

Economic contribution and potential of New Zealand's oil and gas industry

Economic Development Group
Occasional Paper 12/07

August 2012



**Ministry of Business,
Innovation & Employment**

ISBN 978-0-478-38246-4 (PDF)

© Crown Copyright
First published August 2012
Economic Development Group,
Ministry of Business, Innovation and Employment
PO Box 1473
Wellington 6140
New Zealand
www.med.govt.nz

Contact: occasionalpapers@med.govt.nz

Acknowledgements:

Thanks to Jason Leung-Wai from BERL and James Zucollo from NZIER for the technical papers they produced and on which this paper is based.

Disclaimer:

The opinions, recommendations and conclusions contained in this paper are those of the Ministry of Business, Innovation and Employment and do not reflect government policy. The Ministry does not accept any responsibility or liability whatsoever whether in contract, tort (including negligence), equity or otherwise for any action taken as a result of reading, or reliance placed on the Ministry because of having read, any part, or all, of the information in this paper or for any error, inadequacy, deficiency, flaw in or omission from the paper.

Any table or other material in this report may be reproduced and published without further licence provided that it does not purport to be published under government authority and that acknowledgement is made of this source.

Contents

Introduction	1
Purpose	1
Information sources	1
Background.....	1
Oil and gas in the New Zealand economy.....	2
The role of oil and gas	2
The industry in New Zealand	2
Health, safety and the environment.....	6
The future of the oil and gas industry.....	7
The potential for making new oil and gas discoveries	7
Estimated economic benefits	9
Potential production scenario.....	10
Impact on national economy	11
Regional impacts	14
Conclusion.....	19
References	20

Introduction

Purpose

This report provides information about New Zealand's oil and gas industry, the contribution it makes to our economy, and its potential to lift our living standards. It provides detailed modelling and analysis that show how the economy might benefit if another petroleum basin was developed in a similar way to the Taranaki basin.

Information sources

The information in this document was primarily sourced from two technical reports commissioned by the Ministry of Economic Development¹ in 2011: *Regional Impacts of a New Oil or Gas Field* by BERL and *Value of Oil and Gas Exploration* by NZIER. These reports were commissioned to provide the Ministry with more information about the value of petroleum (oil and gas) to the New Zealand economy.²

Background

New Zealand has a long history of producing oil and gas, dating back to initial exploration drilling in 1865 at Moturoa on the Taranaki foreshore. Since then, the industry has developed and grown to the point that crude oil is now New Zealand's fourth largest export commodity by value, is responsible for thousands of high wage jobs and produces hundreds of millions of dollars of government tax and royalty revenue.

Despite the success of the industry, it remains largely confined to the Taranaki region of the North Island – home to all current oil and gas production. Yet there is reason to be confident that this figure could grow even bigger, especially with exploration in other parts of New Zealand.

According to research done by GNS Science, there is huge potential to discover new oil and gas reserves. Along with a land area of 270,000 square kilometres, New Zealand has sovereign rights over 5.7 million square kilometres of seabed – most of which has scarcely been explored.

The New Zealand Government recognises that with the right balance of private investment and government support, the industry could make a significant contribution to the economy – provided that the risks are responsibly managed.

The government launched the Petroleum Action Plan in November 2009.³ The plan sets out eight actions that will help New Zealand to realise its resource potential in a way that balances both economic and environmental demands. These actions include developing a coordinated investment strategy to improve knowledge of New Zealand's petroleum resources and underpin new investment; reviewing health, safety and environmental legislation for offshore petroleum operations; and improving the quality of information about the Crown's known petroleum reserves.

As part of the action plan, the government also announced its intention to review the regulatory regime for Crown minerals. This review will culminate with amended legislation that will enable New Zealand to greatly benefit from the discovery and development of its petroleum and mineral resources.⁴

¹ Reference is made to the Ministry of Economic Development (MED) in this paper, where actions date before July 2012. MED became part of the Ministry of Business, Innovation and Employment from 1 July 2012.

² Both reports have been published along with this summary report on the Ministry's website at www.med.govt.nz/sectors-industries/natural-resources/oil-and-gas/petroleum-expert-reports

³ See www.med.govt.nz/sectors-industries/natural-resources/oil-and-gas/petroleum-action-plan

⁴ Information on the Review of the Crown Minerals Act regime is available at www.med.govt.nz/sectors-industries/natural-resources/oil-and-gas/review-of-the-crown-minerals-act-regime.

Oil and gas in the New Zealand economy

The role of oil and gas

Oil and gas are an essential part of New Zealand's energy mix. They have a wide range of uses and play an important role in fuelling our economy.

Oil and gas are used to transport goods, produce fertilizers and chemicals, and manufacture metals and other construction materials. They are also critical to domestic and international travel and leisure activities.

Natural gas also ensures that New Zealanders have a secure supply of energy. Gas-fired generation helps to make up the shortfall when hydro availability is affected by low rainfall.

Oil and gas will continue to play a vital role in our economy in the future. While renewable energy sources are expected to make an important and increasing contribution to energy supply, the world and New Zealand will need oil and gas for the foreseeable future.

Development of New Zealand's oil and gas resources will ensure we have access to secure and affordable energy in the years ahead. It will also help support regional development and increase our standard of living.

The industry in New Zealand

Oil and gas is a mature industry in New Zealand. However, mining and production is primarily concentrated in the Taranaki region.

Gas is currently produced from 14 fields, with the majority coming from two offshore fields: the recent Pohokura development and the mature Maui field.

The two newest offshore oil fields, Tui and Maari, have boosted oil production in recent years. Together they contributed 49 percent of New Zealand's oil production in 2010, while Pohokura contributed a further 22 percent (Ministry of Economic Development, 2011a).

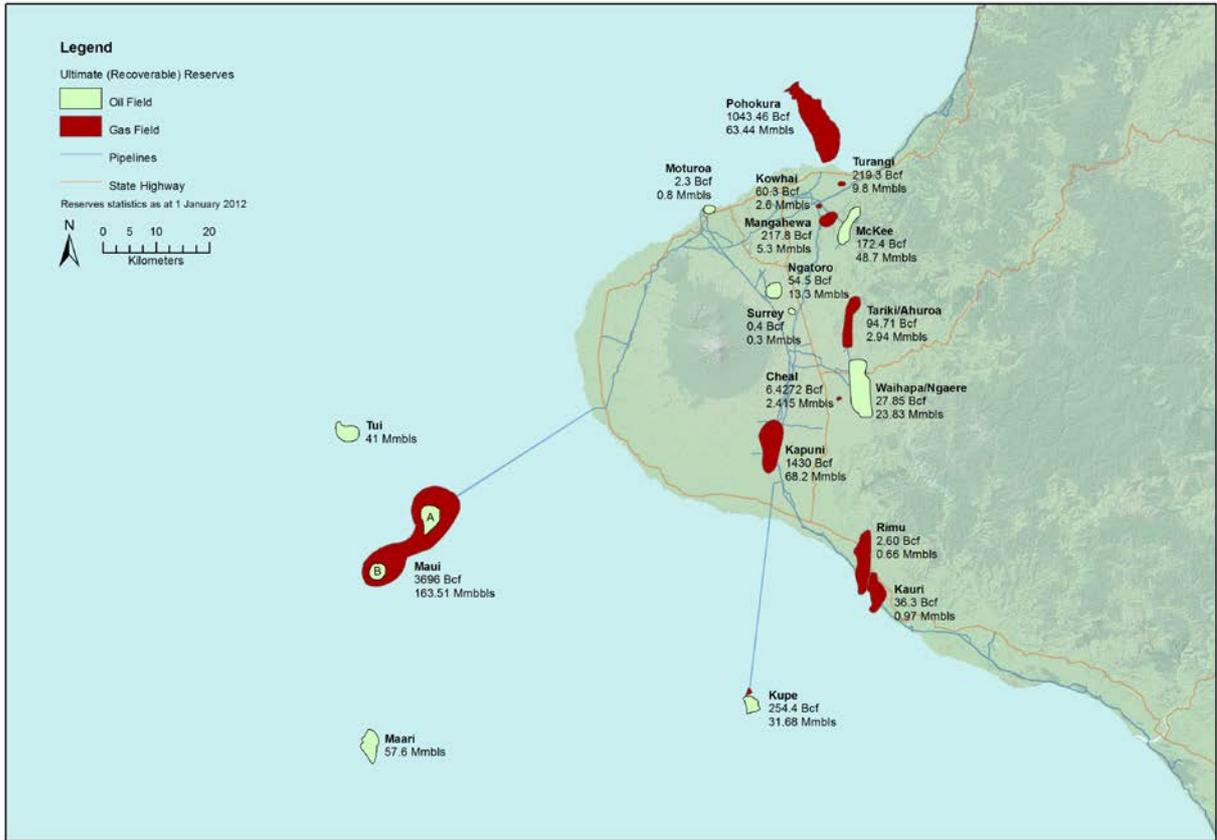
In total, 16 fields in the Taranaki region produced 19.3 million barrels of crude oil (116 Petajoules (PJ)) and 0.157 trillion cubic feet of gas (173 PJ) in 2010 (Ministry of Economic Development, 2011a).

As a result of the success of the petroleum and agricultural industries in Taranaki, the region has the highest average labour productivity (Figure 2) and the highest level of output per capita (Figure 3) in New Zealand.⁵

These graphs reflect the relatively high salaries that are paid to oil and gas industry workers, and other supporting industries such as engineering, which are a large share of the Taranaki economy.

⁵ This statement is based on regional estimates provided by BERL. Note that these estimates are less reliable for small regions such as Taranaki.

Figure 1: Oil and gas fields in Taranaki



Source: Ministry of Business, Innovation and Employment

Figure 2: Average labour productivity by region (2011)

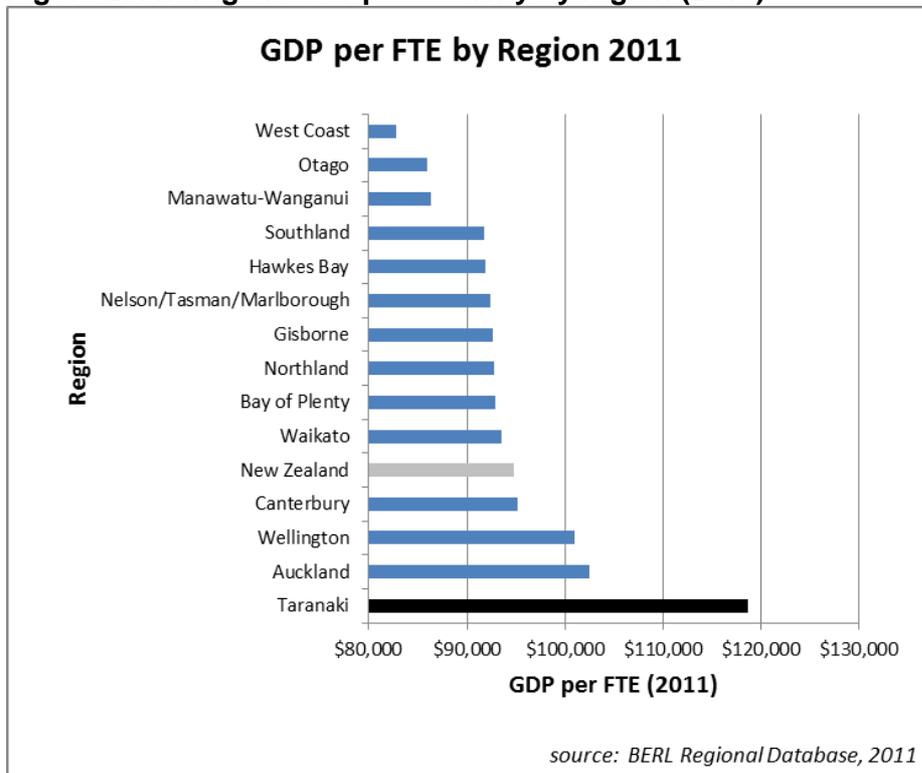


Figure 3: Output per person by region (2011)

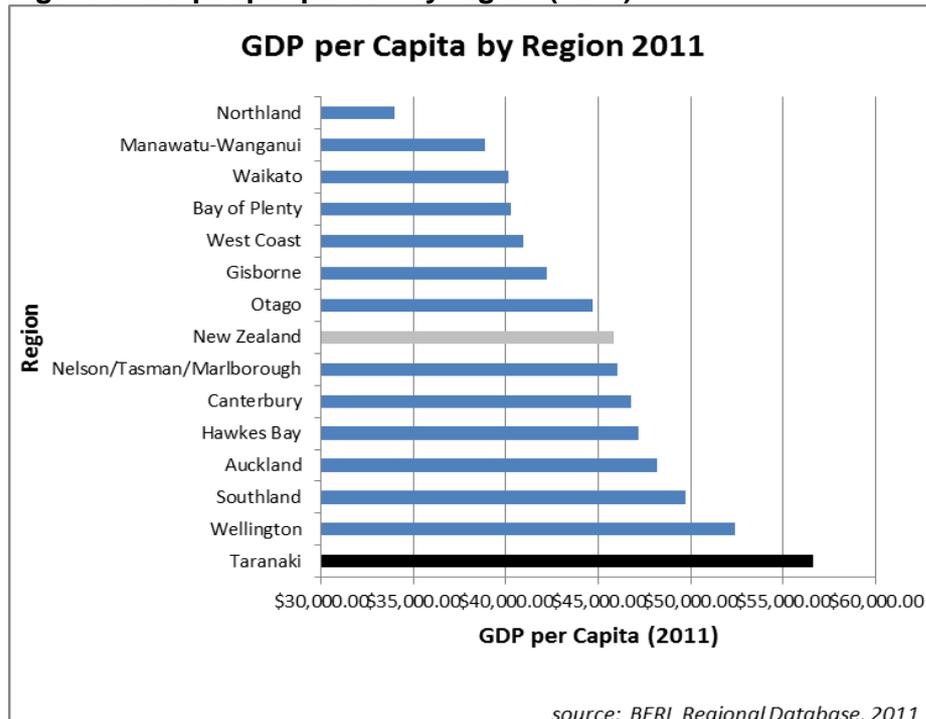


Figure 4 below shows the contribution of different sectors to the Taranaki economy in 2011. The mining sector, which includes oil and gas activities, was directly responsible for 23 percent of regional gross domestic product (GDP) in 2011.

Figure 4: Sector contributions to Taranaki GDP

Real GDP in 2011 \$m for Taranaki	2008	2009	2010	2011
New Zealand	195,432	192,484	191,211	194,277
Taranaki Region	5,970	5,911	6,020	6,035
Mining	1,492	1,382	1,467	1,384
Manufacturing	983	901	869	922
Rental, Hiring & Real Estate Services	657	697	766	709
Agriculture, Forestry & Fishing	342	350	353	360
Health Care & Social Assistance	304	310	317	319
Retail Trade	306	305	307	313
Construction	320	315	283	289
Wholesale Trade	254	246	236	232
Transport, Postal and Warehousing	206	206	203	231
Professional, Scientific & Technical Services	155	175	185	181
Information Media & Telecommunications	127	135	135	168
Electricity, Gas, Water & Waste Services	107	147	157	168
Public Administration & Safety	165	171	159	165
Financial & Insurance Services	137	155	150	151
Education & Training	137	139	147	151
Administrative & Support Services	115	107	115	125
Accommodation & Food Services	69	70	69	68
Art & Recreational Services	51	57	58	53
Other Services	43	43	45	46

Source: BERL, Statistics New Zealand

The successes in Taranaki have also had positive effects on the broader macroeconomy. In 2009, the petroleum and minerals sectors contributed 2.3 percent of GDP – oil and gas production accounted for 1.5 percent.

The oil and gas industry also generates around \$400 million in annual royalty and around \$300 million in annual company tax revenue for the government.

Oil is now New Zealand’s fourth-largest merchandise export, despite the fact that production is limited to a relatively small number of fields and only one petroleum basin (Statistics New Zealand, 2011).

Figure 5: The value of oil exports in comparison to other commodities

Commodity	12 months ended June, millions of dollars		
	2009	2010	2011
1. Milk powder, butter and cheese	8,970	8,840	11,335
2. Meat and edible offal	5,526	5,058	5,398
3. Logs, wood and wood articles	2,330	2,638	3,200
4. Crude oil	1,964	2,126	1,990
5. Mechanical machinery and equipment	1,842	1,647	1,733

Source: Statistics New Zealand

The International Energy Agency (2011) forecasts that primary oil demand will continue to rise over the medium term, and that the costs of production will continue to increase. This is happening in the rest of the world as existing fields deplete and new fields are developed in areas that are harder to reach, and as global demand continues to remain strong.

This outlook presents both a risk and an opportunity for New Zealand. As oil and gas are important inputs to the economy, higher oil and gas prices flow through to the production and distribution costs of almost every activity and product we consume. Between 2002 and 2010, for example, New Zealand’s oil import bill increased by 133 percent – even though the volume of imports only increased by seven percent. This increase has a big impact on the cost of living in general.

On the plus side, higher oil prices increase the value of our oil exports, company profits, and government tax and royalty revenue. The extent to which a rise in oil and/or gas prices is good or bad for an economy depends largely on whether the country is a net importer or exporter of oil and gas resources. New Zealand’s dependence on imported oil has varied over time, dropping as low as 35 percent in 1997 and peaking at 82 percent in 2006. Despite the recent increases in production, New Zealand remains a net importer of oil. However, it is self-sufficient in natural gas.⁶

Current oil production volumes are equal to 50 percent of the total annual volume of oil consumed (Ministry of Economic Development, 2011a). For technical and economic

⁶ That is, we neither import nor export natural gas; rather, an internal market operates that balances domestic supply with domestic demand. This means that the domestic price of gas is driven by domestic rather than international supply and demand considerations (unlike oil).

reasons, however, we export almost all of our domestically-produced crude oil and import nearly all the crude oil that is refined and used domestically.⁷

Health, safety and the environment

New Zealand has rigorous regulations around oil and gas exploration and production activities in order to manage the risks to health, safety and the environment.

More than 1,000 wells have been drilled in New Zealand in the past 150 years, and many of our biggest and most successful fields are offshore (McDouall Stuart, 2009). In this time, New Zealand has maintained a good environmental track record. Nonetheless, the government is implementing a number of changes to strengthen the regulatory regime. These measures include:

- A new regime for the management of environmental effects of activities in the exclusive economic zone and continental shelf – the area beyond 12 nautical miles from New Zealand’s coastline. The Exclusive Economic Zone and Continental Shelf (Environmental Effects) Bill is currently before Parliament, and will come into effect once a complete set of regulations is developed in the later part of 2012. Under the new legislation the Environmental Protection Authority will regulate seabed mining and some petroleum activities.
- Voluntary interim measures that have been agreed with the industry and will be in place until the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Bill is passed. The measures include the industry undertaking environmental impact assessments and meeting international drilling safety standards for new exploration operations in the exclusive economic zone.
- A High Hazards Unit within the Labour Group of the Ministry of Business, Innovation and Employment. The new unit provides greater focus, capacity and capability to provide assurance of good safety management in extractive industries.
- A targeted review of the Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 1999 is being undertaken by the Ministry of Business, Innovation and Employment in 2012.
- The Ministry of Transport is reviewing the liability insurance requirements for the offshore petroleum industry.

This ongoing work is intended to ensure that New Zealand has world-class legislation in place to effectively manage any risks to health, safety and the environment.

⁷ There is a range of different types of crude oil that trade at different prices. New Zealand produces so called ‘light, sweet’ crude, which sells at a premium price on international markets, yet the refinery is geared around ‘medium, sour’ crude, which typically sells at a lower price. It is for this reason that we export almost all of the oil produced here, rather than consume it domestically.

The future of the oil and gas industry

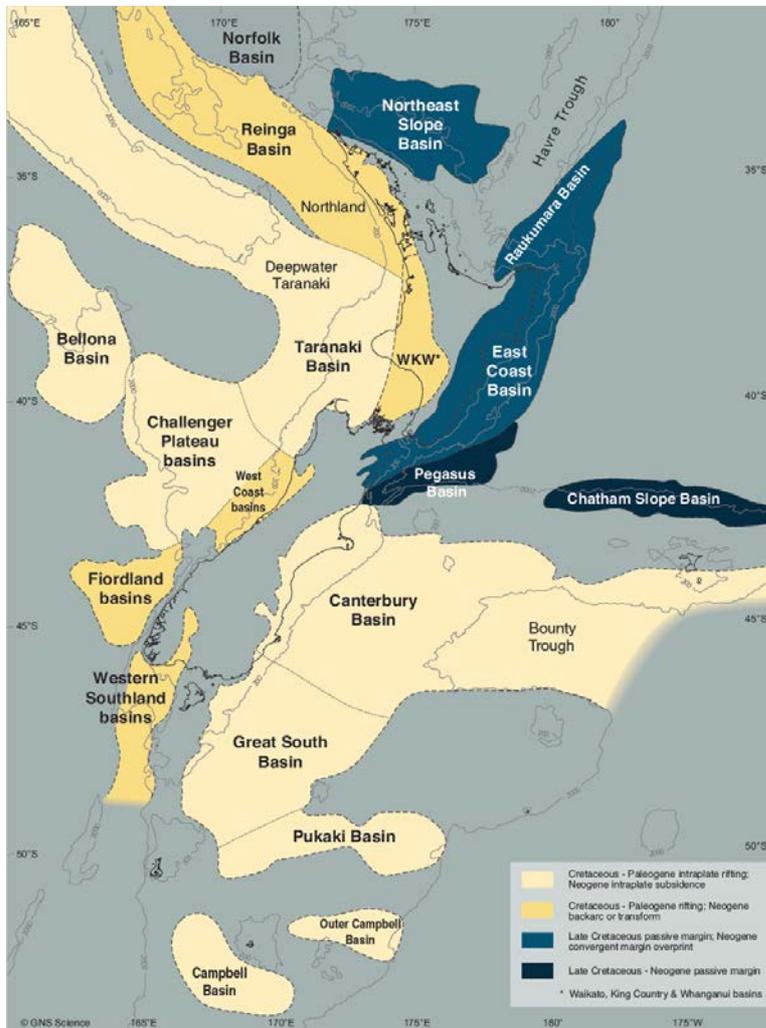
Recent studies have assessed the potential for discovering new oil, gas and mineral resources in New Zealand, as well as their possible value. These studies – such as the Woodward Partners (2011) valuation of future oil and gas royalties⁸ – show that there is significant oil and gas potential, and its discovery and development would produce economic benefits for New Zealand.

This paper complements these studies by examining the wider economic consequences and regional development benefits of several oil and gas development scenarios.

The potential for making new oil and gas discoveries

New Zealand is an under-explored petroleum destination by international standards. All of New Zealand's current and historic oil and gas production has come from just one basin, the Taranaki Basin, although 17 other petroleum basins could contain commercial deposits of oil and gas.

Figure 6: New Zealand's petroleum basins



Source: Ministry of Economic Development (2010)

⁸ Available at www.med.govt.nz/sectors-industries/natural-resources/oil-and-gas/petroleum-expert-reports/assessment-of-future-royalty-income

Defining basins and fields

In this paper, reference is made to different 'basin' and 'field' development scenarios. A petroleum 'basin' is often very large and refers to an area containing the sedimentary rocks that are necessary for oil and gas to form and accumulate.

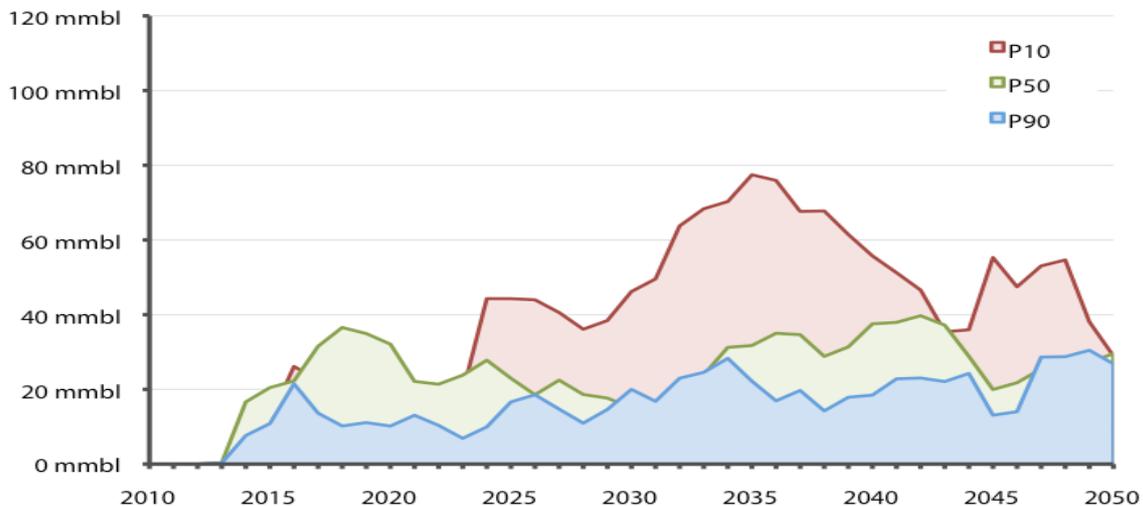
Within a given basin, there may be any number of individual oil and gas fields. These are deposits of oil and gas that are 'trapped' in individual formations within a basin. For example, there are 16 oil and gas fields currently producing in New Zealand – all of which are located in the Taranaki basin.

In 2009, the Ministry commissioned GNS Science and Michael Adams Reservoir Engineering to estimate the resource potential of eight major petroleum basins in other parts of New Zealand.⁹

As a result of that work, conclusions have been drawn about the possible volumes of oil and gas that may be present in the basins around New Zealand, along with profiles of how they might be developed over time. This profiling was based on modelling work undertaken by the Ministry of Economic Development and includes assumptions about rates of exploration, production costs, oil prices and exchange rates.¹⁰

Figures 7 and 8 below, reproduced from the Woodward Partners (2011) report, show possible future oil and gas production profiles from new oil and gas fields in eight frontier basins. They do not include ongoing production from existing fields in Taranaki.

Figure 7: Future oil production from frontier basins (mid valuation scenario)

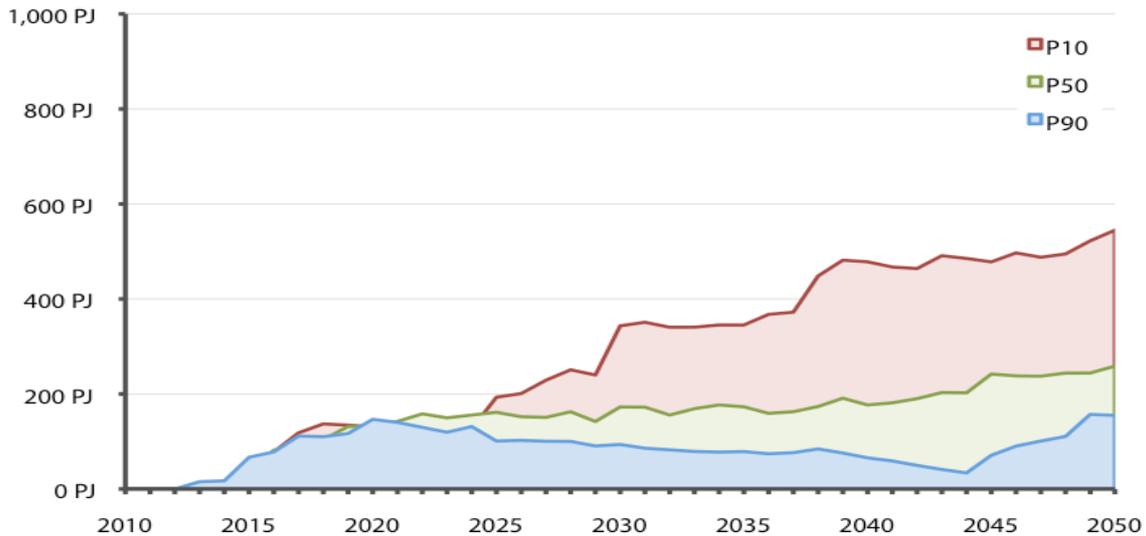


Source: Woodward Partners (2011)

⁹ These expert reports can be downloaded from www.med.govt.nz/sectors-industries/natural-resources/oil-and-gas/petroleum-expert-reports

¹⁰ A full explanation of the model can be found in chapter 6 of the Energy Outlook Modelling Technical Guide and can be downloaded from www.med.govt.nz/sectors-industries/energy/pdf-docs-library/energy-data-and-modelling/modelling/energy-outlook/technical-guide.pdf

Figure 8: Future gas production from frontier basins (mid valuation scenario)



Source: Woodward Partners (2011)

Estimating resource potential

A 'P50' estimate represents the midpoint, or central case, of a given probability distribution. In this paper, the probability distribution in question relates to the size and timing of field discoveries in our hypothetical South Island basin. Other probabilities can also be examined. For example 'P10' estimates, which represent more optimistic scenarios (that is, those with a 10 percent likelihood of occurring) and 'P90' estimates, which represent more conservative scenarios (that is, those with a 90 percent likelihood of occurring) are often presented in addition to a P50 central case. Some of the later analysis draws on a P10 scenario.

This analysis must be treated with a degree of caution. Although it is based on geological information, it relies on assumptions about a large number of variables and should not be interpreted as a firm estimate of what will be commercially developed at specific points in time. Rather, its principal value is to indicate the scale of New Zealand's untapped petroleum potential which, if developed, could provide large economic benefits to the country over an extended period of time.

Estimated economic benefits

Forecasts of possible future production suggest that New Zealand could become a net exporter of oil – instead of a net importer – in the next 20 years (Ministry of Economic Development, 2011b). The economic benefits of this increased production include more exports, higher paying jobs, and increased investment, royalties and taxes.

A study by Venture Taranaki (2010) estimated that the oil and gas industry in New Zealand already directly employs 3,730 people and supports a further 3,970 jobs in other parts of the economy. These jobs primarily support the local industry in Taranaki. But if other basins were developed in the same way, thousands more jobs could be created in other regions of New Zealand. This is examined in more detail later in the paper.

Of course, the number and type of jobs and other benefits that result from a particular oil or gas discovery are dependent on how a particular resource is developed. In the case of a large gas discovery, for example, piping the gas onshore requires very significant infrastructural investment that can lead to flow-on employment opportunities that might not occur if the raw product was exported directly from the production platform as Liquefied

Natural Gas (LNG). These development decisions depend on a large number of domestic, international, technical, geological and economic factors that are very difficult to forecast.

One recent example of this flow-on effect is the announcement in January 2012 that Methanex, a global methanol producer, is increasing production at its Motunui complex in Taranaki because of the discovery of new gas resources at the nearby Mangahewa gas field. The increased availability of gas – the raw material in methanol production – is expected to lead to increases in output that will increase exports by \$250 million per year and create 500 additional construction jobs. In addition to these benefits, the deal could generate up to \$1.2 billion in government revenue from royalties and taxes.¹¹

Potential production scenario

This section looks at the potential economic outcomes from plausible oil and gas discovery and development scenarios. It draws on modelling work commissioned and undertaken by the Ministry of Economic Development and assumes that patterns of development would be broadly similar to those observed in the past in Taranaki.

First, we analyse the overall economic effects for New Zealand of a new *basin* development in the South Island. We then take a closer look at the regional economic development consequences of three possible *field* scenarios in several hypothetical South Island basins. The choice of a hypothetical South Island basin enables us to consider a location that has little existing oil and gas industry infrastructure, yet promising resource potential.

Basin development scenario: ten new oil and gas fields

Our central scenario assumes a discovery of ten new oil and gas fields of varying sizes in a single South Island petroleum basin. The discovery and development of the various fields within the basin are assumed to occur in a staged manner over a 30 year timeframe. Details of each field discovery are set out in Figure 9.

It is important to note that this scenario does not represent the entire oil and gas potential of New Zealand. It is a set of hypothetical developments in one basin only, which might represent, on average, 20-25 percent of the possible annual production during the period in question that is implied by Figures 7 and 8. It is based on information about New Zealand's oil and gas potential in one basin and draws on mid-range ('P50') field size probabilities.

¹¹ www.beehive.govt.nz/release/government-welcomes-jobs-and-growth-taranaki

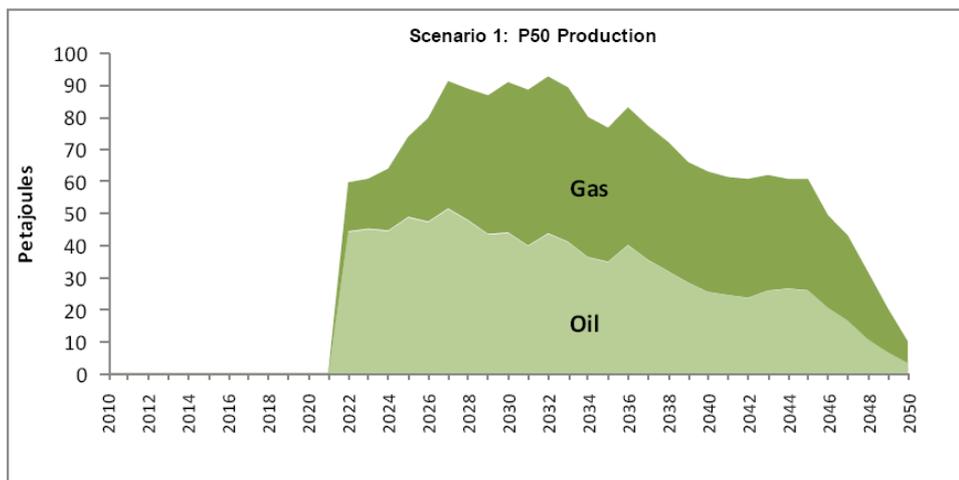
Figure 9: Potential oil and gas discoveries, 2012-2046

Discovery year	Field type	Tech field size (tcf/mmbbl)
2012	Gas	0.4
2015	Oil	120.1
2021	Gas	1.4
2022	Gas	0.7
2028	Oil	240.3
2030	Oil	13.7
2039	Oil	48.1
2043	Oil	60.1
2046	Oil	80.1
2046	Oil	40.0

Source: Ministry of Business, Innovation and Employment

The figure below illustrates how this series of P50 discoveries could translate into an oil and gas production scenario over time.

Figure 10 Potential oil and gas production from P50 discoveries



Source: Ministry of Business, Innovation and Employment

Impact on national economy

The New Zealand Institute of Economic Research (NZIER) general equilibrium (GE) model has been used for the ten-field, new basin development scenario to estimate the effect of increased oil and gas production on the New Zealand economy as a whole.

The model estimates how the output of the New Zealand economy would change as a result of additional oil and gas production, on average, in each year of the scenario. The model uses a representative year of production to estimate the average annual impact on the economy.

Over the life of a basin, there will be several oil and/or gas fields in operation in any given year. The actual level of production changes from year to year in line with the production profile shown in Figure 10. For the purposes of this modelling, average production in the years 2021-2050 is used to create a 'representative year' (assumed to be 2030).

Findings

In the representative year of this scenario, additional exports are \$1.5 billion and additional royalty payments to the Crown are \$320 million per annum (using 2010 prices).¹² These changes are attributable entirely to the additional oil and gas that is produced from this basin.

In line with this production, there would also be additional indirect benefits for local economies – such as the wages provided to employees, which are then spent by households; or local businesses supplying the oil and gas industry with goods, services and capital. In many regions, these indirect, or flow-on, benefits will be a crucial source of economic development opportunities for existing businesses and a catalyst for new investment from other regions in New Zealand and potentially abroad.

The GE modelling shows national employment increasing in the oil and gas industry, as well as in supporting mining services, in line with rising output. Consumer industries also see growth. For example, the restaurant industry responds to a 2.1 percent increase in household expenditure by taking on an additional 1.6 percent more workers. This result captures the flow-on effect of increased mining sector activity for one retail and hospitality sector. Similar effects would be expected for other sectors.

As well as positive benefits that accrue to other businesses, the model indicates that the expansion of the oil and gas sector would have some negative impacts on other sectors. For example, increased oil exports and investment in New Zealand are likely to lead to an appreciation of the exchange rate, in turn affecting the international competitiveness of other export sectors.

The international price of output from industries such as dairy and horticulture effectively increases as a result of the exchange rate appreciation, and these sectors consequently face a slight reduction in profitability. In addition, some of the increases in employment that occur in oil and gas and related sectors would be at the expense of other export industries. The model reflects this process with, for example, employment in the horticulture industry decreasing by 0.2 percent as labour moves toward higher paying opportunities in the oil and gas sector.¹³

¹² Value calculated by NZIER by averaging the time series of royalty payments from the development estimated by the Ministry of Economic Development.

¹³ Refer to the NZIER report for further detail.

Figure 11: Indirect impacts on different sectors of the economy (2010 NZ\$)

Sector	Type	Percentage change
Mining services	Supplying	179
Bars and restaurants	Household expenditure	2.1
Clothing	Household expenditure	2.2
Non-building construction	Investment	2.3
Dairy	Competing exporter	-0.01
Horticulture	Competing exporter	-0.19

Source: NZIER

The net effect of all of these direct and indirect impacts on different sectors of the economy is positive. Gross National Disposable Income (GNDI), the total income of New Zealand residents, increases by 0.77 percent, on average, as a result of the increased level of oil and gas production.

GDP is 1.2 percent or \$2.1 billion higher (in 2010 prices), on average, in every year of the scenario than it would be if the basin development scenario was not included in the model.

Figure 12: Estimated effects of a P50 basin development on key macro variables (Real percentage change)

Indicator	Percentage change	Real value change
GDP	1.2	\$2.1 billion
GNDI	0.77	\$1.4 billion
Private consumption	0.72	\$800 million
Public consumption	0.72	\$280 million
Exports (volume)	3.0	
Imports (volume)	2.0	
Real wage	0.02	
Capital stock	1.4	

Employment effects of a new basin development

The results of the GE model indicate that employment in the oil and gas extraction industry and the mining services industry could increase by around 150 percent as a result of this kind of P50 basin development scenario. Using industry employment data published by Venture Taranaki (2010) as a starting point, this could see national employment in this industry increase from around 3,700 jobs to around 9,300 jobs.

This increase in employment is modest in the context of the national labour market. However, it is consistent with the high capital intensity of the industry and could be very significant for local labour markets in regional communities. The relatively high average labour productivity of the sector means that the creation of these additional jobs produces a small increase in the overall national real wage.

Regional impacts

Having examined the nationwide benefits, this section draws on BERL's analysis of the regional benefits of potential future oil and gas production. It looks at how different types of oil and gas fields might impact on local economies.

Investment decisions about the type of infrastructure needed to produce the oil or gas will be impacted by factors such as: whether a field development is onshore or offshore, how far below ground a particular reservoir is situated, the size and location of particular discoveries and the relative shares of oil and/or gas that are discovered.

Different types of infrastructure development will, in turn, impact on the local economy in different ways. The size, structure and capability of local supporting industries, such as engineering services, will further influence the share of investment and employment demands that are captured locally.

Three specific field development examples have been considered to examine how these factors can affect the type of regional economic benefits that arise from oil and gas sector activities. These examples were taken from a database developed by the Ministry of Economic Development to estimate plausible future discovery and production scenarios in different regions of New Zealand. One of these fields appears in the previous, basin-wide scenario. The other two are taken from other hypothetical basins in the database.

The likely regional and national development impacts of the fields described below would be expected to be broadly similar if they were to occur in any of the regions of New Zealand that contain undeveloped oil and gas potential. However, some regional difference in effects would be expected, in light of structural differences between regional economies.

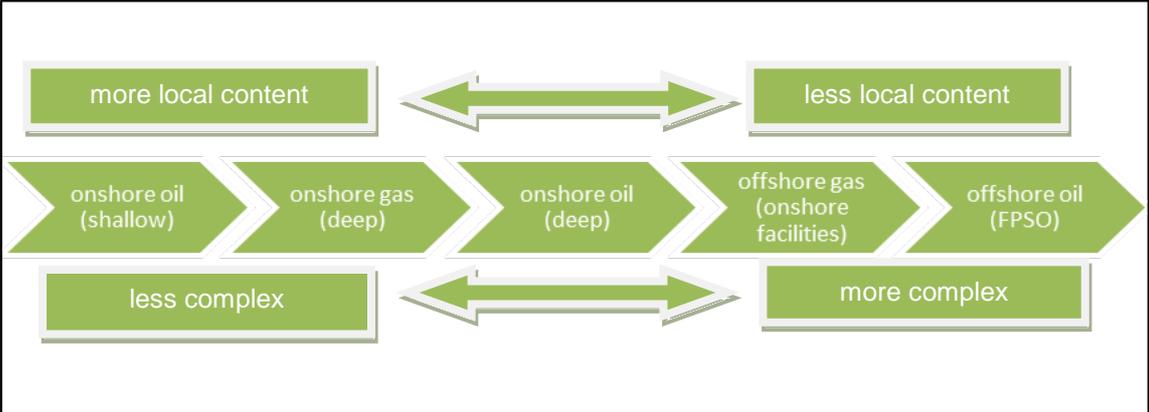
The three representative field developments considered are:

1. An oil field of 120 million barrels, discovered in a near offshore South Island basin.
2. An oil field of 125 million barrels, discovered in a far offshore South Island basin.
3. A gas field of 12 trillion cubic feet discovered in a far offshore South Island basin.

In each of these cases, the development of local industry starts from a low base. Initially, the necessary skills and specialised equipment are imported into the host region from elsewhere in New Zealand (mainly Taranaki) and from offshore. Over time, however, a deeper pool of local expertise is expected to emerge within the host region.

Because of the need for sector investment to take place near the physical location of an oil or gas deposit, this pattern of development – involving the injection of many millions of dollars of new investment into the host region – is a possibility in regions of New Zealand that have unproven oil and gas potential. The oil and gas industry has the potential to be a source of comparative advantage for certain regions that otherwise have limited high-growth sector opportunities.

Figure 13: Industry value chain for field development type



Source: BERL

Analysis at an individual field level is undertaken because it is at this level that the direct impacts of activity on the regional economy can be explored. Direct effects can be expressed in terms of employment (full time equivalent jobs, or FTEs) and value added (GDP) contributions. Depending on the type of field being developed, the regional economy is also more or less involved in providing input and project resourcing, as shown in Figure 13.

Field example 1: South Island near offshore oil

Discovered in 2013, the first hypothetical oil field analysed is 120 million barrels – approximately 2.5 times the size of the Tui or Maari fields. The total estimated expenditure associated with this discovery and development – from exploration to decommissioning – is \$3.2 billion.

Based on this estimate and an understanding of the industry value chain, New Zealand companies might realistically capture \$1.6 billion of this expenditure. In most cases, it is assumed that successful domestic participants will be Taranaki-based businesses. Over the longer term, as the domestic industry matures, local companies could take a larger share of new developments.

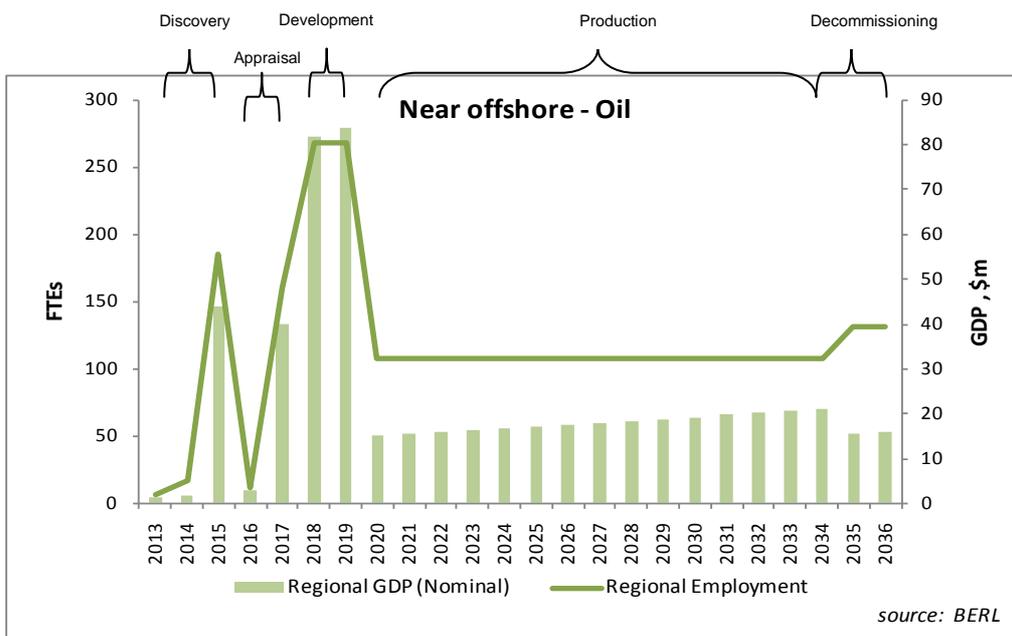
The direct economic impact of this field would be greatest through the development and production phases.

Averaged over the 24-year life of the development, this single field could generate new expenditure in the host region of \$67 million per annum. The production phase (being the longest at 15 of the 24 years) could result in \$47 million per annum spent in the region. Over the entire life of the field, it could contribute around \$557 million to regional GDP, or \$23 million of ongoing GDP contribution per annum.

At the various stages of development, the project would also create different kinds of local employment opportunities – particularly during the development phase. Over the life of the field, an average of 116 FTEs would be directly employed each year. The development phase is the most intensive period, drawing in around 270 FTEs each year for the two-year period.

Oil production is capital intensive and this is reflected in the estimated employment impacts. Salaries for the newly created positions would be significantly higher than the national average due to the technical expertise required to operate the plant and equipment.

Figure 14: Direct regional employment and GDP impacts of a hypothetical near offshore oil development



Field example 2: Far offshore oil

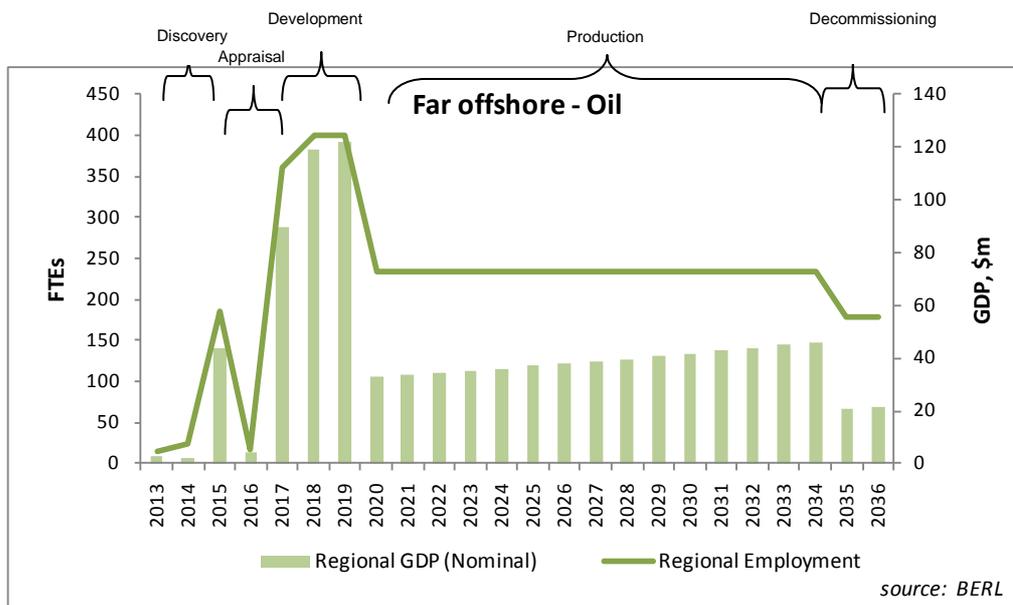
The second field scenario comprises an oil field of 125 million barrels, assumed to be discovered in 2015. This is similar in size to the previous example, however it is assumed to be discovered further offshore. This has cost and design implications for the development project that will influence its impact on the regional economy.

The total expenditure associated with the development of this project – from exploration to decommissioning – is \$6.5 billion. It is estimated that \$2.8 billion of this expenditure would fall within the regional economy, with the remainder flowing to overseas suppliers of specialised plant, equipment and services. As in the first field scenario, domestic benefits flow via business contracts with Taranaki-based specialist operations. There would also be wider regional benefits in the accommodation, hospitality and retail sectors.

This development profile would be expected to increase regional GDP by \$1 billion over the life of the project – or \$42 million per annum. Analysis indicates the project could generate employment for some 220 FTEs annually over the life of the field. Most of the expenditure in the regional economy would happen in the development and production phases.

Averaged over the 24-year life of the field, this single development could result in \$116 million of new expenditure in the region per year. The production phase (being the longest and comprising 15 of the 24 years) could itself inject \$102 million per annum.

Figure 15: Direct regional employment and GDP impacts of a hypothetical far offshore oil development



A much higher proportion of employment and GDP is captured in the production phase, compared to the near offshore field in the previous scenario. This is because the type of development required is more costly due to the distance from shore and because the share of production-phase expenditure within the region is relatively high.

Field example 3: Far offshore gas

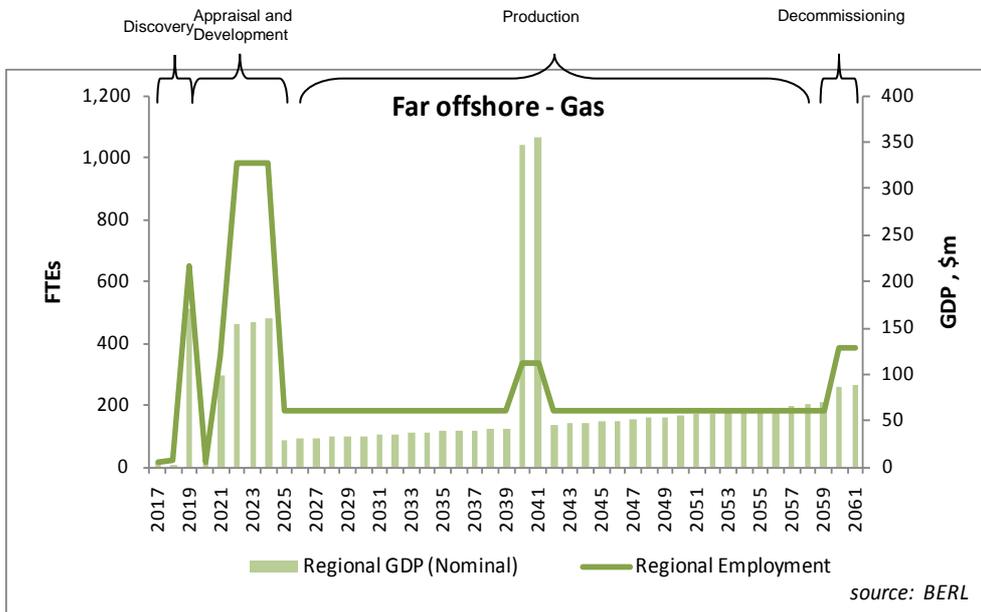
The third example is a 12 trillion cubic feet (tcf) gas field is discovered in 2019. At over three times the size of Maui, this is a very large ‘P10’ discovery. That is, based on the modelling parameters, there is a 10 percent probability that a discovery at least this big will be made in the basin in question. In other words, it is a more optimistic scenario than the two preceding field examples. It is included in this report to enable the regional development implications of an export-scale natural gas opportunity to be considered and compared alongside several mid-scale oil discoveries.

The whole-of-life development and production costs associated with this discovery are \$19.3 billion. For this example of a “large” field development, BERL has assumed in their report that the use of a floating LNG platform enables production to be exported directly from the point of production. This assumption is considered as the most realistic development scheme for a resource of this size, given the small scale of the domestic gas market. The employment and regional investment effects of this form of development are lower than they might be if alternative, arguably less plausible, development schemes are assumed.

Around \$8.1 billion of total expenditure would be spent in the regional economy (with the remainder going offshore) over the 45-year life of the field.

This development would also contribute \$3.2 billion to the region’s GDP over its life, with an average of \$71 million per annum. This increase in economic activity would be significant in the context of many regional economies where such a find is possible.

Figure 16: Direct regional employment and GDP impacts of a hypothetical far offshore gas development



Due to the long production life of the field, the greatest economic benefits occur during the production phase. However, the development phase accounts for around 25 percent of the total employment effect with 980 FTEs. Over the life of the field, it can be expected to employ an average of around 260 FTEs annually.

Conclusion

Research and modelling work undertaken by the Ministry of Business, Innovation and Employment, Woodward Partners, NZIER and BERL has highlighted the positive economic impact of oil and gas development. These economic benefits can be measured in terms of GDP, direct royalty and taxation returns, higher paying jobs, investment, regional development and exports.

New Zealand's oil and gas industry is already making good returns with potential for much more development. It is the country's fourth-largest exporter, behind dairy, meat and forestry. It directly employs more than 3,700 people and supports more than 3,900 jobs in other parts of the economy. Expected future royalties from the current production of oil and gas are valued at \$3.2 billion in present value terms.

If exploration continues as it is now, production from new fields could yield \$5.3 billion in royalties in net present value terms. Under a higher exploration scenario, however, this figure could be \$9.5 billion in net present value terms. Much of the government's work programme in this area is targeted at achieving increased exploration and production in New Zealand.

Modelling shows that there would be a 1.2 percent increase in national GDP if a pattern of oil and gas field developments occurred over a 30-year time frame in a South Island petroleum basin that is currently undeveloped. On the basis of the best information that is available, our basin models suggest that this scenario is in the middle of the statistical range of possible quantities of oil and gas that could be discovered. Such a development process would also contribute \$1.5 billion to annual export revenue and \$320 million to annual royalty payments (using 2010 prices), as well as creating around 5,500 new job opportunities in the oil and gas industry.

Local economies would also be expected to benefit through job creation, higher wages, higher demand for local goods, services and capital, and new investment in the region. For each of three major new field developments presented in this paper, regional GDP increases are estimated to be between \$557 million and \$3.2 billion, depending on the size of the field and how the discovery is managed and developed.

In summary, based on our current understanding of New Zealand's oil and gas potential, further development and production could provide significant economic benefits to New Zealand – on both a local and national level – over long periods of time. Unlocking this potential is a current area of focus for the government and a source of opportunity for many regions in New Zealand.

References

1. Business and Economic Research Limited (2011). *Regional impacts of a new oil or gas field*. Report to Ministry of Economic Development.
2. GNS Science (2009). *Potential undiscovered oil and gas resources of New Zealand*. Report to Ministry of Economic Development.
3. International Energy Agency (2011). *World Energy Outlook 2011*. France: OECD/IEA.
4. McDouall Stuart. (2009). *Stepping up: Options for developing the potential of New Zealand's oil, gas and mineral sector*. Wellington: McDouall Stuart.
5. Michael Adams Reservoir Engineering (2009). *Production and cost estimates for New Zealand's petroleum resources: Phase 1 report*. Report to Ministry of Economic Development.
6. Minister of Labour (2011). *Improving Health and Safety in High Hazard Industries*. Wellington: Cabinet Office.
7. Ministry of Commerce (1992), *Evaluation of Allocation and Pricing Regimes*, Wellington: Ministry of Commerce.
8. Ministry of Economic Development (2010). *New Zealand Petroleum Basins*. Wellington: Ministry of Economic Development.
9. Ministry of Economic Development (2011a). *New Zealand Energy Data File*. Wellington: Ministry of Economic Development.
10. Ministry of Economic Development (2011b). *New Zealand Energy Strategy 2011—2021*. Wellington: Ministry of Economic Development.
11. New Zealand Institute of Economic Research (2011). *Value of oil and gas exploration: Hypothetical scenarios*. Report to Ministry of Economic Development.
12. Statistics New Zealand (various). *Overseas Merchandise Trade: June year*. Wellington: Statistics New Zealand.
13. Statistics New Zealand (2011). *Year to December 2010. Hot Off The Press Overseas Merchandise Trade: June 2011*. Wellington: Statistics New Zealand.
14. Venture Taranaki (2010). *The Wealth Beneath Our Feet: The value of the oil and gas industry to New Zealand and the Taranaki region*. New Plymouth: Venture Taranaki.
15. Woodward Partners (2011). *Valuation of the Crown's royalty streams from the petroleum estate*. Report to Ministry of Economic Development.