Dairy	Other manufacturing	Taranaki total
Employment (FTEs)	817	6,155	2,155	45,221
GDP (NZ\$m)	741	732	202	4,379
Labour productivity (NZ\$/FTE)	907,026	118,856	93,792	96,832
Output (NZ\$m)	1,321	2,152	566	10,000
Business units	57	2,909	262	12,793
Business size (FTEs/business)	14.3	2.1	8.2	3.5

source: BERL regional database, Statistics NZ

The dairy sector employed nearly 14 percent of Taranaki's FTEs, compared with 4.8 percent for other manufacturing and just 1.8 percent for oil and gas.

However, the dairy sector in Taranaki produced \$732 million in GDP compared with \$741 contributed by oil and gas. In other words, although the dairy sector is a far larger employer in the region, the higher labour productivity of the oil and gas sector (\$907,000 per FTE for oil and gas compared with \$119,000 per FTE for dairy) ensured that it contributed more to GDP in the region.

Despite having two and a half times as many FTEs as the oil and gas sector, the other manufacturing sector produced \$202 million in GDP. Labour productivity in the sector is one-tenth that of the oil and gas sector. Average regional labour productivity stood at \$96,800 in 2006, one-ninth of oil and gas labour productivity.

Another indicator related to GDP is output. Output is a measure of total production by the sector, including value added by the sector (GDP) and intermediate inputs provided by other industries and imports. GDP accounted for 56 percent of all output by the oil and gas sector in 2006. In other words, 56 percent (\$741 million out of \$1.32 billion) of all production by the sector is value added by the sector rather than intermediate inputs or imports. In the case of dairy, the portion of output added by the sector is 34 percent, while for other manufacturing it is 36 percent. The regional average GDP to output ratio was 44 percent in 2006.

The number of businesses within the oil and gas sector is low, at around 57 in 2006. Dairy had 51 times more businesses in 2006. However, oil and gas businesses tend to be much larger, averaging 14.3 FTEs per business in 2006 compared with 2.12 FTEs per business in dairy and 3.53 on average throughout Taranaki.

In summary, the oil and gas sector is characterised by very high labour productivity, large business size and a high ratio of GDP to output.

BERL is currently undertaking industry projections for the Taranaki region, utilising CGE modelling and recent employment growth rates. These projections indicate that the oil and

gas sector could potentially account for around 38 percent of the region's GDP by 2026.<sup>20</sup> This is largely a reflection of the high productivity and returns in the industry, but also of its recent growth.

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<sup>20</sup> BERL (2007). Taranaki Industry Projections 2006-2026. Research report to Venture Taranaki – preliminary report not yet finalised. The projections assume strong employment and resultant GDP rises to 2011, in line with currently planned levels of exploration and extraction activity. The study projects slower, but nevertheless robust, growth in the oil and gas sector from 2011 to 2026.

## 5 The oil and gas sector in New Zealand

At a national level, the oil and gas sector is assumed to be made up of oil and gas exploration, oil and gas extraction, and the portions of other mining and quarrying and services to mining located in Taranaki.<sup>21</sup>

### 5.1 Economic Impact Analysis

Table 5.1 presents the direct contribution of the oil and gas sector to the economy of New Zealand in terms of employment, GDP and business units.

**Table 5.1 New Zealand oil and gas sector**

<b>New Zealand oil &amp; gas sector</b>	<b>Total</b>	<b>% of national</b>
Employment (FTEs)	904	0.05
GDP (NZ\$m)	827	0.53
Business units	139	0.03

*source: BERL regional database, Statistics NZ*

Nationally, the oil and gas sector directly employs relatively few FTEs, at around 900 in total (0.05 percent of all employment). These FTEs operate from just 139 business units (0.03 percent of all New Zealand businesses). Nevertheless, the sector's direct contribution to GDP is substantially greater, at 0.53 percent of the New Zealand total, or \$827 million.

Upon including the businesses that provide inputs into the oil and gas sector, the activity increases significantly, as shown in Table 5.2.

**Table 5.2 New Zealand oil and gas sector direct, indirect and induced impacts**

<b>New Zealand oil &amp; gas sector</b>	<b>Direct</b>	<b>Direct + indirect</b>	<b>Total</b>
Output (NZ\$m)	1,473	2,645	3,133
GDP (NZ\$m)	827	1,365	1,615
Employment (FTEs)	904	5,962	8,647

*source: BERL regional database, Statistics NZ*

GDP contribution increases by almost \$540 million to \$1.37 billion, while employment increases by over 5,000 FTEs to 5,962 FTEs.

Taking into account induced effects of the sector, the total impact of the sector is even larger, particularly on employment, where the multiplier effect is strong. The industry created

<sup>21</sup> As Taranaki is home to all New Zealand's oil and gas production, activity in the other mining and quarrying, and services to mining industries outside of Taranaki is likely to be servicing industries other than oil and gas.

around 8,650 FTEs nationwide, producing \$3.13 billion in output and \$1.62 billion in GDP in 2006.

## 5.2 Input-output analysis

Table 5.3 presents the make-up of the New Zealand oil and gas sector's inputs and outputs. It also shows the sector's contribution to each category of regional inputs and outputs.

**Table 5.3 New Zealand oil and gas sector total inputs and outputs**

<b>New Zealand oil &amp; gas sector</b>	<b>% of industry</b>	<b>% of national</b>
<b><u>Inputs</u></b>		
Intermediate inputs	36.17	0.17
Imports	1.77	0.06
Wages and other household income	6.35	0.11
Other inputs	55.71	1.11
<b><u>Outputs</u></b>		
Intermediate outputs	62.25	0.29
Exports	28.64	0.94
Household and government consumption	2.36	0.03
Other outputs	6.69	0.27

*source: BERL, Butcher & Associates*

Nationally, other inputs (which include depreciation, taxes and profits) make up 56 percent of the sector's inputs. More than 36 percent of the sector's inputs come from industries in the country, while just 1.8 percent of the oil and gas sector's inputs are imported.

The sector supplies almost two-thirds of its outputs to industries in New Zealand, while a further 2.4 percent is consumed by households and government.

Almost 29 percent of New Zealand's oil and gas sector outputs are exported.<sup>22</sup> Imports that feed into the national oil and gas industry sector account for just 0.06 percent of New Zealand's imports, while the sector's exports contribute 0.94 percent of total national exports.

The industries which play a major contributing role in terms of inputs to the national oil and gas sector are similar to those that feed into the Taranaki region's oil and gas sector. This is no surprise considering Taranaki's dominant role in New Zealand's oil and gas sector.

Table 5.4 presents the top ten industries by contribution to oil and gas sector inputs in New Zealand.

<sup>22</sup> Only oil is exported from New Zealand. All gas is consumed locally.

**Table 5.4 Major input industries into the New Zealand oil and gas sector**

<b>New Zealand oil &amp; gas sector</b>		<b>% of sector's inputs</b>
1	Oil & gas extraction	6.79
2	Other mining and quarrying	5.54
3	Anc. Services to Construction	3.32
4	Computer services	2.94
5	Non building construction	2.46
6	Air transport, services to transport and storage	2.24
7	Wholesale trade	1.90
8	Oil & gas exploration	1.23
9	Other business services	1.09
10	Services to mining	1.06

*source: BERL, Butcher & Associates*

Nationally, the largest input into the oil and gas sector is the oil and gas extraction industry, at 6.8 percent. Other mining and quarrying; ancillary services to construction; computer services; non-building construction; and air transport, services to transport and storage each contribute at least 2.0 percent to oil and gas sector inputs in New Zealand.

The top ten input industries account for around 29 percent of intermediate inputs into the oil and gas sector. Total intermediate inputs, as shown in Table 5.3, account for around 36 percent of total inputs.

Table 5.5 presents the ten industries that are most reliant on the oil and gas sector in New Zealand in terms of the portion of their total output absorbed by oil and gas and the estimated employment as a result of the oil and gas activity.

**Table 5.5 Industries reliant on the New Zealand oil and gas sector**

<b>New Zealand oil &amp; gas sector</b>		<b>% of contributor industry output</b>	<b>contributor industry FTEs</b>
1	Services to mining	35.79	82.1
2	Oil & gas exploration	9.49	364.1
3	Oil & gas extraction	7.99	413.5
4	Other mining and quarrying	7.59	43.8
5	Coal mining	3.17	22.6
6	Computer services	1.10	297.0
7	Non building construction	0.86	95.5
8	Other business services	0.73	106.7
9	Anc. Services to Construction	0.56	478.5
10	Technical services	0.54	146.7

*source: BERL, Butcher & Associates*

More than one-third of all output by the services to mining industry feeds into the oil and gas sector nationally, although this output is almost exclusively confined to the Taranaki region.

As expected, the oil and gas exploration and extraction industries also contribute substantial portions of their output to the oil and gas sector.

The oil and gas sector also plays an important role in other mining and quarrying, accounting for 7.6 percent of its output, although again this is almost exclusively in the Taranaki region.

## 6 Construction impacts

Construction costs are generally incurred in the period between exploration and extraction. They are, therefore, not captured in the multiplier analysis. However, they should be considered as a part of the economic impact of the sector as, without the oil and gas discovery, the construction expenditure would not have been incurred.

Note that the numbers used to identify the construction impacts are not rigorous and rely on estimates. Therefore, they should not be quoted as actual impacts but used to provide an indication of potential impacts.

The value of construction differs depending upon a range of variables such as the type of find (oil/gas/condensate), the extraction method used, the size of the discovery, whether the discovery is onshore or offshore, proximity to existing, compatible infrastructure, and the proportion of construction awarded locally.

To address this issue we have looked at the five most recent discoveries where we have an estimate of total construction costs. The proportion of that construction expenditure captured by local and national businesses has also been estimated based on discussions with the project sponsors directly or with industry experts.

We have used multipliers for the non-building construction industry to determine the economic impact on employment, GDP and output, both direct and total, as a result of construction. Output and GDP values are in net present value dollars when the expected construction period for the project is known. Employment figures are one-year FTEs.

### 6.1.1 *Kupe Gas/Condensate*

Kupe is an offshore gas/condensate field expected to be producing by the middle of 2009. Production is expected to be via an offshore installation connected by a submerged pipeline to a new onshore production station in South Taranaki.

The Kupe Gas Project is expected to be completed by mid-2009 and will provide New Zealand with approximately 254 petajoules (PJs) of natural gas, 1.1 million tonnes of LPG and 14.7 million barrels of light oil (condensate).<sup>23</sup> Kupe will supply up to one-sixth of New Zealand's gas needs from mid-2009.

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<sup>23</sup> [www.scoop.co.nz](http://www.scoop.co.nz)

Genesis Energy has secured all of the gas for its existing Huntly and planned Rodney power stations.

The cost of construction is estimated to be around \$1,080 million.

Table 6.1 shows the estimated economic impact of the construction of the Kupe project on the Taranaki economy.

**Table 6.1 Kupe project construction impact on Taranaki**

<b>Kupe Gas/Condensate construction</b>	<b>Direct</b>	<b>Direct + Indirect</b>	<b>Total</b>
Output (NZ\$m)	391	552	618
GDP (NZ\$m)	137	204	240
Employment (FTEs)	1,809	2,659	3,021

*source: BERL*

Around 40 percent of the total cost of the project is expected to be spent in the Taranaki region over three years. This equates to \$391 million in direct output, and \$618 million taking into account indirect and induced effects. Resultant GDP will be \$137 million in direct value added and \$240 million in total. Construction is expected to create the equivalent of 1,809 direct one-year FTEs and a little over 3,000 total one-year FTEs.

Table 6.2 shows the estimated economic impact of the construction of the Kupe project on the New Zealand economy.

**Table 6.2 Kupe project construction impact on New Zealand**

<b>Kupe Gas/Condensate construction</b>	<b>Direct</b>	<b>Direct + Indirect</b>	<b>Total</b>
Output (NZ\$m)	411	883	1,146
GDP (NZ\$m)	144	344	474
Employment (FTEs)	1,900	4,179	5,623

*source: BERL*

Slightly more of the total cost of construction is expected to occur in New Zealand as a whole, at \$411 million over three years. The large national multiplier is expected to increase total output as a result of construction to \$1.15 billion. Direct GDP added would be around \$144 million while total GDP of around \$474 million would be produced. The equivalent of 1,900 one-year FTEs would be directly created, while adding indirect and induced effects would bring employment to more than 5,600 FTEs for a year.

### 6.1.2 Cheal Oil

The Cheal onshore oil field holds a proven 1.64 million barrels of oil. By the end of 2007, production may reach 1,900 barrels of oil per day from three wells. However, production is more likely to be between 1,400 and 1,500 barrels a day as a balance is struck between production rates and reserve recovery.<sup>24</sup>

Table 6.3 shows the estimated economic impact of the construction of the Cheal project on the Taranaki economy.

**Table 6.3 Cheal project construction impact on Taranaki**

Cheal Oil Field construction	Direct	Direct + Indirect	Total
Output (NZ\$m)	15	21	24
GDP (NZ\$m)	5	8	9
Employment (FTEs)	69	102	116

*source: BERL*

A higher proportion of construction spending on this relatively small project is likely to remain within the local economy, by virtue of its onshore nature. Direct output is likely to be around \$15.0 million, while total output should reach \$23.7 million. Direct GDP of \$5.3 million and total GDP of \$9.2 million will be added to the local economy, while 58 direct and 97 total FTEs will be created for a year.

Table 6.4 shows the estimated economic impact of the construction of the Cheal project on the New Zealand economy.

**Table 6.4 Cheal project construction impact on New Zealand**

Cheal Oil Field construction	Direct	Direct + Indirect	Total
Output (NZ\$m)	18	39	50
GDP (NZ\$m)	6	15	21
Employment (FTEs)	83	183	246

*source: BERL*

The national impact of construction will be about \$18.0 million in direct output and \$50.2 in total output. \$6.3 million in direct GDP and \$20.8 in total GDP will be produced, creating 83 direct FTEs and 246 total FTEs for a year.

<sup>24</sup> Austral Pacific Energy Limited

### 6.1.3 Pohokura Gas/Condensate<sup>25</sup>

Pohokura is a gas/condensate field that started producing in late 2006. When fully completed, it will consist of three onshore and six offshore wells. Extracted gas is piped to an onshore production facility. Condensate and oil is shipped out to either Sydney or Marsden Point refinery.

The field has around 700 BCF of gas reserves, and 42 million barrels of oil. Extracted gas and condensate is piped sub sea to an unmanned production facility onshore at Motunui.

The cost of construction is estimated at close to \$900 million.

Table 6.5 shows the estimated economic impact of the construction of the Pohokura project on the Taranaki economy.

**Table 6.5 Pohokura project construction impact on Taranaki**

Pohokura Gas construction	Direct +		Total
	Direct	Indirect	
Output (NZ\$m)	180	254	284
GDP (NZ\$m)	63	94	110
Employment (FTEs)	832	1,224	1,390

*source: BERL*

Direct spending in the region due to the construction of the Pohokura project is likely to be around \$180 million, with up to \$284 million in total output. This will result in \$63 million in direct GDP and \$100 million in total GDP. Employment will include the equivalent of around 830 direct FTEs and nearly 1,400 total FTEs for one year.

Table 6.6 shows the estimated economic impact of the construction of the Pohokura project on the New Zealand economy.

**Table 6.6 Pohokura project construction impact on New Zealand**

Pohokura Gas construction	Direct +		Total
	Direct	Indirect	
Output (NZ\$m)	270	581	753
GDP (NZ\$m)	95	226	312
Employment (FTEs)	1,249	2,747	3,696

*source: BERL*

<sup>25</sup> Estimates of the impacts of construction for the Pohokura, Tui and Maari fields assume 20 percent local spend and 30 percent national spend, as we have not been able to determine actual percentages from the project owners. However, we are confident that these percentages provide relatively conservative estimates, as percentages for projects such as Kupe, where numbers have been provided by project team members, are much higher.

Pohokura construction will contribute around \$270 million in direct output to the New Zealand economy, and \$753 in total output. This will result in \$94.5 million in direct GDP and \$312 million in total GDP. The equivalent of around 1,250 direct FTEs are expected to be created for a year, with as many as 3,700 total FTEs created on a national basis.

#### 6.1.4 Tui Oil

Tui is an offshore oil field around 50km off the west coast of Taranaki, consisting of four production wells (Tui-2H, Tui-3H, Pateke-2H and Amokura-2H). The field is estimated to contain around 32 million barrels of proven and probable reserves.

Oil is pumped directly into an FPSO, which is then transferred to oil tankers and shipped directly to market. Tui's first shipment of 300,000 barrels went to Sydney and Brisbane in mid-August 2007 and a second similar shipment, also bound for East Coast Australian refineries left later the same month .

Production from the Tui field has rapidly peaked, constrained by the maximum processing capability of the *Umuroa* FPSO, namely 50,000 barrels of oil per day, although all four wells will be able to produce as much as approximately 100,000 barrels per day.

The cost of constructing the Tui oil field was estimated at around \$322 million (US\$269 million). A Norwegian company based in Singapore was responsible for the refurbishment of the *Umuroa*, and detailed design was done by a US company.

Table 6.7 shows the estimated economic impact of the construction of the Tui project on the Taranaki economy.

**Table 6.7 Tui project construction impact on Taranaki**

Tui Oil construction	Direct	Direct + Indirect	Total
Output (NZ\$m)	64	91	102
GDP (NZ\$m)	23	34	39
Employment (FTEs)	297	437	497

source: BERL

Tui construction is expected to directly increase regional output by about \$64.3 million, with total output reaching \$102 million. This will result in direct GDP of around \$22.5 million and total GDP of \$39.4 million, along with the equivalent of nearly 300 direct FTEs and 500 total FTEs for a year.

Table 6.8 shows the estimated economic impact of the construction of the Tui project on the New Zealand economy.

**Table 6.8 Tui project construction impact on New Zealand**

<b>Tui Oil construction</b>	<b>Direct +</b>		<b>Total</b>
	<b>Direct</b>	<b>Indirect</b>	
Output (NZ\$m)	96	207	269
GDP (NZ\$m)	34	81	111
Employment (FTEs)	446	981	1,320

source: BERL

Nationally, Tui is expected to contribute around \$95.5 million in direct output and \$269 million in total output. This will result in \$33.8 million in direct GDP and \$111 million in total GDP, along with 446 direct FTEs and 1,320 total FTEs.

### 6.1.5 Maari Oil

Maari is an oil field located 80 kilometres offshore and is expected to come on-stream by the middle of 2008. Recoverable reserves are estimated to exceed 50 million barrels of crude, with another 20 million barrels upside potential. Total gross initial oil production rate is expected to be around 35,000 barrels of oil per day, with production continuing for about ten years.

Operation will be via an unmanned wellhead platform housing five production and three injection wells. Oil will be extracted directly from a seabed wellhead onto the FPSO *Raroa*. Oil will then be transferred directly to tankers and shipped to market.

Construction of the Maari project is estimated at \$530 million. The conversion of the Andaman Sea tanker to the *Raroa* is being undertaken by a Singaporean company.

Table 6.9 shows the estimated economic impact of the construction of the Maari project on the Taranaki economy.

**Table 6.9 Maari project construction impact on Taranaki**

<b>Maari Oil construction</b>	<b>Direct +</b>		<b>Total</b>
	<b>Direct</b>	<b>Indirect</b>	
Output (NZ\$m)	106.0	149.5	167.5
GDP (NZ\$m)	37.1	55.3	64.9
Employment (FTEs)	490	721	819

source: BERL

Locally, Maari construction will likely lead to a direct rise in output of \$106 million, with total output reaching \$167 million. Direct GDP resulting from this would be around \$37.1 million, with nearly \$65 million in total GDP. The equivalent of 490 one-year FTEs would be directly created, with more than 800 total FTEs after indirect and induced effects are included.

Table 6.10 shows the estimated economic impact of the construction of the Maari project on the New Zealand economy.

**Table 6.10 Maari project construction impact on New Zealand**

<b>Maari Oil construction</b>	<b>Direct</b>	<b>Direct + Indirect</b>	<b>Total</b>
Output (NZ\$m)	159	342	444
GDP (NZ\$m)	56	133	184
Employment (FTEs)	735	1,618	2,176

*source: BERL*

At a national level, Maari construction will increase direct output by \$159 million, and total output by \$444 million. This will raise GDP by around \$55.7 million directly and \$184 million in total. It will create employment for 735 FTEs directly and nearly 2,200 FTEs when indirect and induced effects are included, for a year.

## 7 Royalties

The oil and gas sector also contributes directly to government via royalties for the right to explore for and extract oil and gas from the area under New Zealand jurisdiction.

New Zealand's royalty regime stipulates the payment of either an ad valorem royalty (AVR) or an accounting profits royalty (APR), whichever is the greater in any given year.<sup>26</sup>

Since 1970, the government has received over \$2.8 billion in royalties from the oil and gas sector. In the latest year, the government received almost \$112 million made up from around \$51 million in royalties and almost \$61 million in energy resource levies.

Royalties and levies over the latest ten years and a total for the last 35 years are shown in Table 7.1.

**Table 7.1 National petroleum royalty statistics**

Year	NZ\$m		
	Royalties	Energy resource levy	Total
1996	29.6	92.1	121.7
1997	36.7	94.6	131.3
1998	26.6	82.9	109.5
1999	35.0	98.3	133.3
2000	54.5	103.5	158.0
2001	66.4	107.6	174.0
2002	48.1	98.6	146.7
2003	34.2	72.0	106.3
2004	46.0	65.7	111.8
2005	50.8	60.8	111.6
<b>Total (1970 to 2005)</b>	<b>785.9</b>	<b>2,019.6</b>	<b>2,805.5</b>

source: Crown Minerals

Both oil royalties and gas levies peaked in 2001 at \$66.4 million and \$107.6 million respectively. Since then gas levies have eased off each year to 2005, falling to \$60.8

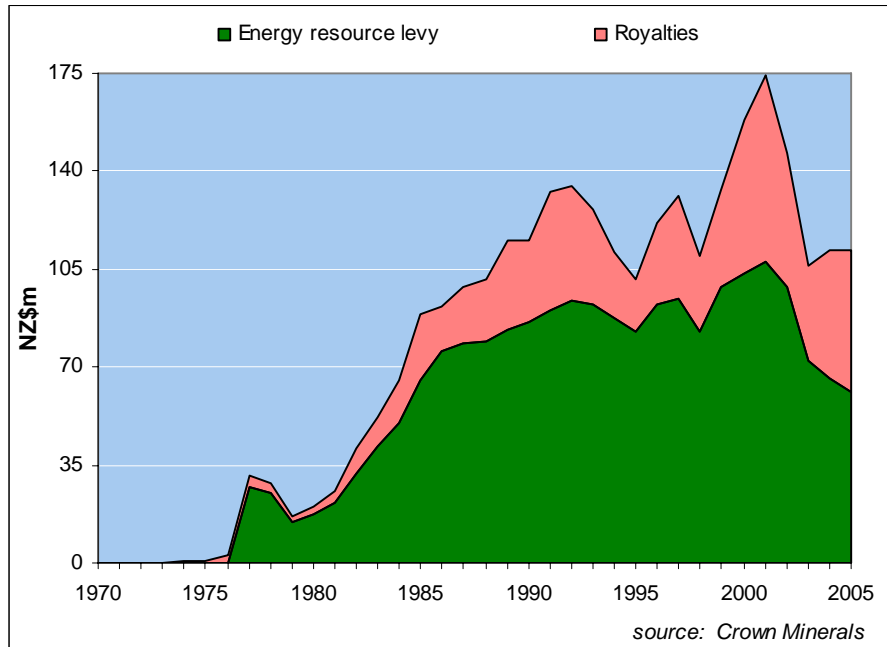
<sup>26</sup> The royalty rates are either: five percent of the net revenues obtained from the sale of petroleum (AVR), or 20 percent of the accounting profit of petroleum production (APR).

If a discovery is made between 30 June 2004 and 31 December 2009; Ad Valorem Royalty (AVR) will be one percent for natural gas; Accounting Profits Royalty (APR) will be 15 percent on the first \$750 million cumulative gross (offshore) or 15 percent on the first \$250 million cumulative gross (onshore).

In calculating the accounting profit, deductions are made and may include associated production costs, capital costs (exploration costs, development costs, permit acquisition costs and feasibility cost), indirect costs, abandonment costs, operating and capital overhead allowance, operating costs and capital costs carried forward and abandonment costs carried back.

million. Oil royalties almost halved in the following two years but have since recovered to around three quarters of the 2001 peak, at \$50.8 million in 2005. Royalties and energy levies are shown in Figure 7.1.

**Figure 7.1 Royalties and levies**



Gas has always been the major contributor source but oil contributions have been increasing to a point where only \$10 million separates the two. Royalties are likely to increase again as further exploration and extraction occurs.

## 8 Associated industries or businesses

There are a number of industries/significant companies that are associated with the oil and gas sector (particularly gas) and that depend upon security of supply (gas outputs) for their businesses to operate effectively.

These industries have not been included in the economic impact assessment. However, they are inextricably linked to the effective and continued operation of the oil and gas sector.

### 8.1 Infrastructure

#### 8.1.1 *Port Taranaki*

A recent report on the economic impact of Port Taranaki<sup>27</sup> suggested that the Port and the oil and gas sector were inextricably linked. The oil and gas sector could not function without a port, and a significant proportion of Port Taranaki's activity relates to the oil and gas sector. Port Taranaki is geared to deal with the oil and gas sector and has the infrastructure and expertise necessary to service the sector.

Crude oil is the most significant product item transported through Port Taranaki, followed by methanol and petrol/fuel oil. Oil and gas related exports make up around 30 percent of Port exports by value. However, it accounts for almost 90 percent of all oil and gas exports out of New Zealand.

The report found that Port Taranaki contributed around \$290 million to regional GDP and accounted for the employment of close to 1,500 FTEs. Note that, as an enabler of business, most of the Port's impact was through related industry activity, including services to the oil and gas sector.

#### 8.1.2 *Other pipeline infrastructure*

The Maui pipeline is a 313 kilometre gas pipeline from the Maui production station to the Huntly power station. The pipeline currently pumps gas from the Maui field and other sources to the Genesis Energy generators, 70 kilometres from Auckland, which together produce more than 1,400MW.

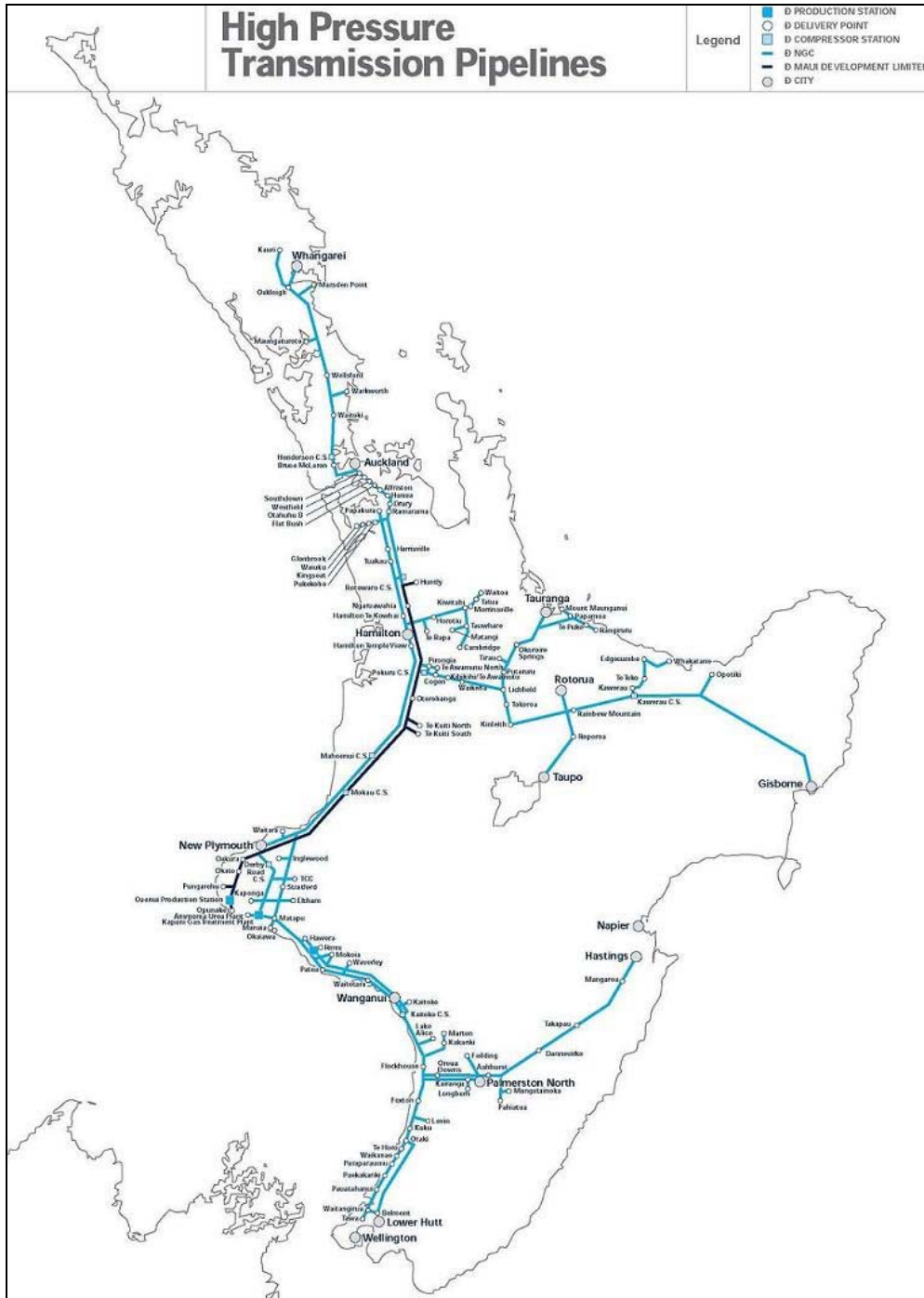
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<sup>27</sup> BERL (2007). Economic Impact of Port Taranaki 2007. Report to Port Taranaki.

In addition, more than 2,300 kilometres of high pressure gas pipelines throughout the North Island are owned and operated by Vector. They transport gas at high pressure from production stations in Taranaki.

Figure 8.1 shows the major high pressure gas pipelines from Taranaki to the rest of New Zealand.

**Figure 8.1 High pressure transmission pipelines**



## **8.2 Major gas distributors/users**

Vector, Genesis Energy, Origin Energy, Ballance Agri-Nutrients, Mighty River Power, and Methanex are all now investing in some way in oil and gas exploration in Taranaki.

### **8.2.1 Vector**

Vector owns and operates the high pressure gas transportation system across the North Island. It also operates the Maui pipeline to the Genesis Energy power station at Huntly. It holds long-term entitlements to gas from New Zealand's major fields and sells natural gas to gas retailers, electricity generators, petrochemical plants and large commercial and industrial customers.

The company owns and operates gas processing facilities at Kapuni in Taranaki. The plant processes raw gas from local fields for the reticulated market. During the treatment process, the plant also produces propane and butane (LPGs), natural gasoline and carbon dioxide for the New Zealand market.

OnGas, Vector's gas brand, retails piped and bottled gas supply throughout New Zealand. Vector is involved in handling over 200,000 tonnes of LPG annually.

The company has around 700 permanent employees and employs around 1,000 contractors to work on their networks.

### **8.2.2 Origin / Contact Energy**

Although Contact Energy no longer has any "upstream" involvement in gas exploration, its "parent company" (with a 51.4 percent interest), Australia's Origin Energy, is actively involved in oil and gas exploration and development (through the \$1.08 billion Kupe project).

Contact Energy is the largest user of natural gas for electricity generation. It owns two power stations in the Taranaki region that make use of natural gas. The New Plymouth station, New Zealand's second-largest thermal plant, has three operational generators. The station can operate on natural gas from a variety of fields, including Maui, or on fuel oil.

The Taranaki combined-cycle station was the first large-scale gas turbine of its kind to be built in New Zealand. Completed in July 1998, the 367MW station uses approximately 1.4 million cubic metres of natural gas per day in generation. The plant is run by a staff of 23.

Contact also holds resource consents for Otahuhu C – a 400MW combined-cycle, gas-fired power station, which can be quickly developed if and when required.

### **8.2.3 Genesis Energy**

The Genesis Energy power stations at Huntly have a capacity of more than 1,400MW, equating to around 17 percent of New Zealand electricity capacity. The station consists of three generating plants - the original 1,000MW coal and gas-fired steam plant, a 50MW open cycle gas turbine generator, and e3p, a 385MW combined cycle gas turbine plant.

While the original 1,000MW plant runs on coal and / or gas, the two most recently developed plants run only on gas which is pumped to Huntly through the Maui gas pipeline from Taranaki.

In May 2007, the company was granted a permit over the Mangatoa area in nearshore North Taranaki. It is also a partner in Kupe and Cardiff.

### **8.2.4 Mighty River Power**

Mighty River Power (MRP) is an integrated energy generation, trading, retailing and metering business. Their portfolio includes the Waikato hydro scheme, geothermal interests at Mokai and Rotokawa, the Southdown co-generation station and a biomass generation programme. Mighty River Power sells electricity and gas to more than 300,000 customers through its retail business Mercury Energy.

Around 20 percent of electricity generated by MRP is non-hydro. In March 2007, MRP commissioned a 45MW gas turbine and generator alongside its existing gas powered Southdown co-generation plant in Auckland, increasing the plant's total capacity to 170MW. This adds further flexibility to the Southdown station, which can operate in periods of high consumer demand, when hydro inflows are low, or when there is no wind.

MRP is currently exploring for natural gas in Taranaki as a 50 percent partner with Swift Energy in the Tarata thrust exploration where the Tawa, Goss and Trapper wells were drilled as part of the partnership's programme.

MRP was also involved with listed explorer L&M Petroleum, funding the non-commercial onshore Southland wells Eastern Bush and Dean earlier this year.

### **8.2.5 Methanex**

Methanex New Zealand owns two methanol plants in Taranaki: one at Motunui and another in the Waitara Valley. Although the production capability of the two plants is 2.4 million tonnes per year, due to a shortage of economically priced natural gas, the Motunui plant was closed in November 2004. The Waitara Valley plant has a production capacity of 530,000 tonnes per year, and operates a flexible regime when methanol prices are favourable and economically priced natural gas is available. In 2006, the plant produced 404,000 tonnes of methanol, nearly all of which was exported to Japan, Korea and China.

The plant is reliant on the availability of natural gas in the region for methanol production. Indeed, there are concerns at Methanex that sufficient supplies of natural gas may not be available at a commercially acceptable price beyond the end of 2007, endangering its production.<sup>28</sup>

### **8.2.6 Ballance Agri-Nutrients**

Ballance Agri-Nutrients (Kapuni) Limited is a wholly owned subsidiary of Ballance Agri-Nutrients Co-operative Limited. Ballance Agri-Nutrients (Kapuni) Limited (Ballance) owns and operates New Zealand's only ammonia urea plant located on a 32.4 hectare site at Kapuni in South Taranaki.

Ballance is dependent on gas both as a feedstock for the manufacture of Urea and as an energy source. Using some 7PJ of natural gas from offshore fields around the Taranaki Coast, the plant produces 150,000 tonnes of ammonia per year, most of which is converted to 260,000 tonnes a year of premium grade granular urea. The granular urea product is used as a nitrogen-rich fertiliser in the agricultural, horticultural and forestry sectors, and as a component in the manufacture of other products.

The company makes a significant economic contribution to the local economy, employing 124 permanent staff and 17 contractors.<sup>29</sup> Ballance currently has a 3-year gas supply contract with Contact Energy, which will supply up to 7PJ of gas a year from 1 October 2007 to 30 June 2010.

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<sup>28</sup> Methanex Corporation Annual report 2006

<sup>29</sup> From submission to the Ministry of Economic Development on Draft Energy Strategy to 2050 dated 29 March 2007

### **8.2.7 Fonterra**

Gas from the Kapuni field feeds the pipeline to the co-generation facilities at the Fonterra dairy plant in Whareroa, the largest single-site dairy factory in the world. Fonterra has a 65MW co-generation facility that allows it to use either coal or gas for production, whichever is cheaper.

While it cannot be argued that gas is essential for operation of the facility, it certainly allows the company to minimise costs based on whichever source of energy is the cheapest at the time. Moreover, it ensures that the plant can continue to operate uninterrupted in the event that one source is unavailable for any reason.

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# Appendices

## Multiplier analysis

The current economic impact of the oil and gas sector was determined by applying multiplier analysis to 2006 industry employment figures for Taranaki and New Zealand.

After defining the oil and gas sector in terms of its constituent industries, employment, GDP and output multipliers were applied for each of the constituent industries, and then their total impacts added.

This multiplier analysis uses multipliers derived from inter-industry input-output tables for the Taranaki region. The Taranaki region input-output tables have been derived from the national input-output tables and other data by Butcher Partners, Canterbury - a recognised source for regional input-output tables and multipliers.<sup>30</sup>

Multipliers allowed us to identify the direct, indirect and induced effects in terms of output (GDP) and Full Time Equivalent (FTE) employment.

## Measures

### *Gross Output Multipliers*

Gross output is the value of production, built up through the national accounts as a measure, in most industries, of gross sales or turnover. This is expressed in \$ million at constant prices. Gross output is made up of the sum of:

- compensation of employees (i.e. salaries and wages)
- income from self employment
- depreciation
- profits
- indirect taxes less subsidies
- intermediate purchases of goods (other than stock in trade)

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<sup>30</sup> For a discussion on regional input output tables and the validity and reliability of the Butcher input output tables see *Statistics New Zealand (2003) Regional Input Output Study*.

- intermediate purchases of services.

#### *Value added (GDP) multipliers*

Value added multipliers measure the increase in output generated along the production chain, which, in aggregate, totals Gross Domestic Product (GDP). Value added is made up of the sum of:

- compensation of employees (i.e. salaries and wages)
- income from self employment
- depreciation
- profits
- indirect taxes less subsidies.

#### *Employment Impact multipliers*

Employment impact multipliers determine the number of FTE roles that are created for every \$1 million spent in an industry for one year. It provides a measure of total labour demand associated with Gross Output.

An FTE is the percentage of time an employee works represented as a decimal. A full-time position is 1.00; a part-time position is 0.50.

#### Direct, indirect and induced effects

The underlying logic of multiplier analysis is relatively straightforward. An initial expenditure (**direct** effect) in an industry creates flows of expenditures that are magnified, or “multiplied”, as they flow on to the wider economy. This occurs in two ways:

- The industry purchases materials and services from supplier firms, who in turn make further purchases from their suppliers. This generates an **indirect** effect.
- Persons employed in the direct development and in firms supplying services earn income (mostly from wages and salaries, but also from profits) which, after tax is deducted, is then spent on consumption. There is also an allowance for some savings. These are the **induced** effects.

Hence, for any amount spent in an area (**direct** effect), the actual output generated from that spend is greater once the flow on activity generated (**indirect** and **induced** effects) is taken into account.

### Leakages

Generally the more developed, or self sufficient, an industry in a region is, the higher the multiplier effects. Conversely, the more reliant an industry is on supply inputs from outside the region, the lower the multipliers. These outside factors can be referred to as “leakages”.

To put this another way, if a house was purchased in the Taranaki region, and all the materials and labour were sourced in the Taranaki region, and all the materials and labour that went into making the housing materials were made in the Taranaki region and so forth, and then the labour spent their wages or salaries in the Taranaki region, again on goods or services produced solely in the Taranaki region, then all the multiplier effects would be captured by the Taranaki region. Where inputs or outputs come from outside the Taranaki region, leakages are said to exist, and the multiplier effect is reduced.

### Limitations of multiplier analysis

#### *Partial equilibrium analysis*

Multiplier analysis is only a “partial equilibrium” analysis, assessing the direct and indirect effects of the development being considered, without analysing the effects of the resources used on the wider national and regional economy.

In particular, it assumes that the supply of capital, productive inputs and labour can expand to meet the additional demand called forth by the initial injection and the flow on multiplier effects, without leading to resource constraints in other industries. These constraints would lead to price rises and resulting changes in overall patterns of production between industries.

To assess inter-industry impacts in full would require economic modelling within a “general equilibrium” framework. Applying such models becomes more relevant where the particular development is considered significant within the overall economy.

#### *Additionality*

Related to partial equilibrium, using multipliers for economic impact assessments assumes that the event is something that would not have been undertaken anyway and that it will not displace existing activity. That is, the event is additional to existing activity. If it does either of the above, then the economic impact is less than that determined by the multiplier and it

would be necessary to subtract both the activity that would have occurred anyway and the displacement effect.

### *Impact*

Again related to “partial equilibrium”, multiplier analysis assumes that an event will not have an impact on relative prices. However, in a dynamic environment, it can be assumed that a large event would have an impact on demand and supply and hence prices. Hence, the larger the event and the more concentrated it is in a single industry or region, the more likely it is that the multipliers would give an inaccurate analysis of impacts. For example, if multiplier analysis was used to determine the effect of residential building construction nationally it would likely be inaccurate as residential building construction accounts for over 6 percent of GDP.

### *Aggregation*

Industries outlined in input output tables are aggregates of smaller sub-industries. Each sub industry has unique inputs and outputs. The higher the level of aggregation the less accurate these inputs and outputs become. Thus, if determining the multiplier effect of a very specific event using highly aggregated data, there will be a lower level of accuracy. Similarly, if an event encompasses a range of industries and multipliers from a single industry are applied the accuracy levels will diminish.

### *Regions and boundaries*

The smaller or less defined a region and its boundaries, the less accurate the multiplier analysis will be. Similarly, the easier it is to move across boundaries, the less accurate the analysis will be. For example, at the national level, the multipliers will be very accurate as it is easy to determine the inputs and outputs crossing through the New Zealand borders.

Similarly, it would also be more accurate to determine a north island/south island split. As smaller regions without obvious geographic boundaries are selected, a higher level of assumptions needs to be made and the multipliers become less accurate. For example, an individual could work in the Auckland region but live in the Waikato region and spend a large proportion of his/her recreation money in the Bay of Plenty region.

For any regional analysis the level of accuracy will have to be accepted. As a rule of thumb, the larger and more defined the region, the more accurate the analysis will be.