



# THE WEALTH BENEATH OUR FEET

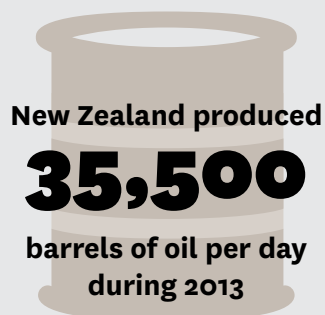
## THE NEXT STEPS

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THE VALUE OF THE OIL AND GAS INDUSTRY TO NEW ZEALAND  
AND THE TARANAKI REGION. A FRESH PERSPECTIVE ON THE  
INDUSTRY AND ITS ECONOMIC IMPACT.

Venture  
**TARANAKI**  
Te Puna Umanga 

# O&G INDUSTRY SUMMARY



Oil is our  
**4TH HIGHEST  
EXPORT EARNER**

## 208 PETAJOULES (PJ) OF GAS

produced from our fields in 2013.  
The energy equivalent to:

- 10,000 lightbulbs on for 10,000 years or
- 200 round trips to the sun from earth in a Ford Falcon XR6

Natural gas is used by over

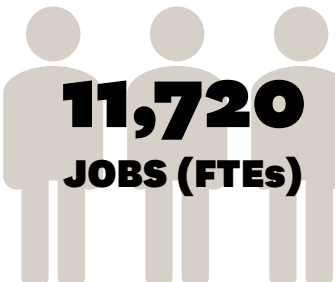


**10,000  
COMMERCIAL USERS**  
such as restaurants, hotels,  
greenhouses & hospitals

Natural gas  
provides instant heat,  
energy & continuous hot  
water supply for over



**245,000  
NZ HOUSEHOLDS**



**11,720  
JOBS (FTEs)**

Gas underpins



**19%**

of our electricity generation  
(2nd only to hydro)

Gas provides



**22%**

of our primary  
energy supply

Natural gas is used as an input  
in manufacturing to create



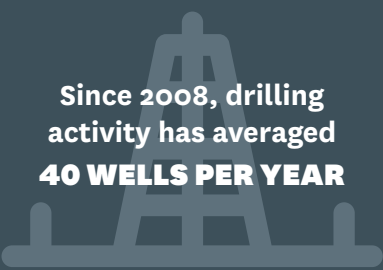
**ADDED VALUE**

such as methanol for export,  
or urea for use on our farms



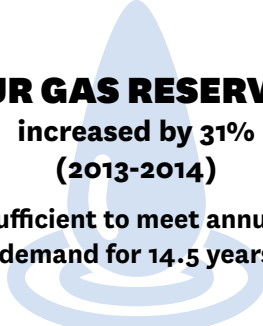
Oil and gas contributed  
**\$1.5B IN ROYALTIES**

to government revenue  
over the last 4 years -  
equivalent to the annual  
budget for the NZ Police



Since 2008, drilling  
activity has averaged  
**40 WELLS PER YEAR**

## OUR GAS RESERVES



increased by 31%  
(2013-2014)

sufficient to meet annual  
demand for 14.5 years



**CURRENT PRODUCING FIELDS:** 20 O&G fields are in production, all in Taranaki.

Key oil & condensate fields (in descending order of remaining oil & condensate reserves)  
Maari, Pohokura, Maui, Kupe, Mangahewa, Turangi, Tui, Cheal, & McKee

Key gas fields (in descending order of remaining gas reserves)  
Pohokura, Maui, Mangahewa, Kupe, Turangi, Kapuni, McKee, Kōwhai & Ngātoro



# FOREWORD

**W**hen we first measured the full economic significance of the oil and gas industry in 2010, it made headlines for redefining the scale of the oil and gas industry and its value to New Zealand's economy.

Since then, the nation has experienced an unprecedented period of exploration activity, both on and offshore. While success has been variable, it has raised the profile of the industry, particularly in a number of frontier communities which have either embraced or rejected the presence of this new type of economic activity.

Prospectivity remains high around the country, with attention shifting beyond the traditional 'energy province' of Taranaki. More positive economic returns from offshore activity hold the key to maximising the benefits to the nation.

The commercialisation of our mineral wealth is a cornerstone of the government's economic agenda. In assessing how far the nation has come towards realising the potential of the 'wealth beneath our feet', it must be asked how well that policy has gone towards meeting regional aspirations

for new jobs and greater, localised economic development.

Has the strategy delivered a return on investment over the past five years? What can be learnt from an economic perspective, and how we can further foster healthy and informed debate on the industry?

As sentiment towards oil and gas evolves, how well is the contribution of energy understood in economic terms, in the actual physical impacts on the towns and communities that stand to host the industry, and in the benefits that it can deliver?

The last edition concluded with a wish-list that, based on the data presented, would see the potential of oil and gas deliver maximum value to the nation as a whole. That list included:

- A change to our philosophical definition of the oil and gas industry
- Building stronger partnerships to foster the industry
- Shifting the government partnership model

While some progress has been made towards these items, more can still be done to leverage these opportunities.

Over the last five years, the economic case for harnessing our mineral wealth has become even more compelling.

This report underscores that the resources most able to effect economic transformation are not those that lie deep beneath our feet, but the people who continue to apply leadership, innovation, and an entrepreneurial spirit to the industry.

Wealth seeks to inform discussion, debate and decisions around the role the oil and gas industry will play in New Zealand's economic and social future.

Ultimately, we must work hard to develop our economic potential so our children and grandchildren have cause to thank rather than criticise us for developing the wealth beneath our feet.

**STUART TRUNDLE**

*Chief Executive, Venture Taranaki*

March 2015

# EXECUTIVE SUMMARY

**F**rom the first commercial mining attempts in the 1860s to its current position as our fourth largest export earner, the oil and gas industry has been a core component of New Zealand's economic evolution.

When the original edition of *The Wealth Beneath Our Feet* was launched in 2010, it quantified, for the first time, just how significant the economic contribution of oil and gas was to the economy. Based on data from 2009, the report found that oil and gas injected \$1.9 billion into the nation's GDP. Adding in induced effects, the industry contributed \$2.5 billion annually, and created 7,700 jobs.

Perhaps more importantly, the earlier edition found there was significant potential for oil and gas to contribute more – the industry had the potential to make a step-change contribution to the New Zealand economy.

Five years on, this new edition looks at whether progress has been made towards that goal, and goes far beyond an updated economic impact assessment to take a much deeper look into the industry, its activity, its potential and the challenges it faces if it is to continue to add value.

While this report again measures the economic value of oil and gas to New Zealand, and to the Taranaki region where all national production is currently domiciled, it also recognises the landscape in which the oil and gas industry sits has changed markedly: new exploration opportunities have been opened up, public awareness and scrutiny of the sector's activity has evolved, and so has the regulatory framework under which it operates.

This report is not an argument for or against the presence of an oil and gas industry in New Zealand. It is, rather, an assemblage of up-to-the minute data, case studies, analysis and projections that define the industry and its impact at this particular point in time. As such

it is presented to inform discussion, debate, and ultimately the strategic decision-making that will enable the industry to reach its potential. Or not.

The industry and its contribution have grown considerably over the last half-decade, and notwithstanding radical shifts in energy demand or further and sustained instability in global commodity prices, the second edition of *Wealth Beneath Our Feet* finds this trend has the potential to continue, and to keep fuelling the economy and a greater number of communities around the nation.

Understanding of the industry generally rests on the exploration and production phases – the finding and extracting of the mineral resource. But that is just one phase of a complex and extensive industry that spans a comprehensive midstream supply chain and downstream users, and provides a critical component of New Zealand's energy security.

Some 96 percent of New Zealand's Exclusive Economic Zone lies underwater, which presents both challenges and opportunities for the long-term prospects of the industry. The process of identification, acquisition, exploration, appraisal and – ultimately – development and production of the resource constitutes the upstream phase. The processing, storage, refinement and transporting comprises the midstream component of the sector, while the marketing, distribution, trading and retailing of the end result comprises the downstream initiatives.

This report analyses the activity and impact of all three phases, which work in concert to deliver the full value of oil and gas.

Driven by necessity, oil and gas is one of the most tightly controlled industries, with a raft of legislative, regulatory, policy and procedural controls that seek a balance between extracting the

maximum benefit from the resource while safeguarding the environment and the health and safety of both its workforce and the communities in which it operates.

The wider regulatory framework spans the permitting process, royalties, health and safety and environmental management. At each step of the way a number of checks and balances exist to manage the impacts of the industry, and a number of local, regional and central government agencies have active roles in this process.

Not to be understated is the engagement of Iwi throughout the process. The unique relationship between Māori and the environment has a profound impact on the evolution of the oil and gas industry in New Zealand. In seeking to build a greater understanding of this relationship, prominent Māori leader Dion Tuuta shares his perspective on the overarching positions of Māori towards oil and gas exploration and production, and explores how these views need to be given greater currency if we truly want to leverage the nation's mineral wealth for the benefit of all current and future residents of Aotearoa.

The 150-year evolution of New Zealand's oil and gas industry has fostered credible and capable supply chains. These local companies are a critical component of the sector's output, and are an important touch point between what is seen as a global industry and the communities in which it operates.

Certain stages of the production process are more conducive to leveraging local suppliers, with project characteristics, timeframes, cost and skill competitiveness, geographic location and local knowledge being determinant factors. As projects move beyond the development phase into ongoing production, there is likely to be a greater component of local involvement.

# OIL & GAS INDUSTRY CONTRIBUTION TO EMPLOYMENT & GDP 2013

This involvement is extensive. Activity in the industry in 2013 comprised:

- A total of 52 exploration and prospecting permits in play
- 24 production permits
- 32 wells drilled – 18 exploratory, 5 appraisal and 9 development wells
- 15 million barrels of oil and 2 million barrels of LPG produced
- 208 PJs of gas produced, 181 PJs of which was fed into domestic supply

Oil and gas reserves were estimated in January 2014 to be 2,642.4 PJs of gas, and 138 million barrels of oil – sufficient to meet current annual demand for 14.5 years.

The crux of this report is the updated economic analysis of the oil and gas industry. Venture Taranaki commissioned specialist economists MartinJenkins to analyse a range of data, with the key outcomes identified at right.

In contrast to the 2010 report, direct employment has grown from 3,730 FTEs to 5,068, while the entire industry contributes a total of 11,720 full-time jobs, up substantially from 7,700 five years ago.

When it comes to the industry's contribution to the nation's wealth, overall GDP rose from \$2.5 billion in the 2010 report to \$2.79 billion.

The value of the industry to the Crown accounts has also dropped, reflecting normal fluctuations in production output. Royalty payments in the year to June 2014 totalled approximately \$300 million – down from \$432 million in 2010.

These components are critical outcomes of having the industry here, as through the full range of government programmes and services they redistribute the returns of the wealth beneath our feet to all New Zealanders.

## NEW ZEALAND



### GDP

The O&G industry (including feedstock) directly contributed

**\$1.0b** in GDP

The industry contributed

**\$2.79b** in GDP

(including indirect & induced effects)

### EMPLOYMENT

The O&G industry (including feedstock) directly employed

**5,068** FTEs

The industry created employment for

**11,720** FTEs

(including indirect & induced effects)

## TARANAKI



### GDP

The O&G industry (including feedstock) directly contributed

**\$982m** in GDP

The industry contributed

**\$1.57b** in GDP

(including indirect & induced effects)

### EMPLOYMENT

The O&G industry (including feedstock) directly employed

**4,340** FTEs

The industry created employment for

**7,070** FTEs

(including indirect & induced effects)

## COMPANY TAX & ROYALTIES IN NEW ZEALAND

PEPANZ estimates the New Zealand Government collects approximately **\$300 million** in company tax from exploration and production companies each year.

In the year to June 2014, the government received **\$371 million** in royalties and energy resource levies from oil & natural gas production & sales.

Over the last four years, the industry has contributed about **\$1.5 billion** in royalties & energy resource levies.

Royalties are used by the government to help pay for the broad range of products & services which New Zealanders utilise.

# THE VALUE OF THE OIL & GAS INDUSTRY TO NEW ZEALAND

## GLOBAL O&G MARKET

Offshore and local direct investment into New Zealand by industry

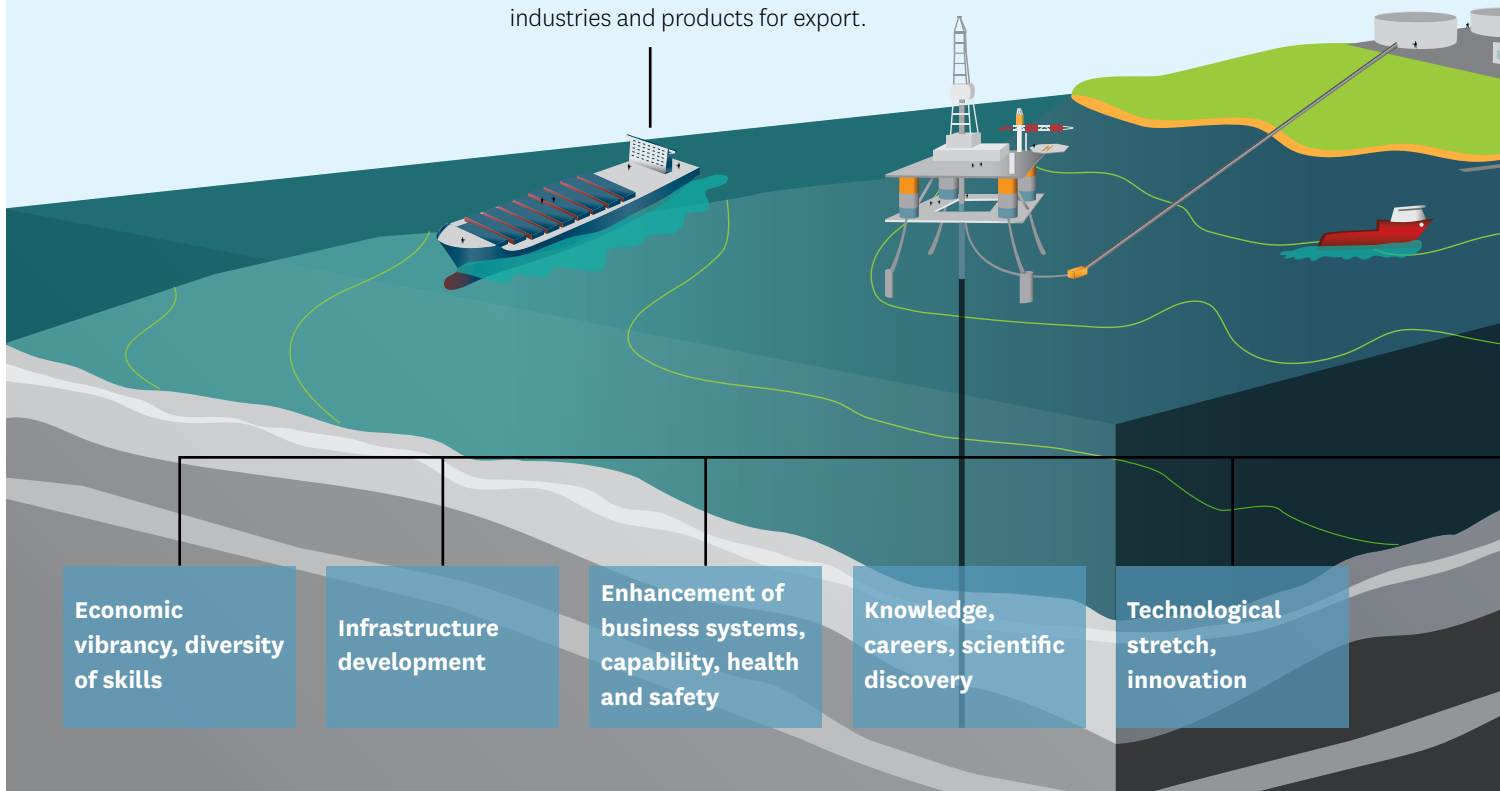
## Exports (direct)

**Oil:** \$1.6 billion

**Methanol:** \$1 billion (estimated)

## Exports (indirect)

**Undetermined:** Natural gas used to underpin energy needs of major industries and products for export.



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But the industry has impacts on the nation that go far beyond the economic and employment figures, providing a range of intangible benefits associated with the presence of a highly technical and capital-intensive industry.

Attracting global businesses, which in turn have brought internationally benchmarked skills and systems and a world-class workforce, have had a substantial impact on the Taranaki region. The results span a heightened health and safety and environmental awareness, strengthened international connectedness and a greater vibrancy and richer social fabric, all facilitating factors in the region's sustained economic growth.

There are also benefits to the nation through the surety of energy supply, primarily through the provision of retail gas supplies through the North Island's reticulated network.

***New Zealand's energy self-sufficiency in 2013 was 83 percent, with oil contributing 33 percent of all primary energy supply, and gas a further 22 percent.***

The value of oil exports in the year to June 2014 was \$1.61 billion. Again there are additional benefits to national growth aspirations through the fostering of a culture of innovation and increasing export diversity to help offset a traditional reliance on primary

production, which accounts for half of all exports by value.

The industry is also contributing to changing perceptions of our nation and region, infrastructure development, business growth and skill transferability, with innovation and knowledge gained in oil and gas being applied to a range of growth sectors. The direct involvement of oil and gas companies in a wide range of community, social and sponsorship scenarios is also having a significant impact on the regions where they operate.

While a greater understanding of the extent of the supply chain has helped shape the revised economic and

**TANGIBLES**

**Total jobs: 11,720\***

**GDP: \$2.79 billion**

**Royalties: \$371 million**

**Company tax: \$300 million (estimated)**

**PAYE: undetermined**

**Exploration and production**

Jobs: 8,481

GDP: \$1.74 billion

**Midstream/downstream processing**

Jobs: 3,237

GDP: \$1.04 billion

**NEW ZEALAND ECONOMIC AND SOCIAL WELLBEING**

- Energy companies and electricity generation
- Businesses and households
- Contribution to and security of New Zealand's energy supply
- Provision of heat, warmth, light, transportation, fuel, production
- 22% of New Zealand's primary energy supply
- 19% of electricity generated

**Business expansion, export development**

**Diversification, leverage**

**Transferability to other sectors, fostering advancement**

**Community investments**

**Potential for economic transformation**

*\*Direct jobs = 5,068, total impact: 11,720*

employment results in this report, it is also an indication of a strengthening role for this supply chain, which largely comprises local content, and the growth of the industry into new areas of New Zealand.

This growth beyond the traditional proving ground of Taranaki has the potential to further increase the value proposition of the industry. While there will be a level of reliance on the capabilities developed over 150 years of industry evolution in Taranaki, there will also be opportunities to establish localised supply chains and service hubs as emerging regions come on stream. All of which will have implications in terms of employment and economic return.

Any new region is encouraged to look closely at Taranaki's experience with the oil and gas industry, though it is important to manage expectations. Oil and gas exploration takes time, and impacts will not occur overnight. While Taranaki's oil infrastructure often sits largely unnoticed in a rural landscape, this may not be the case in other regions, where a range of geological and other physical factors may be vastly different.

While a commercially viable oil discovery beyond Taranaki offers significant potential for delivering an economic game-changer, the future of oil and gas remains uncertain.

The future of the industry can be determined by which one of the possible scenarios plays out over the coming years. Potential outcomes range from a major find – either on or offshore and in varying parts of the country – through to no further finds.

Further complicating the outlook, unconventional plays such as shale oil, coal seam gas or gas hydrates could have a greater role in the future shape of the industry, as could a greater contribution of renewable sources to the overall energy mix – skill transfer into areas such as geothermal are an indication of the growth in this area.

## WHAT IS KNOWN IS THAT THE FUTURE WILL NOT BE MORE OF THE SAME.

Shifting public perceptions, evolving technologies, more challenging exploration locations, and tightening investment decisions will all impact on the shape of New Zealand's oil and gas industry going forward.

Drawing the findings of this report to the logical next steps, there are a number of areas that must be considered by all stakeholders if New Zealand and its present and future generations are to maximise the wealth beneath their feet:

### BLUEPRINT FOR INDUSTRY GROWTH

New Zealand has been successful in attracting inward investment and a blueprint for industry growth will help ensure the returns are maximised for the nation.

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Such a blueprint will seek to amplify the economic production of resources, sustain and promote the supply chain, and build a stronger and more collaborative partnership between government and the industry.

The blueprint will look beyond the current successes to identify, assess and plan for scenarios that could impact on future decades of oil and gas investment and production in New Zealand.

### WHOLE OF GOVERNMENT APPROACH

Realising the full potential of oil and gas requires a whole of government approach that goes beyond departmental priorities and builds a shared understanding of the oil and gas industry and its barriers to growth.

Progress has been made, but needs to be extended across infrastructure, capability development, skill attraction, exporting, energy markets, supply chain growth and retention, environment and technological advancement if the nation is to gain maximum value from its mineral resources and their development.

### STRONGER TIES WITH REGIONS AND REGIONAL DEVELOPMENT

The aspirations and concerns of regional New Zealand can differ from those of central leadership, and there is an opportunity for greater alignment between the two. Developing stronger relationships and a collective vision could enable opportunities, sensitivities and concerns to be considered and strategies evolved. This is important where community expectations may not be adequately met using resource management tools.

### CREATING A WINNING INDUSTRY

While offering an attractive investment prospect is important, the Block Offer process could also actively consider factors such as a potential operator's company values, approach to community engagement, utilisation of local content, deployment of technologies to minimise environmental impacts, and contribution to regional development.

### BUILDING PUBLIC CONFIDENCE

Education, awareness and promotion about how the industry operates, its contribution to economic and social outcomes, and its stringent health, safety and environmental regime can help build public understanding and confidence. Relationships and trust also matter, and there are opportunities to strengthen this aspect. Assurance is needed that response strategies and capabilities are sufficient to offset New Zealand's distance to global resources should things go wrong.

### THE IMPORTANCE OF THE SUPPLY CHAIN

The supply chain must be considered in any definition of the industry, as must the important contribution to employment. While a local content policy is far from a regional panacea, greater understanding of the supply chain and the opportunities to leverage local capability and capacity is still required.

### LEVERAGING INNOVATION

The oil and gas industry is technically advanced, yet innovation within the sector is generally not widely known. Given national aspirations, these successes should be identified, celebrated and more actively fostered. Industry health and safety systems are often leading-edge, and knowledge and processes could add significant value to other sectors, lifting our competitiveness and safety record across the board, and ultimately saving lives.

### FAST TRACKING FUTURE ENERGY

There is opportunity to transfer expertise and capabilities developed in oil and gas to help New Zealanders towards a more progressive energy future. The industry should be viewed as an active enabler and participant in helping the nation reach its future energy aspirations. Progress has already begun, and this should be promoted, encouraged and celebrated.

### BENEFITS TO PRESENT AND FUTURE GENERATIONS

Built over millions of years, New Zealand's oil and gas resource is precious, and its returns should extend beyond redistribution via the Crown accounts. The intergenerational impact of realising the wealth beneath our feet could see more targeted reinvestment into infrastructure, innovation and regional value creation to help ensure the industry delivers its potential value to all New Zealanders – present and future.



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**THE OIL AND GAS INDUSTRY AND ITS SUPPLY CHAIN IS A MAJOR CONTRIBUTOR TO THE NEW ZEALAND ECONOMY. THIS REPORT OFFERS A FRESH PERSPECTIVE ON HOW WE CAN LEVERAGE THE WEALTH BENEATH OUR FEET.**

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EnSCO oil rig

# DEMYSTIFYING THE INDUSTRY

**An introduction to New Zealand's oil and gas industry  
- from exploration to exports.**

**E**nergy is a critical factor in our lives, communities and global economies. It powers production chains, logistics, industry and is embedded in virtually everything we eat, the products we use, our transportation and basic needs such as heat and light. Currently 81.7 percent of global energy consumption comes from fossil fuels: 31.4 percent from oil, 29 percent from coal and 21.3 percent from natural gas.

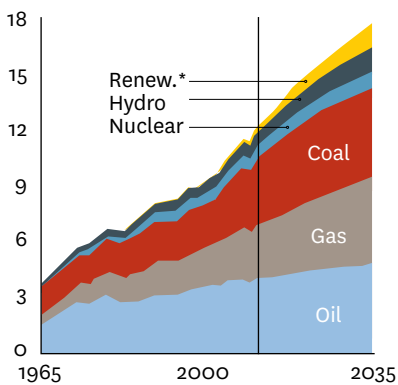
Over the last decade the world's energy needs have increased, and continued population growth and activity in developing economies will require even more energy in the future. To meet this demand the requirement for fuel is anticipated to grow, particularly from renewable sources which are forecast to grow 6.4 percent annually. Amongst fossil fuels, gas demand is projected to grow 1.9 percent per year, while oil and coal are anticipated to decline.

New Zealand is part of this global energy story. Exploration and production significantly contributes to domestic needs and contributes to meeting global demand through responsible export development of our energy resources and expertise. This is underpinned by an energy strategy which considers our nation's economic, social and environmental aspirations.

Despite the importance of energy, widespread understanding of oil and gas exploration, production and processing remains largely focused on the consumer experience 'at the pump' or media reports on oil and gas industry activities. This chapter seeks to demystify the process and foster greater understanding of oil and gas and the industry that surrounds it.

### CONSUMPTION BY FUEL

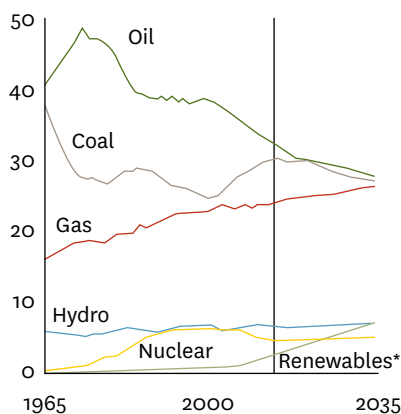
Billion tonne of oil equivalent



\*includes biofuels

Source: BP Energy Outlook 2014

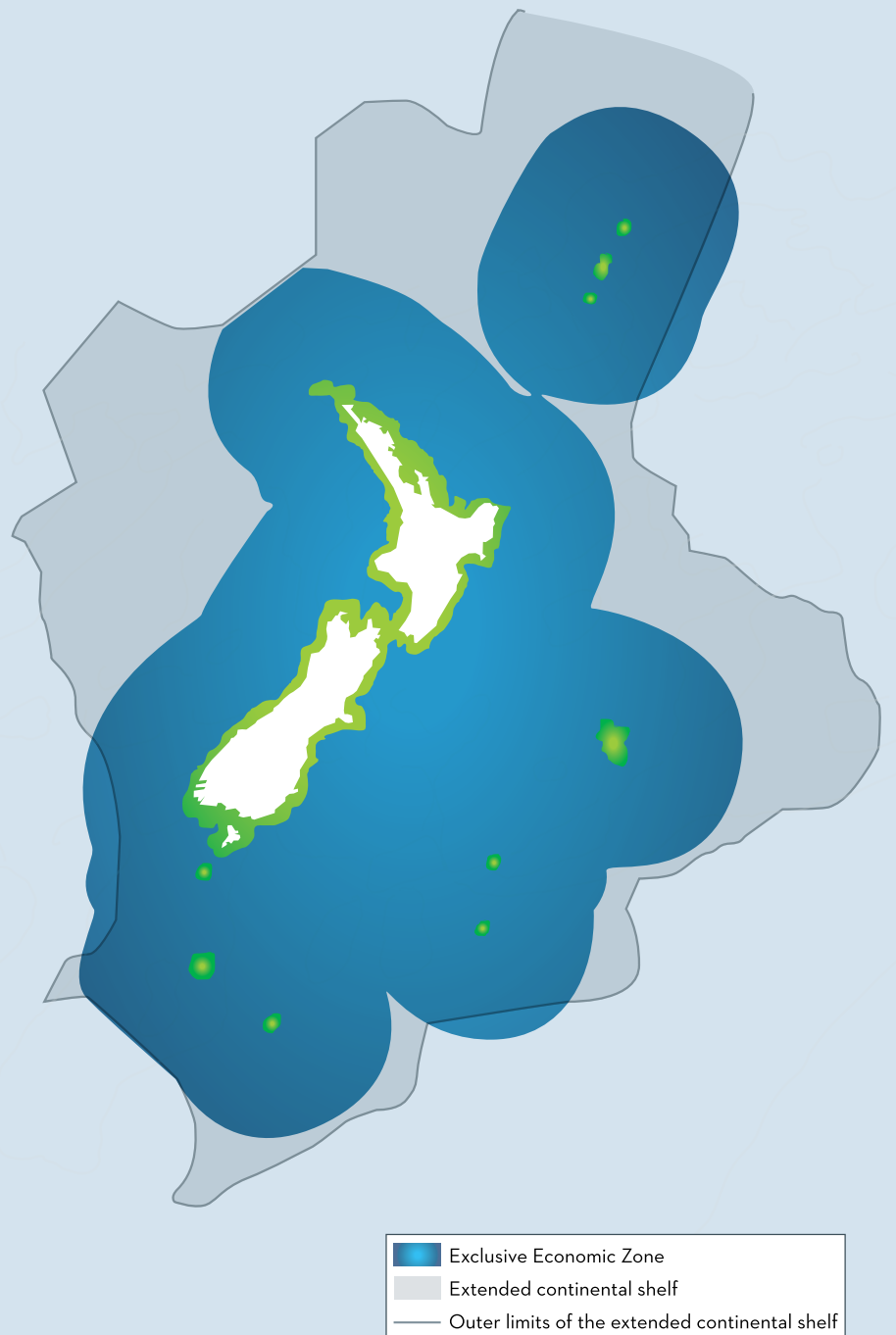
### SHARES OF PRIMARY ENERGY %



\*includes biofuels

A geographically small country, New Zealand's vast economic footprint spans its territorial waters and extended continental shelf. New Zealand has the world's fourth largest Exclusive Economic Zone (EEZ), equivalent to around three-quarters of Australia's land mass. Approximately 96 percent of 'New Zealand' is underwater – a fact that holds significant implications for our economic potential and industries such as oil and gas. New Zealand is resource-rich, yet only fractional amounts of our seafloor have been mapped or examined in detail.

### NEW ZEALAND'S EXCLUSIVE ECONOMIC ZONE AND EXTENDED CONTINENTAL SHELF



New Zealand promotes its oil and gas resource potential to attract exploration companies, whose investment can benefit our country through contribution to our energy supply, export programme, economic development and social wellbeing.

In New Zealand, the Crown holds title to all petroleum resources. New Zealand Petroleum and Minerals, which sits within the Ministry of Business, Innovation and Employment, administers the Crown's interests and drives the policy framework that governs the sector and our energy strategy.

#### **What makes New Zealand attractive for oil and gas exploration?**

- Our oil and gas reserves
- Proactive industry policies
- Ease of doing business
- Political stability
- A skilled workforce
- Solid exploration track record

We are, however, a small nation geographically distanced from the world's major economies. This adds

expense, particularly where exploration requires expensive equipment, such as offshore drilling rigs.

Industry activities are carried out under the Crown Minerals regime in which explorers bid for rights to explore for oil and gas over defined geographic areas. Successful bidders are awarded an exploration permit which is accompanied by a work programme and associated obligations. These must be met within a defined timeframe.

If a discovery is made, the permit holder applies to convert the exploration permit to a mining permit, and following a successful application, proceeds to development and operations and eventually decommissioning and restoration.

Permits are held by exploration and production (E&P) companies, which range from 'juniors' – smaller companies within the oil and gas sector – to 'supermajors' – significant global energy companies – of both New Zealand and international origin.

These companies are supported extensively by the service industry which provides goods, services and expertise to enable the fulfilment of permit obligations.

## **NEW ZEALAND'S PETROLEUM RESOURCES**

By international standards, New Zealand is an under-explored petroleum destination.

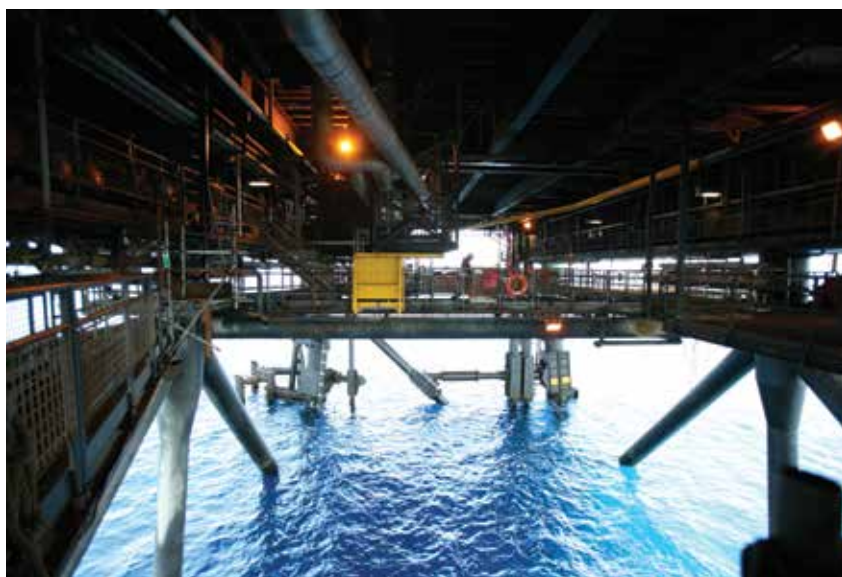
New Zealand's 17 petroleum basins cover two million square kilometres that may contain commercial oil and gas deposits.

### **WHAT IS A BASIN?**

**Sedimentary basins are natural depressions in the earth's surface which, over millions of years, have accumulated deposits of sediments, and are considered good potential for oil and gas exploration.**

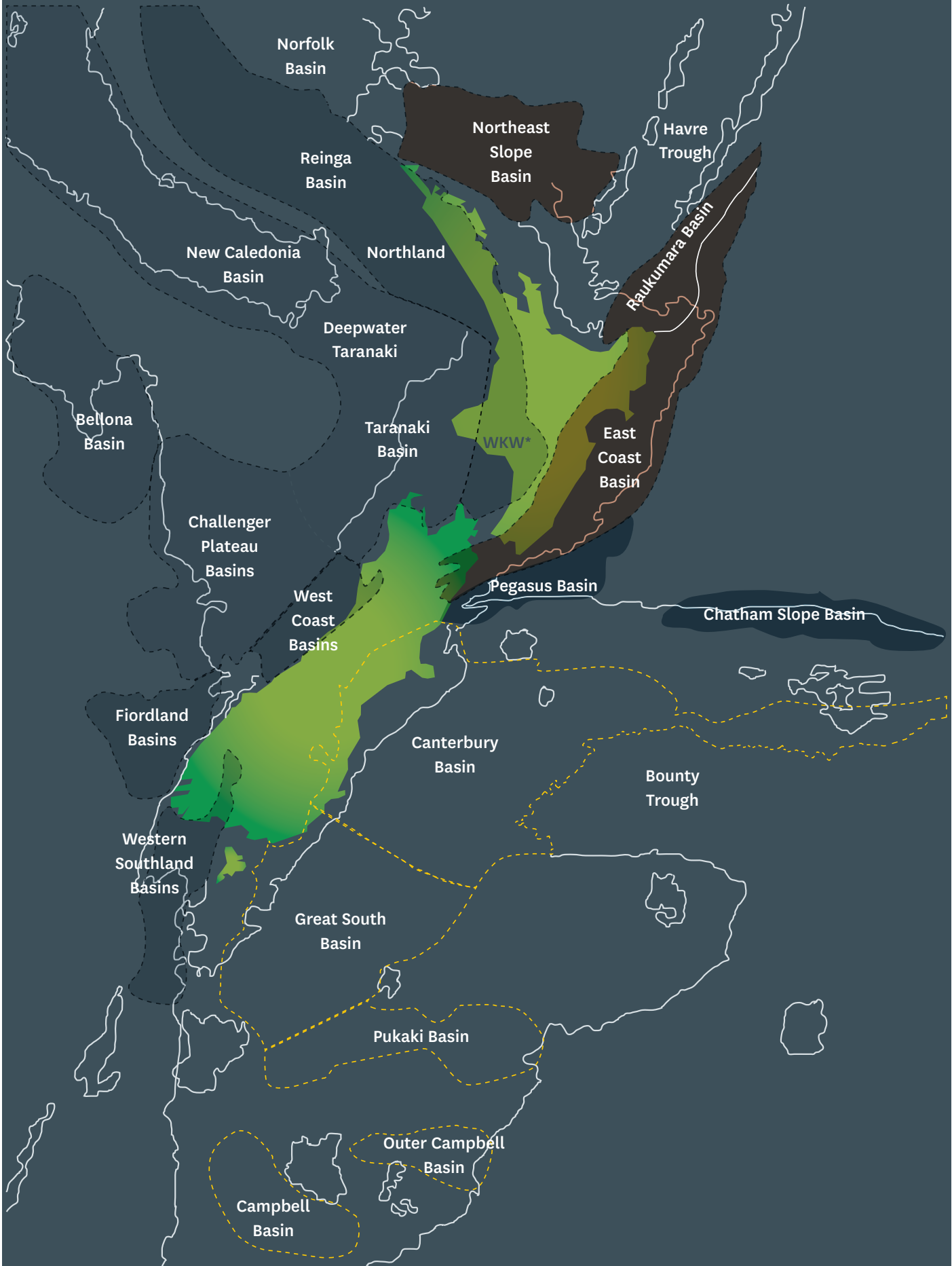
To date, all production in New Zealand has come from the Taranaki Basin. The Great South, Canterbury, Reinga-Northland, and East Coast basins have also attracted recent interest, and several other near and on-shore basins have had a small number of exploratory wells drilled. However these and the far offshore frontier basins remain largely unexplored.

The Taranaki Basin covers an area of 330,000 square kilometres and has an extensive track record of successful discoveries that constitute New Zealand's only commercially producing oil fields. The region serves as the base for most oil and gas exploration companies operating in New Zealand, as well as a specialist support industry. Although more than 400 wells have been drilled in the Taranaki basin since 1950 – spanning both onshore and offshore – it is still considered under-explored compared to similar basins overseas, and is viewed as holding considerable potential for future discoveries.



*Under Maui platform*

# NEW ZEALAND'S PETROLEUM BASINS



\*Waikato, King Country & Whanganui Basins.

## HOW THE INDUSTRY WORKS

The oil and gas industry can be viewed as three sequential components – upstream, midstream and downstream.

Upstream involves the exploration and production (E&P) activities associated with finding oil and gas reserves, and the process of extracting the resource from the ground. In some cases this can extend to specialist processing such as separating the oil and gas into its various components.

Midstream entails storage, further processing, refining and transportation of the oil and gas. Downstream are the end users of the processed oil and gas resource, although the line between midstream and downstream activities is frequently blurred, and is sometimes viewed as a single downstream phase.

## UPSTREAM

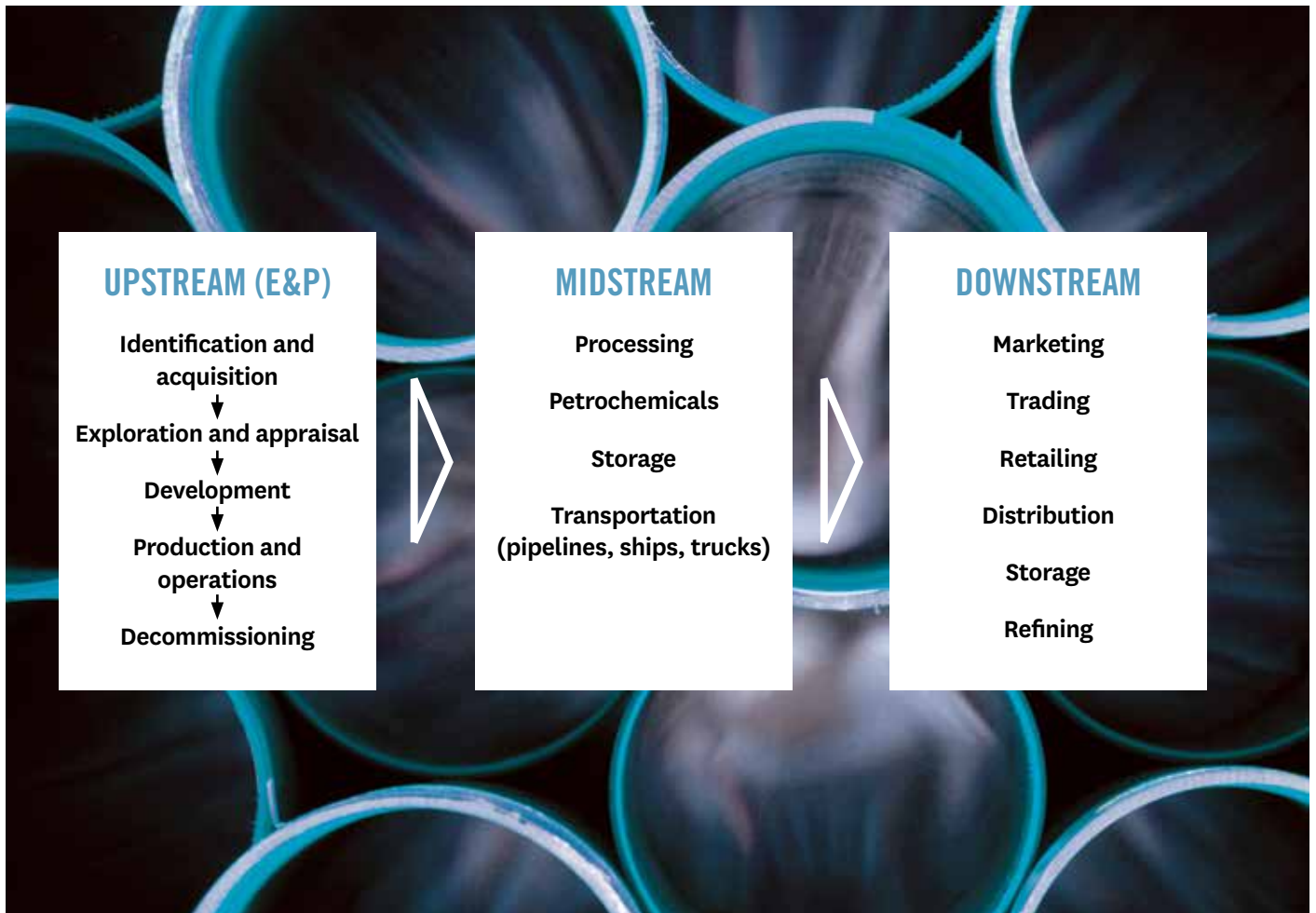
The upstream phase has a series of distinct steps which reflect the lifecycle of oil and gas field development:

- **Identification and acquisition** of oil and gas opportunities including interpretation of data.
- **Exploration and appraisal** where the prospect is examined in greater detail by obtaining physical evidence and confirmation of its potential.
- **Development** whereby if the oil and gas resource is deemed commercial, facilities are constructed to extract, separate, stabilise and store the resulting production.
- **Production and operations** of the facility which enables the crude oil, natural gas, and natural gas liquids to reach the market and generate revenue.

- **Decommissioning** which spans the closure and removal of facilities and restoration of the site once oil or gas is no longer produced.

In the New Zealand industry, the upstream component includes:

- Numerous companies actively exploring throughout New Zealand, although the focus remains on Taranaki.
- Producing fields (currently in Taranaki) with most gas fields also producing oil (condensate and LPG), and oil fields often also producing gas.
- Pre-processing facilities at most fields to separate oil and condensate from raw gas and sediments.
- Gas-gathering pipelines, interlinking to form a transmission network.



## IDENTIFICATION AND ACQUISITION

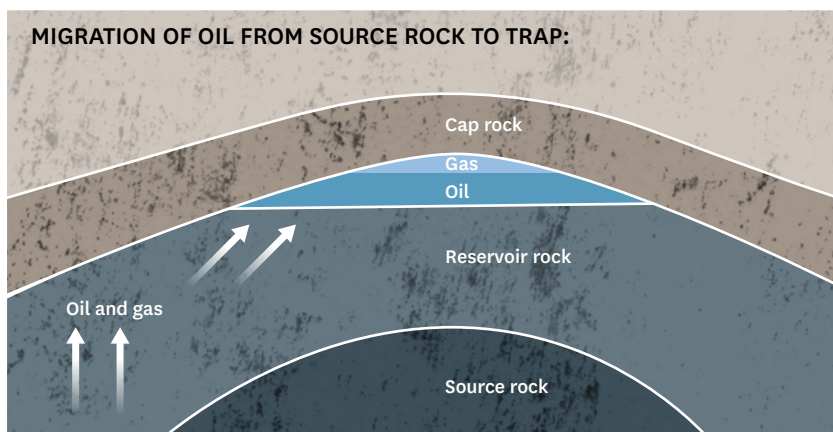
Before commencing any potential exploration activity, the E&P company will engage in an extensive due diligence process which will address strategic, commercial, political, economic and technical aspects of the opportunity. Potential prospects are usually assessed competitively on a global basis and against the company's broader investment portfolio.

A critical aspect of their assessment is prospectivity – an analysis of signs that may indicate a potential hydrocarbon discovery. While prospectivity is centred on the geology of an area and likelihood of an oil and gas discovery, a considerable amount of data, research, interpretation and judgement is engaged in coming to a decision to progress or otherwise.

**Similar to detective work, the early phases of investigation and exploration require geoscientists to look for signs that oil and gas may be present deep beneath the ground in sufficient quantities to be commercially successful.**

Crude oil and natural gas are naturally-occurring substances formed from the accumulation of plant and animal organisms millions of years ago, which have been compressed in source rock thousands of metres beneath the surface. This organic matter subsequently breaks down to form hydrocarbons within the rocks when the right combination of pressure and temperature is reached. The mobile oil and gas migrates upwards through porous rocks and faults until stopped by an impermeable layer, or cap. Accumulations of oil and gas build up, contained within a reservoir trap and a rock seal.

Explorers will look for these petroleum systems which may indicate the presence of oil and gas. Within a global search, exploration companies will gather initial data about a country's geology, history and track records of discovery when considering investment options. An explorer's 'play' will typically



Source: *Oil – an Introduction For New Zealanders (2008)*, MED, by Ralph D. Samuelson

focus on a specific region where zones with a favourable geology occur. They will look for 'leads' which are areas of potential interest within plays, then gather data to assess whether potential traps of oil and gas may be present, which in turn leads into 'prospects'.

In New Zealand the Crown, as the owner of the resource, has embarked on a process of promoting opportunities by building a comprehensive library of data and information which is made available to potential explorers. On the basis of this acquired data the Government will define exploration areas which are then put to competitive tender in an annual Block Offer process, which includes the prepared data packages to encourage bidders.

Interested explorers will embark on their own technical and commercial due diligence as part of the tender process, including any legal work to establish appropriate agreements where there is more than one participant in the tender. Tenders are generally awarded on the basis of the company's proposed work programme and its capability to meet statutory, health and safety, and environmental requirements plus technical ability.

## EXPLORATION AND APPRAISAL

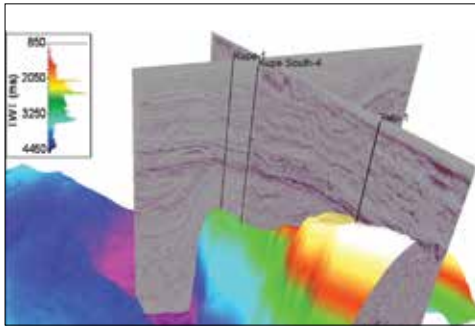
If awarded a prospecting or exploration permit, the E&P company will then seek to develop a more comprehensive picture of what lies beneath the ground.

In addition to gathering and interpreting geophysical data, seismic surveys can be undertaken which utilise the reflection of sound waves to identify layers of rock and build a picture of the underground formations. A series of sensors, called geophones, is used to pick up reflected pulses, either on the ground in onshore surveys, or towed behind boats offshore.

Recent technological advancements in seismic surveying have given rise to complex 3D mapping, and more recently time-lapse '4D' results which provide insights over the course of a field's life.



Helicopter Seismic Drilling Rig



**CLOCKWISE FROM BOTTOM LEFT:** Drilling operation, seismic modelling, Kan Tan IV loadout.



14

This data is then processed and interpreted by geoscientists, who ascertain rock properties and the possible presence of hydrocarbons. This process will likely also draw on other data such as rock samples, previous well results, and any other information about the geology of the region, but the only way to truly know what lies beneath is to drill a well.

The drilling process entails going through the cap rock and into the reservoir to physically acquire 'down hole' data that provides a more definitive understanding of potential reservoir sands, evidence of hydrocarbons, and petrophysical properties. The drilling process provides continuous rock and fluid samples which are analysed by a geologist.

Drilling in a new area is usually referred to as a 'wildcat'. If significant quantities of oil and/or gas are found then it is termed a 'discovery'. If nothing substantial is found, then this is called a 'dry hole' which is usually plugged and abandoned.

Drilling is an expensive undertaking that requires extensive and sophisticated equipment and skilled people. Sometimes numerous wells may be required to fully scope the size and scale of a discovery, and this is still no

guarantee of a commercially viable hydrocarbon presence.

Prior to commencing a drilling operation the exploration company will undertake a pre-drilling evaluation of the operational risks, including environmental, geological and financial considerations, as well as a comprehensive site survey of both surface and subsurface conditions. This will identify any critical factors that need to be considered in the drill programme, and inform the necessary consents required to meet environmental, regulatory or other conditions.

This stage will involve careful consideration of aspects such as drill location, trajectory, site preparation, infrastructure, access roads, the disposal area for drill cuttings and mud, and storage, safety and security systems. Once all conditions are met, a drilling company will then be brought in and the drilling rig set up.

Offshore drilling operations will generally utilise a Mobile Offshore Drilling Unit (MODU) to drill the initial well. Rigs or drill ships vary greatly depending on factors such as cost and availability, water depth, transportation requirements, or depth of target zone. A 'jack up' has long legs that can sit on the sea bed with the rig sitting at a pre-determined height above the

water, while a semi-submersible rig can operate in slightly deeper waters and is more easily moveable. A drill ship comprises a drilling rig that works from the top of a specialist ship, and can operate in deep water.

Starting an exploration well is called 'spudding' and commences with a starter hole which is shallower and wider than its subsequent extensions. This is followed by insertion of sections of steel 'casing' pipe, which are slightly smaller than the initial borehole and are then back-filled with cement. The casing provides strength to the borehole and is an important safety device that can respond to and isolate any high pressure zones encountered in the drilling process. Casing also protects underground aquifers from being contaminated by oil and gas, by isolating the well bore. The casing process continues as the well is drilled deeper, with progressive insertions of smaller casing units and additional cement.

During the drilling phase drilling fluid or 'mud' is pumped down the well to contain any pressurised gas or liquids, cool and lubricate the drill bit, and lift rock fragments back to the surface. The rock samples are assessed by a 'mud logger' (geologist) as the drill moves deeper, identifying the rock layers the drill is passing through.



Once target depth is reached, a series of wireline logging tools are used and fluid, oil and gas samples may be collected to help determine viability.

When the drilling process has finished, the well can be sealed (suspended) while the results are analysed. Appraisal wells are drilled to reduce uncertainty on the potential extent of the discovery including confirming rock properties, where the oil/water or gas/water contact boundaries sit, and the physical structure of the reservoir itself.

Drilling additional wells incurs further cost, however greater investment in this phase can help clarify the risks and opportunities associated with the potential discovery and inform the strategy concerning how to maximise profitability.

If the well and its drilling operation is considered a success, then it is 'completed.' Additional production tubing is added to the casing and these are perforated to create a pathway for oil and gas to flow to the surface. A series of valves are added to the top of the well to control the flow, known as a 'Christmas tree.'

### HIGH FINANCIAL RISK BUT POTENTIALLY HIGH REWARD

Exploration activity carries a high level of financial risk, despite advances in geological modelling and prediction. It costs many millions of dollars to investigate and drill a well, and even more to develop it, yet on average only one in ten exploration wells are considered a commercial success.

As a result, exploration companies are often global companies with a business portfolio that enables them to spread financial risk across multiple territories, countries and stages of development. The rewards of those wells they deem

successful must generate returns not only to justify the costs of the current development, but accommodate the costs of those that were unsuccessful.

There remains limited ability to predict whether a discovery will be oil or gas, and while companies generally target oil prospects as opposed to gas – oil is more valuable and sold on global markets – natural gas has accounted for over 70 percent of New Zealand reserves discovered to date, and most finds reflect a mixture of both oil and gas.

### MANAGING EXPECTATIONS

Determining a commercial success involves a complex analysis of scientific, geological, technical, financial, infrastructural and institutional considerations, by a multitude of skill sets.

Even when oil and gas is found, the quantities and the costs of developing

the field may not meet the threshold of commercial viability.

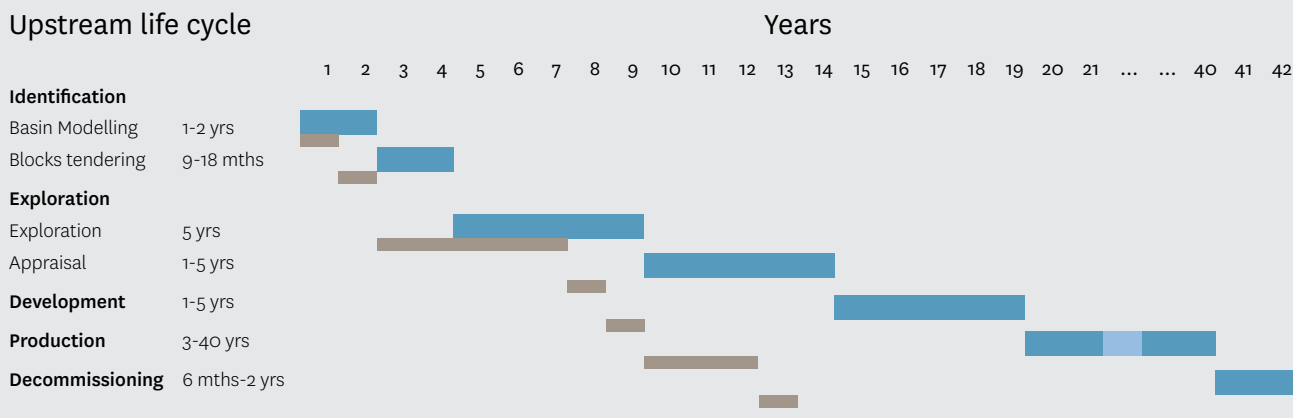
A field not considered viable at one point in time may be revisited as technological, infrastructural or customer factors change.

In some cases, where the cost of drilling is not justified by the potential reward, exploration permits may be surrendered before a well is even drilled.

### HOW LONG DOES IT TAKE?

Oil and gas exploration and development is a long term process. The time from securing a permit, to drilling and making a decision concerning whether or not to develop a field can take many years. An overview of an upstream life cycle is shown below, providing a typical range for a successful field over the life of the process.

#### Upstream life cycle



Source: Arête

## DEVELOPMENT

Once the size and scale of the discovery is known, then facilities are required to enable the resource to be extracted, separated, stabilised and stored i.e. the construction of pipelines and a production station. The next step is a comprehensive field development plan, based on a production profile informed by the technical and commercial analysis, which will determine what facilities are required at the site, and the number and phasing of further wells to be drilled.

Common activities during this phase include; technical specifications being defined, consents and regulatory approvals being secured, facility designs drawn up, contracts let for the fabrication and construction, and the resulting facilities being prepared for the operational phase.

The development phase can run for several years, especially in complex large-scale developments, and is usually accompanied by intensive work activity, employment and contractor opportunities and economic benefits. The outcome is a completed and fully operational facility.

## PRODUCTION, OPERATION AND MAINTENANCE

The production phase commences with the first commercial quantities of hydrocarbons flowing through the well head – referred to as bringing the facility ‘on line’. Once producing, a field can begin to generate revenue, offsetting the high up-front cost of development. Explorers and associated investment partners will pay a share of this financial return to the Crown in the form of royalties as well as payroll taxes and taxes on profit.

**THE DEVELOPMENT PHASE CAN RUN FOR SEVERAL YEARS, ESPECIALLY IN COMPLEX LARGE-SCALE DEVELOPMENTS, AND IS USUALLY ACCOMPANIED BY INTENSIVE WORK ACTIVITY.**

Once oil and gas is extracted from a field, it will generally be piped to a production station where the raw product can be cleaned, separated into its components, and processed into a more stable and appropriate state to reach customers and markets.

New Zealand production stations vary in size, structure and configuration, though facility construction usually comprises an intensive period of activity and this can have a strong impact on economic benefits and employment. Once the facility is built this activity will end, but all require ongoing operation and maintenance which can necessitate ‘shutdowns’ or ‘turnarounds’ when the facility is shut down for a period to enable comprehensive maintenance work, plant modifications and statutory inspections.

To extend the production life of a field, wells may be ‘worked over,’ a process by which problems in the well bore are fixed to enhance flows, or techniques such as enhanced recovery may be employed to access further hydrocarbons.

## DECOMMISSIONING

Should the economics of the project shift into negative territory, wells and surface facilities can be decommissioned, effectively ending their commercial life. The only facility to be recently decommissioned in New Zealand was the Maui floating production, storage and offloading facility (FPSO) in 1997.

A number of onshore and offshore fields in Taranaki may reach end-of-life in the coming decades, which will result in their decommissioning, although continued advances in extraction technologies have the potential to extend the lifespan of production facilities.

Although decommissioning signals the end of commercial returns from a facility, the activities involved in undertaking decommissioning can lead to significant work for supply chain companies, generating economic returns for the region.

## TARANAKI O&G FIELDS

### PRODUCING FIELDS INCLUDE:

#### Off shore:

- Maui (gas condensate)
- Tui (oil)
- Pohokura (gas condensate)
- Maari-Manaia (oil)
- Kupe (gas condensate)

#### Onshore:

- Kapuni (gas condensate)
- McKee (oil and gas)
- Waihapa Ngaere (oil and gas)
- Kaimiro (oil and gas)
- Kowhai (gas condensate)
- Onaero
- Mangahewa (gas condensate)
- Ngatoro (oil, gas and condensate)
- Rimu/Kauri/Manutahi (oil, gas and condensate)
- Cheal (oil)
- Copper-Moki (oil and gas)
- Turangi (gas condensate)
- Sidewinder (gas condensate)
- Puka (oil and condensate)

### NEW ZEALAND’S OIL AND GAS PRODUCTION STATIONS INCLUDE:

- Production Station (Opunake)
- Pohokura (Waitara)
- McKee-Mangahewa (Tikorangi)
- Kupe Production Station (Manaia)
- Cheal Production Station (Stratford)
- Sidewinder Production Station (Inglewood)
- Turangi Production Facility (Tikorangi)
- Kowhai Production Station (Tikorangi)
- Kaimiro Production Facility (Inglewood)
- Rimu Production station (South Taranaki)
- Waihapa Production Station (Stratford)
- Kapuni Production Station (South Taranaki)
- Copper-Moki (Stratford)





## RAROA – THE RETURN

New Zealand's largest producing oil field, Maari, sits 80km off the South Taranaki coast. Discovered in 1983, Maari was developed 22-years later when OMV NZ became the major investor in the field, and later its operator after their development proposal navigated the complex subsurface challenges to enable production.

When production began in 2009 it drove a number of technological achievements, such as the world's tallest-self-installing wellhead platform, the longest well drilled in New Zealand and the world's largest casing with a drilling application.

At its offshore location, oil is produced from six wells which are linked to a normally unmanned wellhead platform before being piped to the floating production and storage vessel (FPSO) Raroa, anchored 1.5km away. The Raroa's production facilities are capable of processing 40,000 barrels of oil daily.

Maari provides employment across two areas. More than 110 full-time staff and contractors are required for routine field operation – the day-to-day running of the Maari facilities. This includes maintaining the offshore installations, supply boat, warehousing facilities and operation, and support teams in both New Plymouth and Wellington.

In addition to the routine operation, the field generates project-related employment which can stimulate a surge in expertise and personnel requirements over limited periods. One such project was upgrade and repair work to the Raroa, undertaken in 2013. This required the removal of all oil on board, disconnection from the wellhead and towing of the vessel to Nelson for refurbishment and upgrade of its process equipment. Of particular note was the replacement of the 45-tonne swivel, which enables the vessel to rotate around its mooring.

This project also presented an opportunity to undertake maintenance work at the field, such as the replacement of mooring lines, which required a specialist team and vessel.

In total the three-week project utilised more than 60,000 man-hours, with up to 250 people a day, predominantly from Nelson and Taranaki – brought in to return the Raroa to operating capacity.

**IN TOTAL THE 3-WEEK PROJECT UTILISED MORE THAN 60,000 MAN-HOURS, WITH UP TO 250 PEOPLE A DAY – PREDOMINANTLY FROM NELSON AND TARANAKI – BROUGHT IN TO RETURN THE RAROA TO OPERATING CAPACITY.**



**TOP:** Raroa leaving Port Nelson after the refit.

**MIDDLE:** Fully refurbished Raroa back in the field.

**BOTTOM:** Overview of the Maari Field (showing subsea infrastructure, WHP, FPSO, offtake tanker and support vessel).



is used to support nearby gas-fired peaker electricity generation plants as well as injecting gas into the Vector transmission network to meet supply and demand fluctuations.

Most Taranaki production facilities enable the preliminary separation of the produced fluids into fractions of oil, gas, water and sediment, to meet wholesale markets and allow a more stable and safely transported product. Where onsite production facilities do not yield marketable products, specialist facilities have been developed, such as those at the Kapuni Gas Treatment Plant, Oaonui Production Station, and the McKee Production Station. They are able to extract high value oil and liquid fractions such as natural gas liquids (NGL) and liquefied petroleum gas (LPG), which is used in New Zealand as a vehicle fuel, for heating, cooking and, of course, firing the Kiwi barbecue.

New Zealand's natural gas is also used as a non-energy component in the manufacture of a number of products for domestic and export markets. South Taranaki's Ballance Agri-nutrients manufactures ammonia and then urea from natural gas, for use domestically as farm fertiliser and feedstock, and to make urea formaldehyde resin used in the building industry. Methanex NZ is one of the world's largest methanol producers, and converts natural gas to methanol at its North Taranaki plants, before exporting through Port Taranaki to the global commodity market. In this sense Methanex is an important participant in the New Zealand gas market as it provides an outlet for gas that is excess to domestic market requirements, as well as providing a value-added export product from our natural gas supply.

Methanol from Methanex is also piped to AICA New Zealand, a specialist resin manufacturing plant in New Plymouth. The firm established in the region to take advantage of the availability of methanol and urea which it uses in the manufacture of specialist formaldehyde-based resins for wood products such as plywood and laminate.

## MIDSTREAM

The midstream part of the industry comprises the refining of raw crude oil and natural gas into marketable products, and their transmission to those markets.

Whereas our natural gas is used or processed domestically, our oil is predominantly exported, as its high quality attracts good prices on the international market.

### GAS

Within New Zealand, our natural gas is used in the following ways:

- Electricity generation
- The industrial sector
- The residential sector
- The commercial sector
- As a feedstock in the petrochemical sector (non-energy use)

After being piped and processed via the production stations, gas from New Zealand's fields can feed into a

major gas network and pipeline system, to be used by consumers to heat homes, meet business energy needs and support electricity generation.

New Zealand has two main gas transmission networks – the Vector network and the Maui pipeline. The Maui gas pipeline spans 313km from the Maui production station to the Genesis Energy power station at Huntly, Contact Energy power stations at Otahuhu and Stratford, and the Southdown cogeneration plant, which together add over 2,100 MW to the nation's electricity capacity. Prior to the discovery of Maui and Kapuni, and the subsequent development of the pipeline infrastructure, coal played a more prominent role in underpinning electricity generation. Vector owns and operates the other transmission pipeline network, around 2,300km in length, which carries gas to major load centres around the North Island, with offtake and connection points to cities and towns.

It is possible to store gas in depleted gas fields, as is the case in the Ahuroa field near Stratford. The stored gas



LEFT TO RIGHT: Methanex (rear) and the Pohokura Production Station (foreground), Rarua facilities

Midstream gas activities include:

- Gas processing facilities to ensure gas meets pipeline specifications for transmission. This may include separation of liquids into condensate, NGL or LPG and removal of various impurities such as nitrogen, CO<sub>2</sub> or sulphur.
- Gas transmission networks linking Taranaki fields to markets, comprising the Vector network linking urban centres throughout the North Island, and the high-capacity Maui pipeline between Taranaki and the Waikato.
- Wholesale and industrial users such as electricity generators and petrochemical plants.
- Import-export links, including methanol exports, LPG imports and exports to balance supply/demand variances, and urea to meet 40 percent of domestic demand.

**OIL**

While New Zealand’s natural gas production is sold largely domestically, our oil outputs are predominantly exported. Oil from New Zealand’s onshore fields is transported either by pipeline or road-based tanker to storage and export facilities at Port Taranaki.

Offshore, oil from the Tui and Maari fields is collected directly from floating production storage and offloading (FPSO) vessels via tanker then exported directly to international markets. At other offshore fields, such as Kupe and Pohokura, product is collected by unmanned platforms then transported via sea-floor pipeline to shore for further processing.

Although New Zealand has a refinery, located at Marsden Point, Whangarei, very little domestic oil is processed there or consumed in New Zealand, largely due to the high quality of New Zealand’s oil deposits, and the high return it can command on the international market. Only 4 PetaJoules (PJ) of domestically-produced oil was utilised in New Zealand in 2012, and only 2 percent of the oil processed at Marsden Point came from domestic sources. The majority of oil sold in New Zealand is imported from the Middle East and South East Asia.

Midstream oil activities include:

- Pipeline and road transport infrastructure from source to storage near Port Taranaki.
- Export from Port Taranaki principally to Australasian refineries.
- Transportation of processed products to storage centres nationwide via ship, pipeline or direct imports.

**DOWNSTREAM**

The downstream oil and gas industry covers the marketing, trading and local distribution of petroleum products to end users. Its delineation from upstream is usually defined at its point of sale, such as the fiscal meter for gas sales, weighbridge for LPG, or the tanker loading arm for condensate and oil.

Downstream activities include:

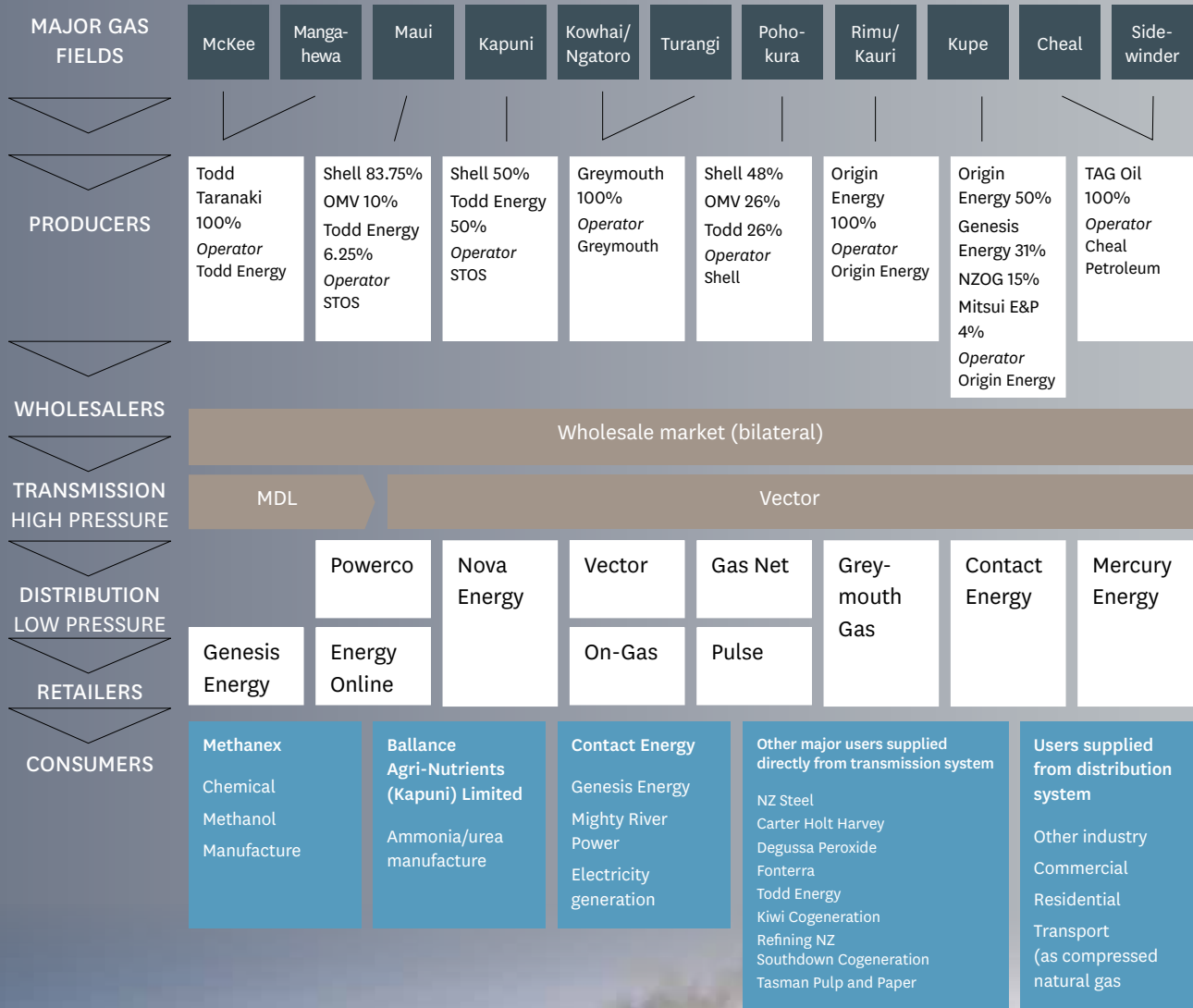
- Gas trading, marketing and retailing.
- Oil product marketing and trading.
- Local distribution by truck.
- Storage and retailing.
- Refining/processing of imported crude oil products, largely from the Middle East and Asia, at Marsden Point refinery.

The types of companies involved include oil refineries, petroleum product distributors, retail outlets and natural gas distributors.



Storage tanks at Port Taranaki

**NATURAL GAS INDUSTRY SUMMARY 2014**



Source: MBIE; Rockpoint; Arete



# REGULATORY FRAMEWORK

**A look at the comprehensive regulatory landscape surrounding the industry.**

*Kan Tan IV*

**T**he oil and gas industry is regulated, with legislation, policies and procedures to ensure the value of

New Zealand's petroleum resource is maximised whilst having safeguards to protect our natural environment and the health and safety of our workforce and public.

## WHO CAN EXPLORE IN NEW ZEALAND, WHERE THEY EXPLORE AND THEIR WORK PROGRAMME

The New Zealand Government owns all of the nation's petroleum resources and grants permits for exploration and production rights in return for royalties on production. The methodology and timeframe for the issuing of permits is regulated by New Zealand Petroleum and Minerals.

The Crown Minerals Act 1991 sets out the legislative framework for prospecting, exploration and mining of Crown-owned minerals for the benefit of New Zealand. The Act establishes the rights to search for and produce petroleum, the effective management and regulation of those rights, and the financial return for the Crown.

Operator's activities are also governed by a range of other laws and regulations, depending on the activities they undertake. The regulators involved may include the Environmental Protection Authority, Worksafe NZ, Maritime NZ, the Department of Conservation, and local and regional councils.

### BLOCK OFFERS AND PETROLEUM PERMITS

New Zealand Petroleum and Minerals (NZP&M), within the Ministry of Business, Innovation and Employment, is responsible for allocating and managing permits for oil and gas activity. It is not possible to undertake activity without a permit, nor is it allowed to breach the conditions of a permit.

Petroleum exploration permits are allocated through an annual 'Block Offer' which involves the government



specifying which areas will be released for new exploration permits. Block Offers call for bids from operators which describe the work programme they propose to undertake in an area. NZP&M assess a bidder's financial and technical capability. A high level assessment of their ability to meet health, safety and environmental requirements is also undertaken. The assessment process ensures the 'winning' bids represent the greatest potential return to the Crown, and gives assurance that the operators will be able to undertake the work safely and responsibly.

Exploration permits in New Zealand can be granted for up to 15 years, but are generally awarded for shorter periods onshore. If a permit holder establishes that commercially recoverable quantities of petroleum exist within the permit area they may then apply for a mining permit, which provides the right to produce and sell petroleum and obliges the holder to pay a royalty to the Crown based on those sales. A production permit may be for up to 40 years.

NZP&M monitor permit holders to ensure they are fulfilling the work programme agreed in the awarded permit.

### LAND UNAVAILABLE FOR PERMITTING

Significant portions of New Zealand are unavailable for permitting of any kind. By law, there are large tracts of land with high conservation value and some of importance to Māori over which no petroleum activity may take place. Land automatically excluded from Block Offers is listed under Schedule 4 of the Crown Minerals Act. This includes National Parks and Marine Reserves. Before releasing Block Offers for tender, NZP&M also consult with affected iwi, hapū and local authorities to identify important areas that are not already protected by legislation.

### ACCESS TO LAND

An onshore exploration or mining permit does not give the holder automatic access to the land within the permitted block – this must be negotiated with the landholder. Much of New Zealand's



*Helicopter on Maui A*

existing oil and gas production activity is on private land, and it is usual for a contract between the land owner and the exploration and production company to set a payment to the owner and specify any conditions regarding the oil company's activities, such as operating times, spatial limitations and restoration. In the case of conservation land, an operator must negotiate a land access arrangement with the Department of Conservation. These arrangements can be used to mitigate any potential environmental impacts.

### ROYALTIES

Any company producing and selling oil and gas in New Zealand is required to pay a royalty to the government, calculated as either five per cent of net sales revenue or 20 percent of accounting profit – whichever is higher. This ensures the government receives a revenue stream throughout the life of an operation.

Gas discoveries made before 1 January 1986 must also pay the Energy and Resources Levy of \$0.45 per GigaJoules (GJ) produced. It is paid by the field owners of Kapuni, Maui and McKee and currently represents a small portion of government revenue.

A 2012 review of petroleum royalties determined that current levels balance fair financial return for the government with a positive level of investment attraction, and that while New Zealand royalties are lower than many other jurisdictions, this reflects the distance to global markets, limited infrastructure and low level of understanding of our oil and gas resources.

### HEALTH AND SAFETY

Oil and gas exploration and production involves complex engineering activities in a wide range of settings. Operators must ensure a safe working environment for their workforce and comply with strict health and safety regulations.

A dedicated High Hazards Unit has been formed within WorkSafe NZ which focuses on industries such as the oil and gas industry, geothermal and mineral mining, to ensure operators are effectively managing health and safety and minimising the risk of major incidents at their sites.

In 2013 new requirements to manage workplace safety in onshore and offshore operations were passed into law and saw a strengthening of the management of hazards and safeguards associated with drilling, with a focus on well integrity.

Before any operator can commence work such as drilling a well, they must prepare a safety case which ensures hazards are identified, defines how they will be controlled, and outlines the responsible procedures that will underpin the management of the well throughout its lifecycle. Before commencing any work, the safety case must be approved by WorkSafe NZ who will also monitor its implementation, including the receipt of independent examinations of well sites and procedures.

### ENVIRONMENTAL MANAGEMENT

The oil and gas industry operates under strict controls to avoid and manage potential environmental damage.

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**DISTRICT COUNCIL  
CONSENTS FOCUS ON  
ACTIVITIES UNDER THE  
DISTRICT PLAN SUCH  
AS THE EFFECT OF THE  
ACTIVITY ON TRAFFIC  
GENERATION, NOISE AND  
LIGHT/ILLUMINATION AND  
ENVIRONMENTAL RISKS.**

**ACTIVITIES ON LAND AND OUT  
TO 12 NAUTICAL MILES (NM)**

The environmental effects of onshore and nearshore oil and gas exploration and production are managed by regional and district councils under the Resource Management Act (RMA). Controls are set through council plans, and through conditions in resource consents.

Regional councils regulate discharges to land, air or water and regulate the taking and use of surface and ground water. In relation to O&G activities, consents may include discharge permits for well testing and production flaring, stormwater and waste water disposal, produced water disposal, drilling waste disposal and enhanced production methods that may present a risk to ground water resources (such as hydraulic fracturing).

District council consents focus on activities under the District Plan such as the effect of the activity on traffic generation, noise and light/illumination and environmental risks from hazardous substances or processes. They may also require consent for activities such as pipeline construction that occur near registered archaeological features or sites of significance to Māori.

District Council's also have responsibilities relating to managing soil contamination that may affect human health. This can involve clearance processes where discharges to land have occurred and are being returned to farming and other sensitive uses.

**HANDLING HAZARDOUS  
SUBSTANCES**

The Hazardous Substances and New Organisms Act 1996 (HSNO Act), which controls the use and handling of hazardous substances within the territorial sea, spans oil and gas production as well as some substances used in the production process, such as lubricants, acids, solvents, drilling chemicals, or spill dispersants. Controls on the handling of hazardous substances, are imposed by the Environmental Protection Authority (EPA), and span containment, transport,

storage, labelling, disposal and certification of certain sites, equipment and people.

**BEYOND 12 NM IN NEW  
ZEALAND'S OFFSHORE WATERS**

The Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act) came into force on 28 June 2013 and promotes the sustainable management of the natural resources in the EEZ and Continental Shelf – the area of New Zealand's economic jurisdiction beyond 12 nautical miles from the coast.

Under the EEZ Act, the Environmental Protection Authority (EPA) is responsible for regulating the effects of certain restricted activities on the environment and existing interests in this area. The EPA assesses applications for marine consents from organisations such as oil and gas companies against criteria which relate to environmental effects, impacts on existing activities, and economic benefits, before an application is granted or refused. Some activities that operators are seeking to carry out are described as permitted activities in the EEZ regulations. Permitted activities do not need a marine consent from the EPA but the regulations set out a number of conditions that operators have to meet. The EPA monitors compliance with the EEZ Act and any conditions on marine consents and has the power to undertake enforcement action.

Applications for marine consents are considered on a case-by-case basis by a decision-making committee of suitably qualified experts appointed by the EPA Board. Applications will be publicly notified unless the EEZ regulations specifically state that an activity will be non-notified. Currently the only activities that are non-notified are those associated with exploratory drilling for petroleum. Notified applications are publicly notified and the views of the public and people with existing interests are taken into account during the application process. Therefore the process includes additional stages such as publicly notifying the application,



*If any mammals are detected within a prescribed mitigation zone all activity stops until they leave the area.*

providing the opportunity for people to make submissions and a public hearing at which people can speak directly to the decision-making committee.

The standard timeframe for a decision on a notified marine consent application is 140 working days (six months) and for a non-notified application it is 60 working days. The EPA recommends that anyone considering applying for a marine consent enters into a pre-lodgement process with the EPA. This is an opportunity to understand the consent application processes relevant to the proposed activity. The pre-lodgement process is intended to lead to a more timely and effective process once the application is lodged. The EPA is required to take all reasonable steps to recover the costs incurred in carrying out its work.

### **OIL SPILL PREVENTION, PREPAREDNESS AND RESPONSE, AND DISCHARGE MANAGEMENT**

Operators must have plans in place covering how they will manage waste and operational discharges of harmful substances and how they will respond to leaks or spills that may stem from their work activities. Operators must also develop and gain approval for their contingency plans in the unlikely event of a well blow out. The oil spill contingency plan relates to any and all spills and includes content on stopping the flow of oil and how they will clean up.

Some of the responsibilities in Discharge Management Plans (DMPs) that are held by Maritime NZ are expected to be transferred in 2015 to the EPA. However, the approval of the oil spill response elements of the DMP will remain with Maritime NZ.

Maritime NZ is responsible for maintaining New Zealand's oil spill response capability and preparedness and assumes lead agency responsibility for any major national oil spill event.

### **MINIMISING DISTURBANCE TO MARINE MAMMALS**

The Department of Conservation (DOC) and the Petroleum Exploration & Production Association of New Zealand (PEPANZ) have developed guidelines for minimising disturbance to marine mammals from seismic surveying.

The guidelines require operators to submit a Marine Mammal Impact Assessment (MMIA) to DOC and to have independent, qualified observers on board, watching and listening for mammals. If any mammals are detected within a prescribed mitigation zone all activity stops until they leave the area. These guidelines must be followed for seismic surveying to be a "permitted" activity under the EEZ legislation. They have been voluntarily adopted by the majority of operators for use in New Zealand's territorial waters (within the 12 nautical mile limit) and over the extended continental shelf beyond the EEZ.

## **COMMUNITY AND IWI ENGAGEMENT**

Oil and gas operations can continue for decades and will feature periods of intensive activity that may have impacts – both positive and negative – on the community. For this reason, ongoing and effective engagement with communities is critically important. The industry is highly technical in nature, and is often poorly understood, so engagement allows knowledge to be shared.

Individual operators choose the extent to which they engage with their local community, but experience in Taranaki has found that early attention to relationship building prior to embarking on consent processes is essential. Engagement should include iwi, schools, the local councils and owners and occupiers near likely wellsites. Economic Development Agencies and Chambers of Commerce may be able to assist with opportunities and contacts.















The government recognises the role of affected iwi and hapū as kaitiaki and NZP&M consults with them as part of the permitting process.

Permit holders are encouraged to engage with communities through the life of an operation, and must report to NZP&M annually on any engagement with iwi and hapū. The reporting aims to encourage permit holders to engage in a positive and constructive manner, and allows the government to monitor the status of local relationships.














# WHO DOES WHAT IN NEW ZEALAND'S EXPLORATION AND PRODUCTION

HOW GOVERNMENT AGENCIES AND COUNCILS MANAGE OIL AND GAS EXPLORATION AND PRODUCTION IN NEW ZEALAND.

## ONSHORE

Up to 4 years	Up to 15 years	Up to 40 years	
<b>ASSESSMENT</b>	<b>EXPLORATION</b>	<b>PRODUCTION</b>	<b>DECOMMISSIONING</b>
Prospecting Permits	Exploration Permits	Mining Permits	Resource Consent
			[Regional and/or District Councils]
Resource Consent (seismic surveying)	Resource Consent (incl. seismic surveying)	Resource Consent	Safety case / notification
[Regional and/or District Councils]	[Regional and/or District Councils]	[Regional and/or District Councils]	
Land access on public conservation land	Resource Consent applications for nationally significant proposals	Resource Consent applications for nationally significant proposals	Land access on public conservation land
			
	Safety case	Safety case / notification	
			
	Land access on public conservation land	Land access on public conservation land	
			
	Hazardous substances	Hazardous substances	
			
	Land access on other Crown-owned land		
	[Relevant Crown agency]		

**OFFSHORE**

2 to 4 years*	5-10 years*	Around 40 years*	
<b>ASSESSMENT</b>	<b>EXPLORATION</b>	<b>PRODUCTION</b>	<b>DECOMMISSIONING</b>
Prospecting Permits	Exploration Permits	Mining Permits	Resource Consents (Territorial Sea)
			[Regional Council]
Seismic Surveying	Resource Consents (Territorial Sea)	Resource Consents (Territorial Sea)	Marine Consents (EEZ & Continental Shelf)
	[Regional Council]	[Regional Council]	
	Marine Consents (EEZ & Continental Shelf)	Marine Consents (EEZ & Continental Shelf)	Safety case
			
	Discharge Management Plan	Discharge Management Plan	
			
	Safety Case	Safety Case	
			
	Seismic Surveying		
			

\*indicative timeframes only

# MĀORI AND THE OIL AND GAS INDUSTRY

What does oil and gas mean for Māori? Dion Tuuta offers a perspective.

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*Dion Tuuta (Ngāti Mutunga, Ngāti Tama) is chief executive of Parininihi ki Waitōtara Incorporated. He has had extensive experience in the Māori sector and held management positions at Crown Forestry Rental Trust and Te Puni Kōkiri.*

**T**angata whenua are a key stakeholder within the oil and gas sector due to their unique status as confirmed by the Treaty of Waitangi and their ancestral relationship with the wider environment within which oil and gas exploration take place.

## CONNECTION TO LAND AND IDENTITY

Taranaki Māori identity is intimately tied to the land and environment. This relationship is personalised to the extent where Māori identify themselves in relation to key environmental features including the mountains and waterways.

While the confiscations of the 19th century impacted upon Taranaki Māori land ownership, the cultural relationship with the environment remains such that Māori continue to view themselves as kaitiaki of the environment irrespective of ownership. This powerful position of Māori continuing to hold kaitiaki responsibility to the environment is a key factor in considering Māori attitudes to the oil and gas sector or any industry affecting the environment.

## GENERAL PERCEPTIONS

There is no single definitive Taranaki Māori view on the oil and gas industry but there are a number of general observations and themes which might be made regarding Māori responses to oil and gas which can be categorised into four broad and overarching positions.<sup>1</sup>

The first sits within the context of oil and gas as a Treaty-based discussion on the ownership of the underlying resource. Most tribal groups maintain a view that the Treaty of Waitangi guarantees Māori rights to control their taonga – including natural resources such as oil and gas. While the Crown asserts the right to manage these resources on behalf of all New Zealanders this is not necessarily a position shared by Iwi and various

Taranaki Iwi have prosecuted claims against the Crown to the Waitangi Tribunal seeking ownership of the resource. The Crown remains resolute in its view that oil and gas is a national asset to be managed on behalf of all New Zealand.

A second position regards oil and gas as an environmental issue which demands that the traditional relationship with the environment be protected at all costs. This position sees the development of oil and gas resources for economic gain to be detrimental to the environment and effectively non-Māori in worldview.

A third general position accepts oil and gas as presenting a potential economic potential provided that environmental risks can be managed and protections guaranteed. While a case can often be made for the potential economic opportunities for Māori in the oil and gas sector this requires an understanding of the risk and opportunities involved and a willingness to participate, potentially at the risk of exposure to criticism that it is seeking economic profit at the expense of Papatuanuku. Examples of Taranaki Māori appetite to explore this opportunity include Ngati Ruanui

taking a small investment in New Zealand Energy Corp and Otaraoa hapū beginning a catering business to provide services to Todd Energy and provide employment for their people.

A fourth perspective might be expressed as those who feel they lack sufficient information to make an informed choice and therefore refuse to articulate a clear policy position.

As a general proposition most Māori responses to oil and gas are likely to sit somewhere along this general continuum of views.

## COLLECTIVE AND INDIVIDUAL VIEWS

The expression of Māori collective views on oil and gas is generally conveyed through mandated tribal governance entities, modern iterations of which have evolved as a response to the Treaty settlement process. The majority of these formal representative structures are less than 20 years old but have inherited the responsibility of managing a wide range of tribal activities including economic and social development as well as cultural revitalisation.

### NEW ZEALAND 2013 CENSUS DATA\* (EMPLOYMENT)

*Māori comprise 12.5% of upstream oil and gas industry employment based on their responses in the 2013 Census. 15% of total Census respondents identified with being Māori.*

	MĀORI	TOTAL NZ	%
Oil and Gas Extraction	69	780	8.8
Petroleum Exploration	36	261	13.8
Other Mining Support Services**	135	882	15.3
<b>Total</b>	<b>240</b>	<b>1923</b>	<b>12.5</b>

*\* Census industry employment data varies from total industry employment data in this report due to more defined scope and different methodology – however it is used to provide useful insight on Māori employment within the O&G industry. \*\*This may include mining minerals as well.*

<sup>1</sup> These themes have been articulated in *Māori and Mining (2013)*. Otago University: A collaborative research project between the Departments of Geology, Geography, Law, Management, Te Tumu – School of Māori, Pacific and Indigenous Studies, Division of Research and Enterprise and Centre for Sustainability.

The leadership of modern tribal entities is predominantly drawn from the registered tribal membership through election processes. Tribal entities have taken on responsibility for articulating the tribal view of environmental issues in response to various pieces of legislation including the Resource Management Act, Crown Minerals Act and the Petroleum Act.

Tribal policy positions are informed by the quality of information its leadership has access to and their ability to interpret the information and form a judgment. Tribal leadership's responses to oil and gas will also be directly affected by their own personal views of the industry and their particular interpretation of the balance between economic and environmental concerns and their interpretation of what this means within a modern tikanga Māori context.

Current attitudes to the oil and gas and energy sector in Taranaki can be contrasted with those of Māori located in the Central North Island who have developed their geothermal resources for energy production. While geothermal resources are more sustainable than oil and gas – and a direct comparison is therefore not strictly appropriate – the key principle is one of Māori exercising tino rangatiratanga over their resources to improve opportunities for their people subject to ensuring the environment is protected.

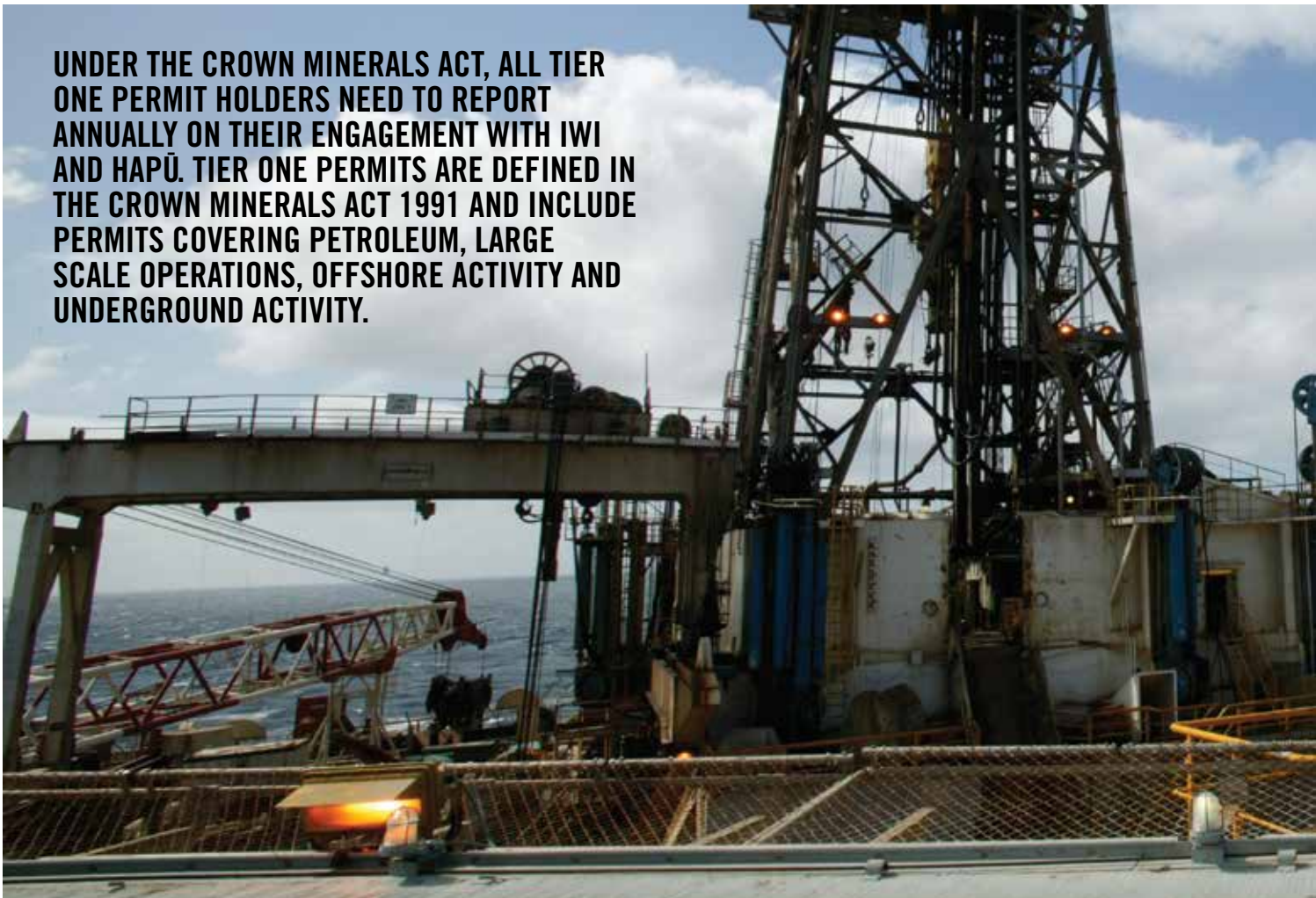
An important difference in Central North Island Māori participation in the geothermal sector is their ownership of the land where the resource is located. This is denied to the majority of Taranaki Māori tribal groups by virtue of the historical land confiscations depriving

them of land ownership and therefore control over the areas where exploration takes place.

It is important to note that while Iwi entities may express a particular policy position, hapū sub-groupings and non-tribal Māori organisations and land owners may take a different view depending on a range of factors. One such factor might include the quality of local level engagement with companies which seek to operate within their specific area of interest and whether this derives local benefit.

Also while tribal collectives may express a particular collective position individual Māori (including members of those same tribal groups) are free to express their own view which may sometimes be in direct contrast to the wider group.

**UNDER THE CROWN MINERALS ACT, ALL TIER ONE PERMIT HOLDERS NEED TO REPORT ANNUALLY ON THEIR ENGAGEMENT WITH IWI AND HAPŪ. TIER ONE PERMITS ARE DEFINED IN THE CROWN MINERALS ACT 1991 AND INCLUDE PERMITS COVERING PETROLEUM, LARGE SCALE OPERATIONS, OFFSHORE ACTIVITY AND UNDERGROUND ACTIVITY.**





Many Taranaki Māori individuals are actively involved in the oil and gas sector as employees of oil and gas companies or business owners servicing the wider industry in their own right.

*Māori collective perceptions and reactions to the industry may evolve over time based on a number of factors including the views of its elected leadership and their growing understanding of the sector as well as the quality of relationships between Māori and oil and gas sector representatives.*

*This may evolve as tribal groups consider whether to seek economic opportunity within the sector but will continue to be underpinned by ongoing concern regarding industry impact upon the environment.*

## BEST PRACTICE GUIDELINES FOR ENGAGEMENT WITH MĀORI

Te Runanga o Ngāti Ruanui Trust have developed a useful document containing guidance, tools and a voluntary approach which could assist industry to effectively engage with iwi in the ongoing development of petroleum and minerals within New Zealand. The document may also be helpful to iwi and other Māori groups in their engagement with industry.

Te Runanga o Ngāti Ruanui Trust is the mandated iwi of Ngāti Ruanui, which is predominantly located within Central and South Taranaki and has acquired experience and knowledge of the petroleum and mineral industry.



# EVOLUTION OF AN INDUSTRY

**New Zealand's oil and gas industry began almost 150 years ago.**

**N**ew Zealand has a long history of oil and gas exploration. In 1886 a well adjacent to the Moturoa oil seeps, near New Plymouth, spurred a nascent oil industry, with sporadic production and refining of oil under the Peak Petrol brand until the 1950s.

Traces of oil were found in Gisborne in 1866, though drilling attempts suffered from equipment and financial constraints. Oil was also reportedly discovered in the South Island near Greymouth in 1896 by railway workers, with small wells said to have been drilled in 1902 and 1910, with little success.

Modern exploration was heralded by Shell in the 1950s. New technologies such as seismic profiling and deep rotary drilling resulted in the discovery of the Kapuni gas-condensate field in onshore Taranaki in 1959. The government considered the Kapuni gas reserves, then assessed at 350PJ, sufficient to invest in the North Island gas transmission network, and to foster natural gas reticulation within connected urban centres.

Seismic imaging advancements for offshore exploration resulted in the discovery of the giant 4,000PJ Maui gas-condensate field in 1969. This find, combined with the first oil

crisis in the 1970's, spawned 'Think Big' projects to create new markets for gas and reduce dependence on oil imports.

From 1985 to 2005, low global oil prices and abundant cheap Maui gas reduced anxiety over the price and supply of oil, and further served to discourage exploration, resulting in a period of reserve depletion.

Since 2003 rising oil prices, incentives to find and develop gas reserves, and proactive government energy and natural resource policies have reinvigorated exploration activities, with material increases in drilling activity.

## FIELD DEVELOPMENT

While exploration is generally focused on finding oil, most discoveries contain a mix of oil and gas. A global market for oil always exists – albeit as a price taker – so production can be optimised by geological and engineering rather than market factors. New Zealand's premium 'sweet light' crudes tend to find a ready export market, mainly with Australian refineries. Gas production, however, is captive to New Zealand's domestic market, whose small size can impact on our nation's

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**LEFT TO RIGHT:** construction of the gas-to-gasoline plant at Motunui, early 1980s





overall attractiveness as an oil and gas exploration location.

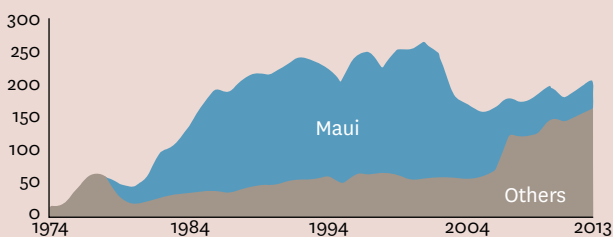
During the Maui years (1979 to 2003), there was no unmet market need, with the Maui contract setting a low base price. Accordingly, several gas fields were produced to strip out marketable liquids such as condensate and LPG and surplus gas was either flared or re-injected for later recovery, as at Kapuni.

More commonly, gas discoveries can remain undeveloped until price rises support commercial viability, such as Mangahewa – discovered in 1960, redrilled in 1997, and in production from 1998, Kupe – discovered in 1986 and producing from 2009, and Pohokura discovered in 2000, and producing from 2006.

Production rates are often dictated by gas market requirements rather than field performance. Beyond the influence of the Maui contract a gas market has emerged that is driven by multiple suppliers meeting the demand of wholesale buyers. Price and delivery terms are set through bilateral contracts on both term and spot rates.

Two recent turning points in the domestic gas market can be observed. The first was the drilling of New Zealand’s first exploration well specifically targeting gas – Mangahewa-2 – in 1997. This was followed in 2000 with the drilling of Pohokura-1, a major gas-condensate discovery on the adjacent structure. The second factor was the redetermination of the Maui field reserves, which reduced the remaining contracted gas reserves and promoted the realisation that gas supply was diminishing. This saw curtailment of gas supplies to Methanex beyond 2003, and contributed to the large decline in gas production.

#### ANNUAL GROSS GAS PRODUCTION BY FIELD (PJ)



Source: [www.med.govt.nz/sectors-industries/energy/energy-modelling/data/gas](http://www.med.govt.nz/sectors-industries/energy/energy-modelling/data/gas)

## THINK BIG AND METHANEX

**M**ethanex New Zealand is the nation’s only methanol manufacturer, and operates two facilities in Taranaki at Motunui and the Waitara Valley. Methanol is a clear liquid hydrocarbon produced primarily from natural gas. It is rich in hydrogen, water soluble and readily bio-degradable, and used in the manufacture of a variety of everyday products such as paint, DVDs, polyester and nylon in carpets and furniture. Methanol is also being increasingly used in clean-tech products, such as bio-diesel.

Methanex plays an important role by providing oil and gas producers with a local market for their indigenous gas, and as such contributes to the overall investment attractiveness of the New Zealand market.

Taranaki’s methanol plants had their beginnings in the late 1970’s and early 1980’s when the government, under Prime Minister Robert Muldoon, initiated the interventionist state economic strategy Think Big. In the face of a global oil crisis, the substantial natural gas reserves off the Taranaki coast were seen as a means of making New Zealand more self-sufficient in transport fuels.

Think Big projects included the development of a methanol plant at Waitara and a synthetic-petrol plant at Motunui. During construction over 2000 workers were employed, and production peaks saw more than 400 employees on site. However, making synthetic petrol proved uneconomic when the crude oil price dropped, and Motunui was subsequently sold to Fletcher Challenge who later on-sold it to Canadian-headquartered Methanex. The company constructed distillation units at the facility, shifting output from synthetic petrol to methanol production.

Redetermination of the Maui gas reserves in 2003 curtailed gas supplies, which saw the closure of the Motunui plant in 2004 and remaining operations focusing on the Waitara Valley plant. In 2008, a three-year supply contract was secured which prompted the refurbishment and recommissioning of one of the two production units at Motunui but led to the mothballing of Waitara Valley.

In 2010, on the back of buoyant global methanol demand, Methanex signalled a desire to refurbish Motunui-1 to minimise disruption caused by code-of-compliance inspections.

Recent successful gas developments, coupled with a supportive government approach, have given Methanex new confidence in their New Zealand operations. They now have sufficient gas supply to operate the Motunui plant at full capacity, reopened the Waitara Valley plant in 2013, and have a positive future outlook based on methanol’s potential in a carbon-constrained world.



Taranaki's first major modern development, Kapuni

## EMERGENCE OF LOCAL CAPABILITY

The discovery, development and operation of the Kapuni and Maui fields heralded the development of considerable expertise in Taranaki. Oil major Royal Dutch Shell (Shell) has been a primary driver of this process since becoming active in New Zealand in 1955 as part of the Shell Todd Oil Services joint venture (STOS – previously Shell BP

Todd). Shell brought a combination of internal technical capability and working knowledge of international industry practices and standards, which has had a significant and positive impact on Taranaki.

Shell's continued presence as an operating company has provided a valuable opportunity for local service industries to build capability. This has been supplemented by a succession of other major global companies

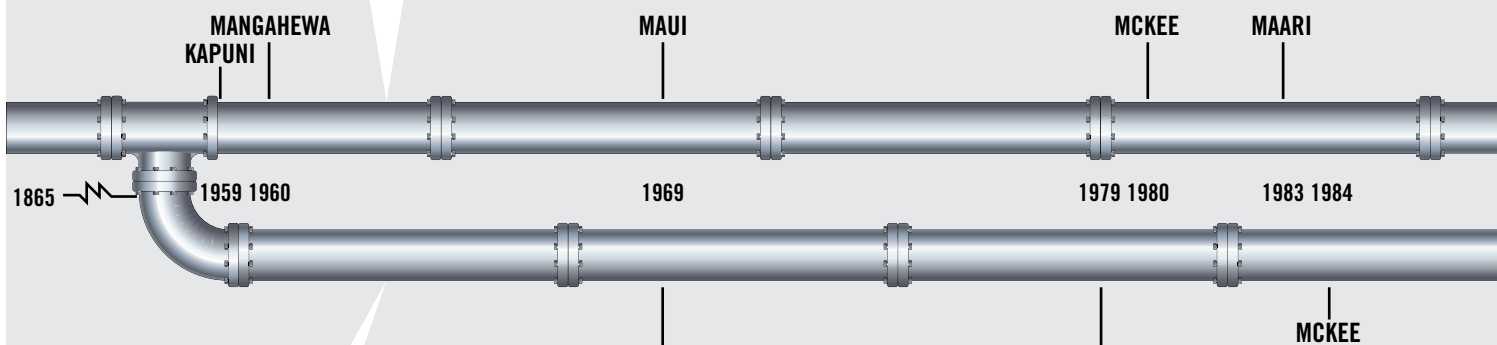
participating in the New Zealand industry at both up and mid-stream levels.

The global oil and gas industry demands high standards in construction and operations, reflecting the need to handle flammable and corrosive materials under high temperatures and pressures.

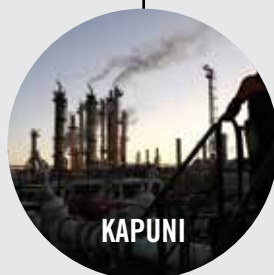
Taranaki's present-day oil and gas industry is built on this experience and global best practice. The region's systems, knowledge, capability, workforce and relationships have evolved over the years, as local companies work alongside the international operators, and now present a mature and highly regarded industry base.

The emergence of oil and gas in a region traditionally driven by dairy production has had local implications for the likes of district planning and regulatory and public interfaces, which have been progressively refined.

## MAJOR FIELD DISCOVERIES



## MAJOR FIELD COMMISSIONING



## RECENT EXPANSION AND DEVELOPMENT

The New Zealand oil and gas industry has arguably come of age. The government's Petroleum Action Plan has led to heightened departmental capacity and capability engaged in facilitating investment, legislative and regulatory reviews, greater provision of technical and seismic data, and proactive promotion of investment opportunities. These outcomes have attracted exploration attention, with increasing investment in the industry and new entrants entering the market.

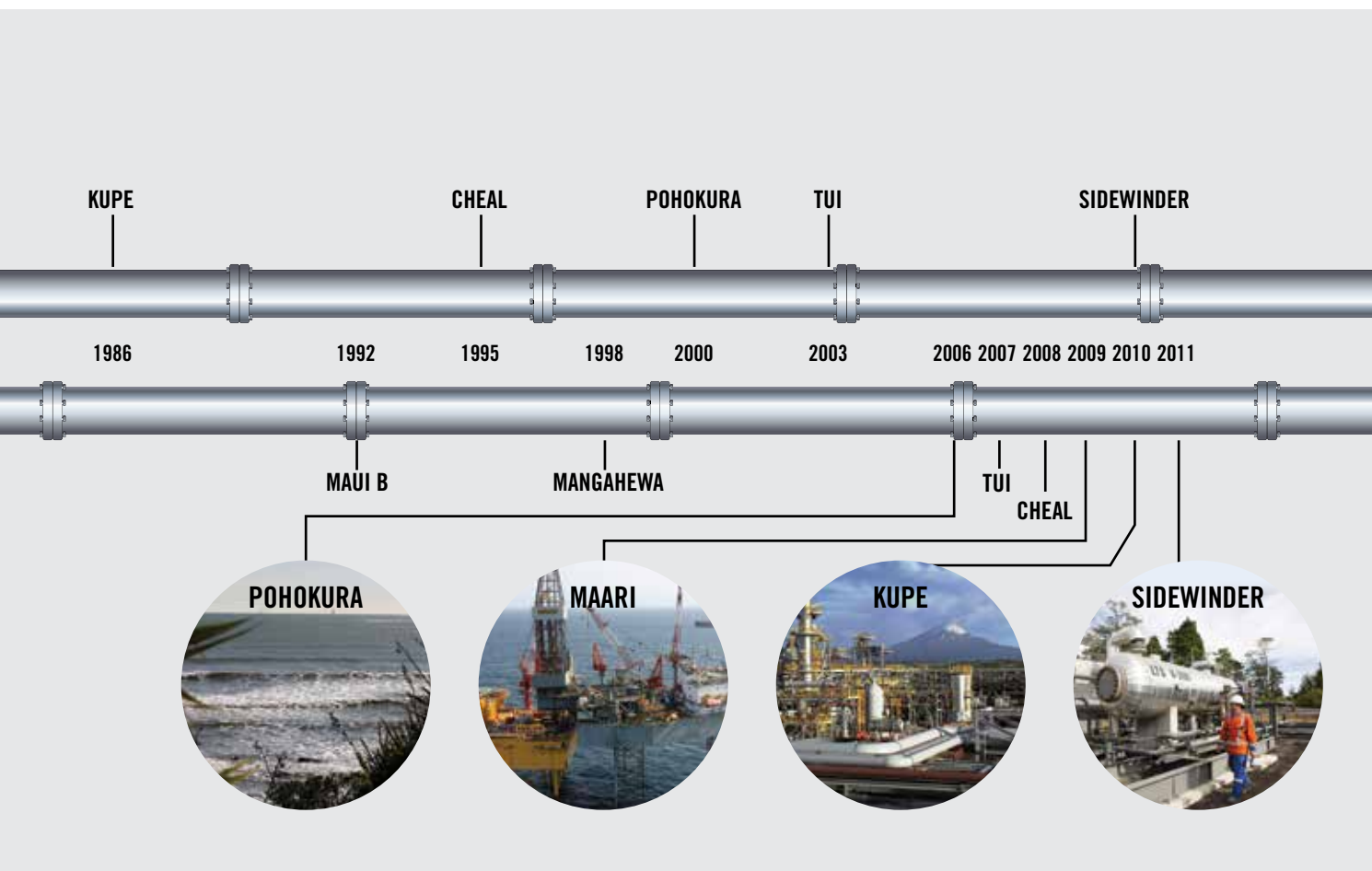
Taranaki has continued to build its reputation as New Zealand's prime energy locality and while there have been no major discoveries in recent years, considerable investment in drilling and appraisal continues, along with extensive development to leverage existing fields.

This activity is paying off. The recent revision of gas reserves – upwards by 31 percent to their highest level in thirteen years – and capital works including the new Mangahewa Expansion Train (MET-2), highlight the Taranaki region still holds great potential. With a government campaign to look beyond Taranaki and into new basins, backed by a continued programme of promotional, legislative and regulatory refinements and the annual Block Offer, New Zealand offers a diversity of investment propositions. As a result, new players have arrived in New Zealand – spanning juniors to multinationals – bringing depth to the current exploration and investment composition.

The local supply chain is increasingly involved in new exploration and development work both in Taranaki and around New Zealand, and has evolved specialist expertise to become globally competitive within and beyond the domestic market.

Underpinning the continued expansion of the New Zealand oil and gas industry has been technological advancements, either locally developed or brought in to New Zealand with significant investment, and spanning the industry value and supply chain – from initial investigatory work, to seismic surveys and analysis, drilling techniques, systems, processes, transportation, storage, infrastructure and production facilities.

Big technology game-changers have arguably been the introduction of more flexible drilling trajectories such as horizontal drilling, the greater shift towards deepwater drilling, and the utilisation of hydraulic fracturing ('fracking'), all of which can realise reserves previously considered to be uneconomic or inaccessible. These changes have helped catalyse interest in New Zealand's emerging regions, unconventional plays and frontier deepwater basins, and have already had a significant role in realising gas potential in onshore Taranaki.



Industry advancements have driven a need for legislation, regulations, systems and infrastructure to keep pace with the changing landscape. Government initiatives include new legislation relating to oil and gas activity in the EEZ, a strengthened health and safety regime and the establishment of Work Safe New Zealand, and greater levels of regional and community engagement around oil and gas.

Lessons learned over Taranaki's 150-year relationship with the industry are being shared, acknowledging differences in geology, local capabilities, communities and district planning frameworks. Questions, discussions and aspirations are being considered around what the industry could offer emerging regions – both in terms of risks and rewards.

## PUBLIC AND ENVIRONMENTAL AWARENESS

The context within which the oil and gas industry operates has experienced considerable change in recent years. Where once it operated largely beneath the radar, the industry now functions under heightened public attention where investment and activities concerning fossil fuels are being increasingly questioned, as is the integration with New Zealand's 'clean green' image.

This has been driven in part by concerns surrounding the risks and potential environmental impacts of exploration and oil spills due to disasters such as the Deepwater Horizon and Montara oil spills and the grounding of MV Rena. It has also stemmed from global attention on perceived risks associated with the utilisation of technologies such as hydraulic fracturing and practices such as land farming.

The possibility and potential of climate change is being actively debated and there is a global shift towards policies that seek to reduce CO2 emissions as well as aspirations towards greater investment and use of renewable energy.

# INDUSTRY ADVANCEMENTS, TECHNOLOGY, PEOPLE, COMMUNITY & ENVIRONMENT



The drillers' cabin and the Archer drilling rig.



## ARCHER RIG

**'Hands on' drilling is becoming increasingly sophisticated, 'clean' and remotely operated.**

The hands-free Archer rig was used in the major offshore drilling campaign undertaken by STOS to investigate the potential of the mature Māui gas field. Māui was the second largest field of its kind in the world when it was first discovered in 1969.

The Archer Rig's use on Māui A was the first time a fully automated drilling operation had been used in

New Zealand, and application of its technology offshore was a world first.

In addition to being 'hands-free' in its drilling operations, the Archer Rig also had a shore-based remote monitoring system which enabled technical experts in the STOS office in New Plymouth and global specialists in Germany, who were familiar with the equipment, to observe and monitor the functioning of the rig and its drilling parameters, such as hookload, gas, pit levels and geological data.

These advancements in offshore drilling enhance safety.

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## QUIET IN EVERY SENSE OF THE WORD

**As oil and gas activity intensifies, and the broader range of impacts are being increasingly considered and assessed, it is becoming more and more important to define success in terms beyond geology and engineering.**

Todd Energy's new Bentec Model Euro Rig 450t drilling rig ('Big Ben') is not only quieter than traditional rigs, but it has also been painted in a customised colour scheme to soften its visual impact on the local environment. The 'visual quiet' challenge was handed to the creative expertise of Massey University, who were charged with finding a colour solution that would enable the rig to blend more with its surrounding landscape.

In addition to its noise reduction and aesthetic advancements, the rig can also 'walk'. When drilling has completed in one location, Big Ben can 'move' a few hundred metres to its next locality, reducing the need to disassemble and reassemble the rig, which has a positive impact on both efficiencies and also environmental disturbance and footprint.



Energyworkers constructing new pipeline with minimal negative environmental impact.

## ENVIRONMENT RECOGNISED IN DAILY OPERATIONS

The catalyst that prompted engineering company Energyworks to gain ISO14001 Environmental Management certification was the decision to lead with excellence and drive business performance as well as external factors such as exceeding client and industry expectations. Gaining environmental certification – an addition to an already extensive suite of accreditation tools – now gives the company triple certification across their key business performance areas in quality, health and safety and environmental operations.

The ISO 14000 standard addresses various aspects of environmental management and provides practical tools for companies and organisations

looking to identify and control their impact and continually improve their performance in this area. The certification is independently audited.

Attaining certification is an endorsement that Energyworks has the operating systems, policies, procedures and documentation that support the ability to sustain responsible environmental performance. It highlights to the company, its employees and clients that the environmental impacts of their activities are being managed, measured and improved.

Demonstrating good environmental practices is becoming an increasingly important component of service delivery in the oil and gas industry, which will only gather momentum in the future.



Remote operation of Production Station. Pohokura in the distance.

## BARELY VISIBLE

The offshore Pohokura platform, which is New Zealand's largest gas resource, and its onshore production station are remotely operated. They have been designed utilising the latest technology to maximise efficiency, and health and safety and minimise environmental impacts.

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## KEEPING THE COMMUNITY INFORMED

Even though the oil and gas industry often operates below the radar, it does have an impact on the communities in which exploration, mining and processing activities are undertaken. There are a number of regulatory checks and balances to manage impacts on communities, but in recent years the oil companies themselves have become far more proactive in engaging, informing and listening to the communities in which they work.

One example is Todd Energy, which produces regular Community Update newsletters that cover developments at their sites, activity and where they're engaging with and supporting the community, supplemented by 6-monthly community meetings.



**THIS ASSESSMENT FOUND THAT NEW ZEALAND-BASED COMPANIES HAVE SHARED A SMALL BUT MEANINGFUL PORTION OF THE UPSTREAM EXPENDITURE.**

*Helicopter landing on rig.*

# IMPORTANCE OF LOCAL CONTENT

**Oil and gas is a global industry with a huge impact on local companies.**

**A** distinctive feature of the oil and gas industry is the significance and interwoven nature of its supply chain and its impact on the overall economic and employment base. When exploration and production (E&P) companies undertake activities – from exploration and appraisal to field development and production – specialist skills sets are required at each point of the process. Rather than employing all these skill sets directly, E&P companies tend to extensively contract specialist supply chain companies as and when required. The ability of local companies to develop the specialist skills required to secure such work is an important component of economic analysis and understanding

how the New Zealand oil and gas industry works.

Several billion dollars have been invested in the upstream development of New Zealand’s oil and gas fields, and more still on midstream and downstream infrastructure and related industries. To assist with the economic evaluation of the industry, and aspirations to maximise the value it generates, an assessment has been undertaken to determine how extensively the domestic oil and gas supply chain is involved in industry activity.\* This analysis included an indication of the type of work and reasons for capture or loss.

The assessment found that New Zealand-based companies have

shared a small but meaningful portion of the upstream expenditure. Local involvement remains greatest for onshore developments (up and mid-stream), as opposed to offshore, and particularly in ongoing production and maintenance operations.

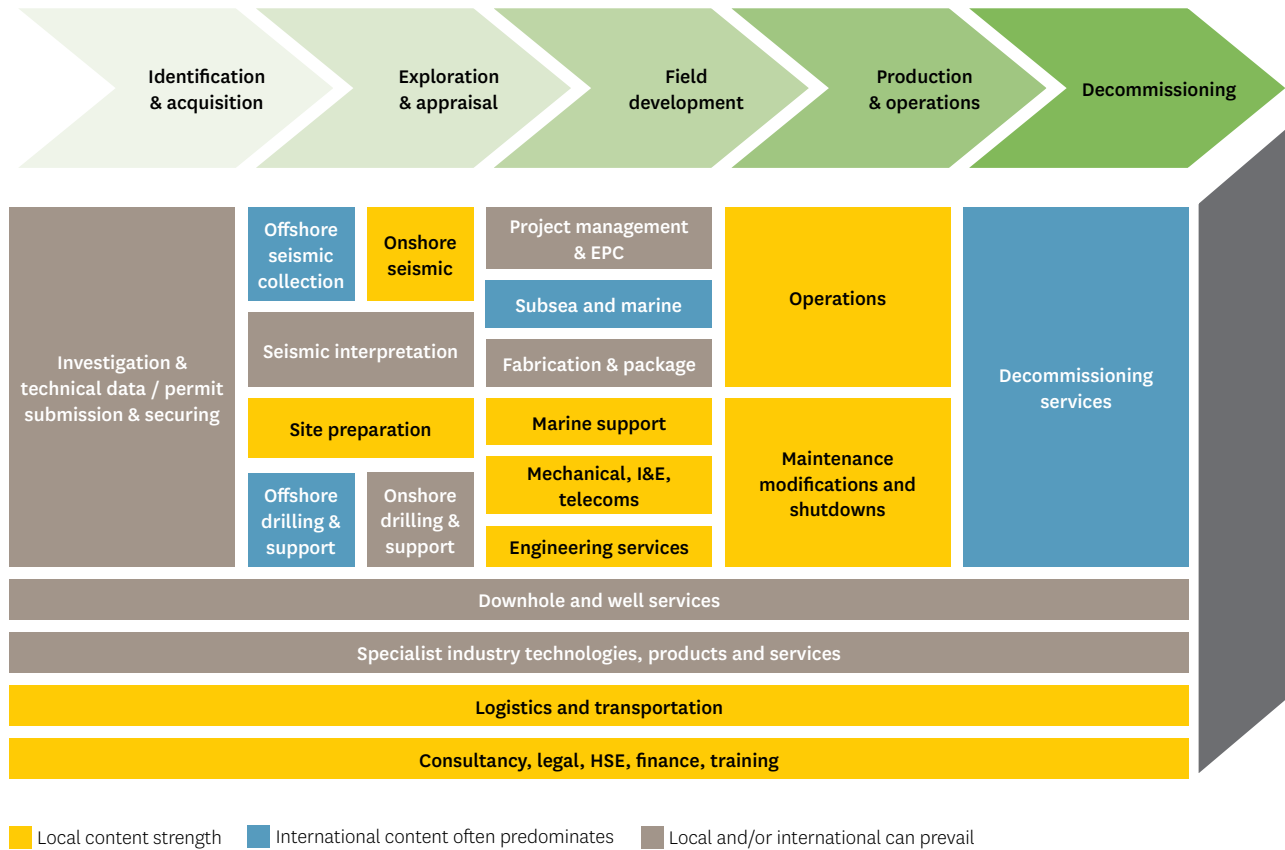
Local participation in oil and gas activities depends on the nature (level of specialisation) and scale (supplier capability and timelines) of the task, and the degree to which the E&P Company and its head contractor are able to facilitate local company involvement. In recent years, with New Zealand’s supply chain companies gaining a positive track record of successful project delivery and new players entering the market, the propensity for New Zealand companies to secure work has increased.

\* Assessment undertaken for Venture Taranaki by Rockpoint/ Berl 2010



The following diagram showcases the supply chain activities which relate to the exploration, development, production and operational activities of E&P companies, and highlights activities where New Zealand companies tend to prevail and those where global specialists often have a competitive advantage.

### SUPPLY CHAIN INTERFACE AT KEY UPSTREAM STAGES



- Exploration and appraisal:** Key tasks are acquiring, processing, and interpreting seismic data and undertaking drilling operations. Each project has specific requirements which demand specialised capabilities. With the exception of onshore drilling rigs, there is insufficient activity to support the continuous presence of equipment in the New Zealand market, so most offshore exploration and appraisal work is undertaken by foreign contractors who bring in specialist

equipment for short-term campaigns. Local companies supplement this with generic tasks and provisioning or roles that require specific local knowledge, such as resource management, regulatory compliance or community consultation.

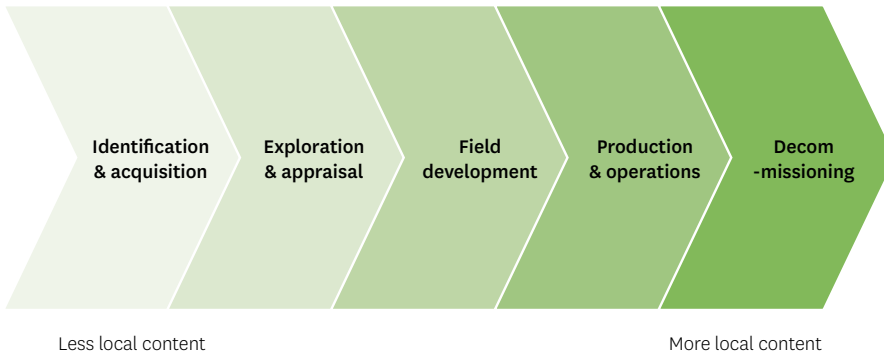
- Field development:** For the detailed design of production wells and surface infrastructure, local companies have the capability to undertake smaller onshore developments. The scale, specialisation, certification

requirements and timelines of offshore projects are often barriers to local companies securing core roles.

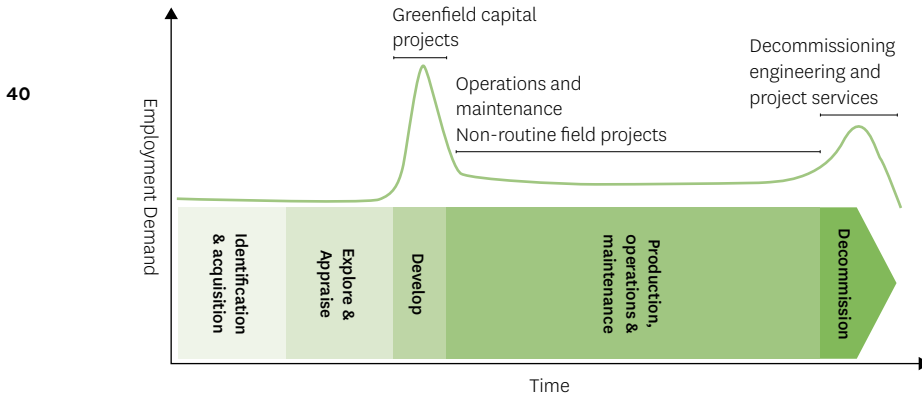
- Production, operations, maintenance and decommissioning:** Once operational, a field requires continuous monitoring, control and maintenance. While some tasks may require imported specialists, the field operator will generally leverage local companies for this phase of production.

**LOCAL PARTICIPATION IN OIL AND GAS ACTIVITIES DEPENDS ON THE NATURE (LEVEL OF SPECIALISATION) AND SCALE (SUPPLIER CAPABILITIES AND TIMELINES) OF THE TASK, AND THE DEGREE TO WHICH THE E&P COMPANY AND ITS HEAD CONTRACTOR ARE ABLE TO FACILITATE LOCAL COMPANY INVOLVEMENT.**

Generally, the early stages of oil and gas activity will see significant portions of work go to offshore specialist firms, though once decisions are made to bring a field into production, New Zealand companies are more likely to participate in facility construction and ongoing operations and maintenance.



**SIMPLIFIED EMPLOYMENT DEMAND CHART OVER ASSET LIFECYCLE**



Whilst employment or contractual demands for specific skills sets differ throughout the facility’s lifecycle, the development phase – when facilities and infrastructure are being constructed to enable production – generally has the highest requirement for overall employment. This phase, while intensive, tends to be brief. Production, operations and maintenance as well as opportunities involving smaller, non-routine field projects, can create important ongoing employment.

**LOCAL COMPANIES CANNOT EXPECT TO CAPTURE ALL CONTRACTS FOR WHICH THEY ARE CAPABLE, RECOGNISING THEY COMPETE WITH EXPERIENCED OFFSHORE PROVIDERS AND GLOBAL INDUSTRY SPECIALISTS. EVEN SO, ANECDOTAL EVIDENCE SUGGESTS THEY ARE AWARDED OVER 70 PERCENT OF THE WORK FOR WHICH THEY ARE QUALIFIED.**

**INFLUENTIAL DECISION-MAKING FACTORS**

Many of the E&P companies in New Zealand are multi-nationals and as such major decisions on construction and production can sometimes be made outside New Zealand. Similarly, the prime contractor on a major project – such as the construction of a very large production plant or significant specialist piece of equipment – can be a large multi-national global company. This makes it more challenging for local companies to capture a major share of activity.

The local management of E&P companies contacted for this study expressed a preference to maximise local content in their development and production operations, citing commercial interests, the convenience of short supply chains and the benefits of fostering a local economy. This approach has been evident on recent developments such as the Cheal Production Station and MET-2, where local companies played a significant role in onshore infrastructure.

Local companies cannot expect to capture all contracts for which they are capable and qualified, recognising they compete with experienced offshore providers and global industry specialists. Even so, anecdotal evidence suggests they are awarded over 70 percent of the work for which they are qualified.

Factors that can influence the level of local company participation in O&G projects include:

- **Project characteristics:** All projects have unique requirements, and the variability – particularly offshore – can mean local companies are less likely to be extensively involved.
- **Timelines:** Ongoing – often multi-decade – production and maintenance operations strongly favour local firms, who can meet rapid response demands over long periods and build a detailed understanding of requirements.

- Cost Competitiveness:** Proximity and short supply chains benefit local companies, offsetting the scale, specialisation and cost advantages of larger international competitors. While locals may not compete against sometimes cheaper offshore wage rates, local companies can remain globally cost competitive for many tasks.
- Liability and indemnities:** Local companies are often too small to provide acceptable liabilities and indemnities to a project, particularly on behalf of subcontractors.
- Continuity of activity:** There is a vast range of tasks demanded by the industry. It is challenging for local companies to sustain capability across all technical and specialist sectors, especially given the project-based nature of O&G activities.
- Project team location:** The industry tends to foster centralised geological and project capability in larger centres of activity. Production is typically managed by operational teams located closer to the project, providing opportunity for local participation.
- Systems and track record:** The potential risks, significant investments and specialist technologies require exacting industry-specific health and safety standards, quality systems and experience. These requirements can prove challenging for local companies seeking entry into the industry or smaller companies with limited resources and opportunities.
- Local knowledge:** Local companies can help foster positive relationships with stakeholders through local knowledge, familiarity with national regulations, legislation, systems, protocols and agencies, and provide a valuable interface between the industry and the community.

## PROJECT EXPENDITURE AND LOCAL BENEFITS

The following analysis<sup>1</sup> is based on discussions with oil and gas industry participants and industry research. It highlights possible costs associated with undertaking differing types of projects, the potential participation of local companies throughout the project lifecycle, and an analysis of local content which could accrue.

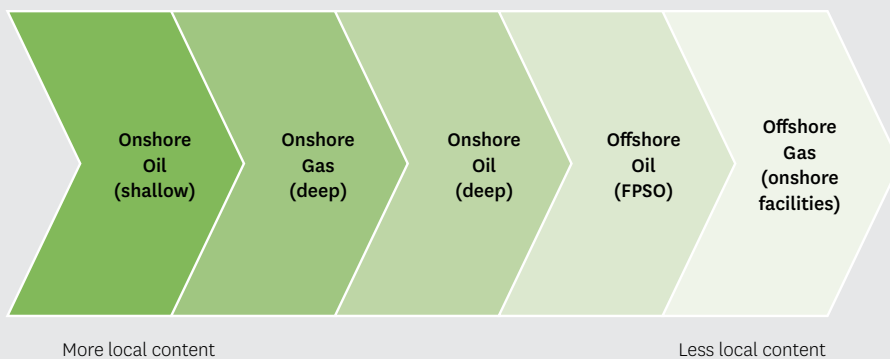
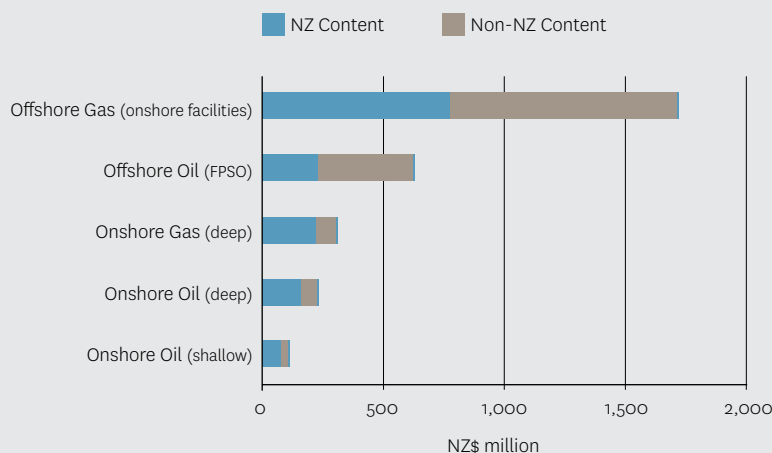
The research confirmed that local companies enjoy a high potential share in the exploration and appraisal stage of an onshore project, and dominate in longer-term production stages of both onshore and offshore projects. Offshore projects tend to be larger and more complex, requiring

technical and engineering expertise unavailable locally.

Figures are illustrative only, and are not based on actual project costs. Exploration drilling success rates are assumed to average 1:10 – for every commercial discovery which leads to a field development the cost of nine dry exploration and appraisal wells (in which local companies can participate) need to be considered.

It should also be noted that production costs are largely operational and are incurred over the field lifetime (decades), and that the portion of project lifecycle costs in each category, and the amount conceivably incurred by engaging local contractors has been estimated.

### NZ CONTENT IN O&G PROJECT



<sup>1</sup> Undertaken for Venture Taranaki by Rockpoint Finance and BERL, 2010

## IMPORTANCE OF GEOGRAPHIC PROXIMITY AND INDUSTRY RELATIONSHIPS

New Zealand’s oil and gas industry supply chain is hubbed in the Taranaki region largely as an outcome of its successful history and the fact that all of New Zealand’s commercially developed and producing fields are located there. This has fostered a close and collegial relationship, which is not

to say companies don’t compete, but rather they acknowledge that through co-operation the collective capability is greater than the individual parts. Timelines in O&G projects are often tight, and the scale of projects can prove a test for individual companies. Partnerships between companies concerning working relationships, project structure, collaborative marketing, the sharing of market intelligence and the management of peaks and troughs, can deliver tangible benefits.

Despite global communication and travel advances, there are clear synergies available for oil and gas service providers that are located in close proximity to each other and to key clients. It is no coincidence that Taranaki, representing the entire commercially producing upstream market, is home to almost all of New Zealand’s service providers and employees.

The following table summarises the positive externalities offered by locating in close proximity to potential clients and to complementary and competing services providers.

LOCATED NEAR	BENEFITS INCLUDE
<b>Potential clients</b>	<ul style="list-style-type: none"> <li>• Reduced transportation and communication costs</li> <li>• Ability to meet face-to-face with clients and flexibility around arranging those meetings</li> <li>• Local knowledge</li> <li>• Increased flexibility to be able to meet client needs</li> <li>• Scale economies from a greater client base</li> </ul>
<b>Complementary services</b>	<ul style="list-style-type: none"> <li>• Referrals</li> <li>• Collaborative marketing</li> <li>• Collaborative industry training programmes</li> <li>• Economies of scale from a greater service base</li> </ul>
<b>Competing services</b>	<ul style="list-style-type: none"> <li>• Access to a larger pool of skilled labour</li> <li>• Ability for potential clients (especially international) to more easily visit and compare competitive service offerings</li> <li>• Faster recognition of new competitive initiatives or new technologies</li> <li>• Potential supply chain synergies</li> </ul>



## CASE STUDY: KUPE GAS FIELD

**T**he Kupe gas field may have had a long journey to production, but given its important role in supplying New Zealand's energy needs, the wait has certainly been worthwhile.

Kupe was discovered by New Zealand Oil & Gas in 1986 but remained uneconomic to develop due to the abundant cheap gas flowing from the Maui field, New Zealand's primary source of gas, for almost 25 years.

However, with the redetermination of the Maui gas reserves and the rapid increase in domestic gas demand to power electricity generation, the development of the Kupe field was seen as both economical and important to meeting New Zealand's growing energy needs.

The joint venture partners Origin Energy (operator), Genesis Energy, New Zealand Oil and Gas and Mitsui Australia came together in 2004, with the final investment decision to proceed with the project taken in June 2006.

Construction began in November 2006 and was complete in late 2009, with the project producing natural gas, liquefied petroleum gas (LPG) and light oil since December 2009.

During the project's construction almost 1,000 people were employed at the production station site at South Taranaki, providing a significant economic boost to the surrounding communities. In keeping with the project's commitment to local content, the majority of the workforce were New Zealanders, with more than six million hours worked. In addition, around 75 percent of tenders were awarded to local companies, equating to approximately \$600 million of expenditure.

Today, Kupe directly employs around 35 people at the production station and tank farm, and approximately 80



Gas from the offshore Kupe field is piped to the onshore production station (above).

people in contract roles including trucking and maintenance.

Kupe comprises an offshore platform with three production wells, a 30km pipeline running from the platform to the shore, an onshore production station near Hawera, and light crude storage and export facilities near Port Taranaki in New Plymouth.

At peak production, the gas produced from the Kupe field will meet around 15 percent of New Zealand's annual gas demand and over 50 percent of New Zealand's LPG needs. In addition, the condensate produced is exported to refineries across Australasia and the South Pacific.

With production from Kupe forecast to continue for 15 - 20 years, the joint venture team is committed to supplying New Zealand with clean, reliable energy for the long term.

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## THE SIGNIFICANCE OF THE EPC COMPANY



**W**orleyParsons has been the Engineering, Procuring and Construction (EPC) contractor for numerous Taranaki oil and gas projects including the MET2 (second production train for the Mangahewa gas field) project for Todd Energy which involved its multi-discipline team from initial concept evaluations through to handover as an operable plant.

The company's engineers produced the detailed design and procured materials and specialist equipment, managed the shipping and transport logistics, tendered and awarded subcontracts and managed the construction, third party inspections, quality and HSE for all aspects of the project. WorleyParsons also pre-commissioned the process, mechanical, electrical and instrumentation systems prior to the introduction of hydrocarbons.

## WHAT IS THE EPC?

**O**nce the E&P Company has finalised its Front End Engineering Design ("FEED") they will then usually contract the entire project with an Engineering Procurement Construction ("EPC"), or Engineering Procurement and Construction Management (EPCM) provider.

The EPC company will contract to manage the entire construction process against an agreed design, timeline and budget. They usually have discretion on how this is achieved, how the project is broken down and who is contracted to provide the required components.

Given the size and scale of O&G projects, the EPC role is a significant responsibility.

## DEVELOPING THE CHEAL DISCOVERY

During the mid-late 1990's the Stratford-based Cheal Permit (38156) had only been lightly explored, but showed sufficient promise for its initial investors to establish a small production facility. It was the 100 percent acquisition of Cheal by TAG Oil in 2009, and their subsequent investments that transformed the permit into a high profile, rapidly expanding commercial onshore oil and gas development.

By 2012 investments in seismic data had focused development of the Cheal Permit through the drilling of eighteen (18) additional wells, including the work-overs of existing wells. Implementation of improved techniques and technologies further enhanced efficiencies and production. The Cheal development programme resulted in increased reserves and production, but as a result of facility constraints only 8 of the 18 wells are on stream.

This prompted a \$50 million expansion of the initial Cheal production facility and its associated infrastructure to enable additional processing capacity for existing and future work programmes. The plant also proved a showcase of New Zealand's oil and gas engineering, supply chain and construction expertise, with 70 percent of the total project costs comprising local content.

Local companies secured the lead Engineering, Procurement, Construction Management (EPCM) role as well as civil, mechanical construction, electrical and instrumentation, control system design and build, automation and control work, and supplied much of the specialist parts and services. In total some 134,000 hours were worked on the Cheal A site at Ngaere, just south of Stratford, involving over 40 local companies equating to 70 jobs (FTEs). A further 50,000 hours or 26 FTE workers were also spent in off-site shop construction, prefabrication and assembly to complete the project.

Continued success within the Cheal permit resulted in the acquisition of an additional three mining permits (54876, 54877, and 54879) within the greater Cheal area. Subsequent discoveries in 2013 have led to an additional six wells being drilled within the greater Cheal area, a further four drilled elsewhere in Taranaki, and the construction of production facilities on the Cheal E (54877) location.

In total some 166,000 hours or 86 FTE workers were involved in the expansion within the greater Cheal area and a further 74,000 hours or 39 FTE workers within the Taranaki region.

Intensity of the construction phase is slowing as infield development drilling continues to add incremental

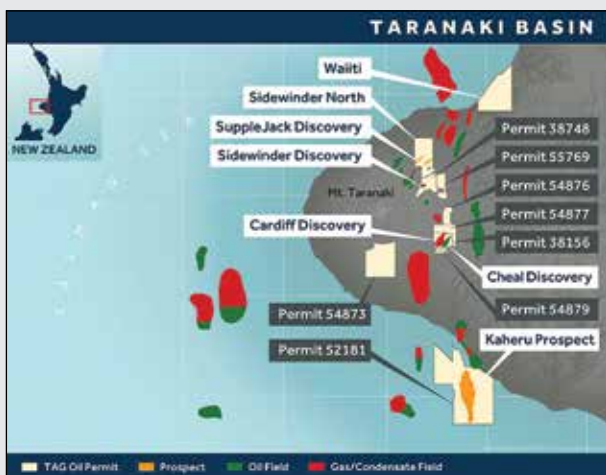
production. The Cheal facility expansion has increased processing and gas liquids extraction capability, boosting the size and scale of the operation.

The ongoing management and maintenance requirements of the expanded facilities have an impact on local spending, staffing and supply chains, with over 90,000 hours or 47 FTE workers directly involved with the day-to-day operations of the existing asset base, and a further 48,000 hours or 25 FTE New Plymouth-based TAG staff.

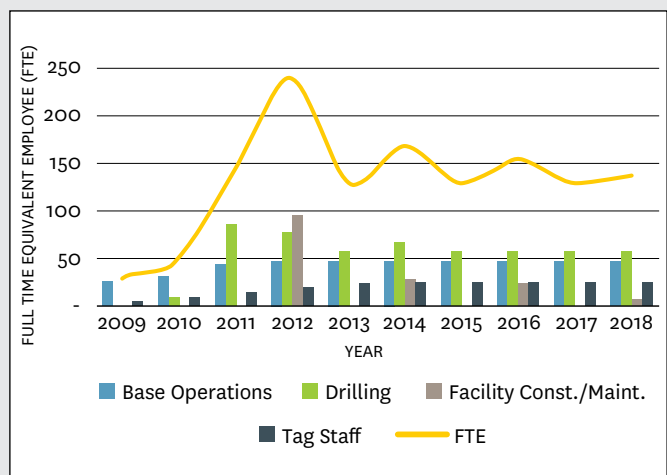
In addition the workers directly involved in TAG's operations further support downstream services and markets through the shipment and sale of oil through Port Taranaki via the Omata Tank Farm, natural gas sales to the Vector transmission system and electricity to the national grid.

Further development, through drilling, well work-overs, maintenance and projects, are all designed to increase the reserves, production and commercial life of the greater Cheal area. With current development plans estimated at 265,000 hours or 138 FTE workers required from 2015 through to 2018 and continued investments in Cheal, significant direct and indirect job creation within the Taranaki region will be seen for years to come.

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Source: TAG Oil



**CHEAL: BY THE NUMBERS**

**PRODUCTION STATION EXPANSION:**

**\$50** million value

**70%** local content

**134,000**

hours for on-site construction

**40** companies involved

**86** full time workers

**74,000**

additional hours (26 FTE workers) for offsite construction, assembly & support

**SUBSEQUENT SUCCESS & EXPANSION IN THE GREATER CHEAL AREA GENERATED:**

**166,000** hours – field & site work

**74,000** hours – off site support

**DAY-TO-DAY MANAGEMENT & OPERATIONS STAFF:**

**47** contracted workers

**25** TAG Oil



## MANGAHEWA EXPANSION TRAIN 2 PROJECT

The Mangahewa Expansion Train 2 – known locally as MET2 – opened in 2014. The production facility is owned and operated by Todd Energy, and planning for the facility commenced in 2011.

One of the three main components of the Mangahewa Expansion Project, MET2 joins the drilling and hook-up of 27 wells in the Mangahewa permit area, and the construction of a 9km corridor of pipelines connecting the wells to the production station and on to the Māui Gas Pipeline.

Mangahewa was recognised as a prospect in the early days of exploration in New Zealand. First drilled in 1961, it showed signs of gas but was considered not to be commercially viable at the time. Tested again in 1979, it demonstrated positive results, but was again abandoned in favour of the more commercially attractive oil targets higher in the well, which later became known as the McKee Oil Field.

The third exploration phase occurred in 1997 with the drilling of Mangahewa 2. The results were sufficiently encouraging to support a mining permit and the development of a gas development project, with dedicated high pressure treatment

facilities (MET1) located next to the McKee Production Station (now called the McKee and Mangahewa Production Facility).

In 2002 Todd purchased the assets and four years later took over full operatorship of McKee and Mangahewa, and in recent years has invested more than \$800 million to develop the field, expanding the plant and infrastructure.

While some of the major componentry in MET2 was built overseas, the balance of work, including the lead contractor and supporting providers of products and services, was sourced locally. This included design work, site preparation and civil engineering, transportation and logistics, mechanical engineering, instrument and electrical work.

The construction of MET2 has enabled higher volumes of gas to be produced from the Mangahewa field, with this gas being fed to Methanex NZ for production into methanol, which is both exported and utilised in the manufacture of many household products. Gas from the field is also used for electricity generation during peak demand periods, and for processing into LPG for use throughout New Zealand.

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OCT  
2012



Final investment decision made

NOV  
2012



First earthworks

DEC  
2012



Foundation piling

MAY  
2013



First load leaving Propak, Calgary

JUN  
2013



Hot oil heater installation

JUL  
2013



Main pipe rack

OCT  
2013



Site construction nearing completion

NOV  
2013



Pre-commissioning activities underway



**MET2: BY THE NUMBERS**

**0** lost time from injury

**600** screwed piles installed

**1,000** cubic metres of concrete foundation poured

**425** spools & 4,000 weld inches completed

**41** modules & vessels moved 18,000 km

**1,100** tonnes of equipment installed

**2,400** ship loose items fitted

**51,000m** of cable pulled & terminated

**218,000** man-hours of on-site work

**JAN 2013**



Fabrication underway at Propak, Calgary

**FEB 2013**



Concrete pour of main foundation slab

**MAR 2013**



Foundations installed and MCC walls erected

**AUG 2013**



Stabiliser column installation

**AUG 2013**



Unloading Propak equipment at Port Taranaki

**SEP 2013**



Building the plant - ractionation area

**DEC 13 – FEB 14**



Commissioning



Final facility



# ACTIVITY

**Activity varies from year to year based on the permits awarded and the cyclical nature of the industry.**

The Ministry of Business, Innovation and Employment (MBIE) collates and publishes annual data on activity and expenditure under permits, including the number of permits granted, surrendered, revoked, relinquished or expired, wells drilled, metres made, and expenditure.

These numbers vary from year-to-year based on the permits awarded and the cyclical nature of the industry. This section provides a summary of this data to indicate industry activity and investment in recent years.

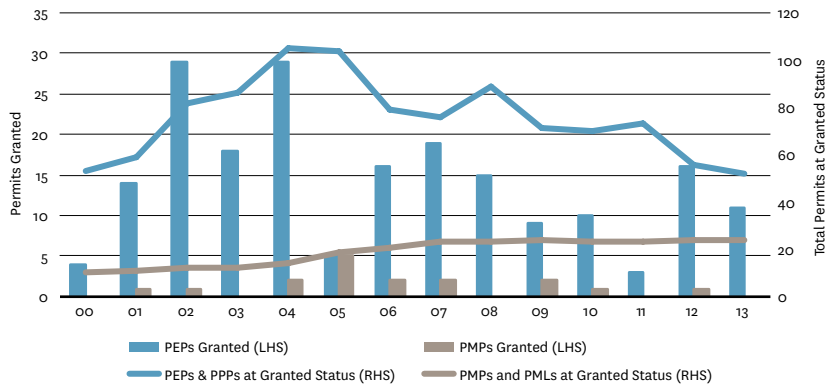
## CURRENT PERMITS

The 2013 Block Offer awarded five onshore exploration permits across Taranaki and the East Coast and five offshore permits across the Reinga-Northland, Taranaki and Great South-Canterbury Basins, bringing the total to 52 exploration and prospecting permits and 24 production permits issued. Over the year, 11 exploration and prospecting permits were granted, while no production permits were granted.

## WELLS DRILLED

In 2013, 32 wells were drilled, down slightly on 2012 and well below the peak of 52 in 2011. Eighteen of these were exploratory wells, five were appraisal wells and nine were development wells. While the number of wells drilled has fallen over the last two years, total metres drilled has increased in all but one year since 2008.

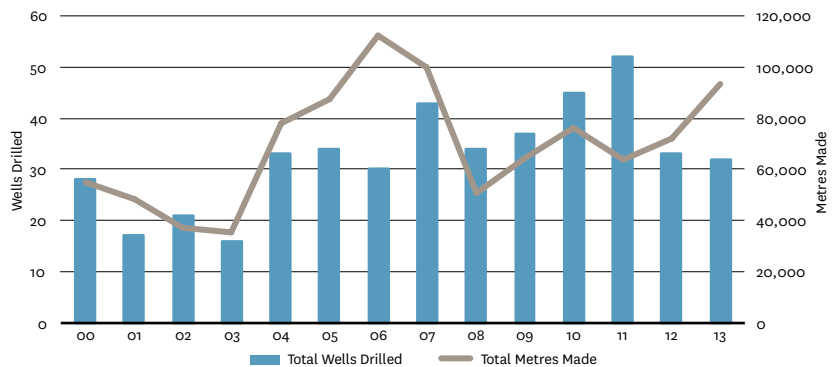
### EXPLORATION AND PRODUCTION PERMITS, 2000 TO 2013



Source: MartinJenkins, data sourced from MBIE.

PEPs = Petroleum Exploration Permits; PPPs = Petroleum Prospecting Permits; PMPs = Petroleum Mining Permits (production permits); PMLs = Petroleum Mining Licences (production permits).

### TOTAL WELLS DRILLED, 2000 TO 2013



Source: MartinJenkins, data sourced from MBIE.



Rig at Kapuni

### MAJOR OIL PRODUCTION FIELDS, 2013

LARGEST OIL FIELDS BY PRODUCTION (MILLION BARRELS/MMBLS)



New Zealand's six largest oil fields accounted for 86 percent of oil produced in 2013. Pohokura accounted for almost a third of total production, Maari for almost 15 percent of production, Kupe 13 percent while the Maui and Tui fields each contribute 11 percent of production.

A further two million barrels of LPG were produced in 2013 with Kupe accounting for just over half of production. Maui, Kapuni and Pohokura were the other main producers of LPG.



Source: MartinJenkins, data sourced from MBIE

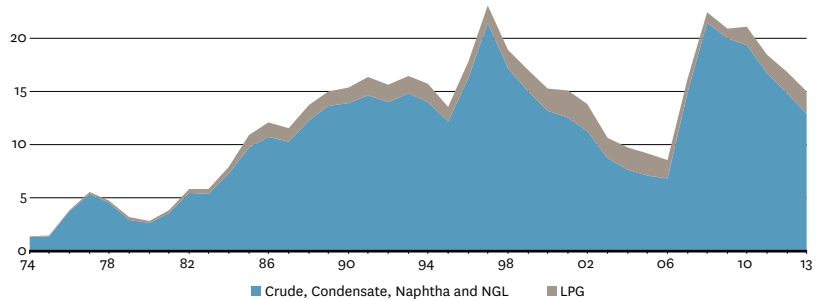
## OIL PRODUCTION

In 2013, 15 million barrels of oil and LPG were produced. This consisted of 13 million barrels of oil and 2 million barrels of LPG. Emergence of the Tui and Pohokura fields from around 2006 saw New Zealand's oil production increase significantly. As these fields have depleted, total production has correspondingly reduced. Oil production has been declining since 2008, falling to 13 million barrels of crude and condensate and 2 million barrels of LPG in 2013.

## GAS PRODUCTION

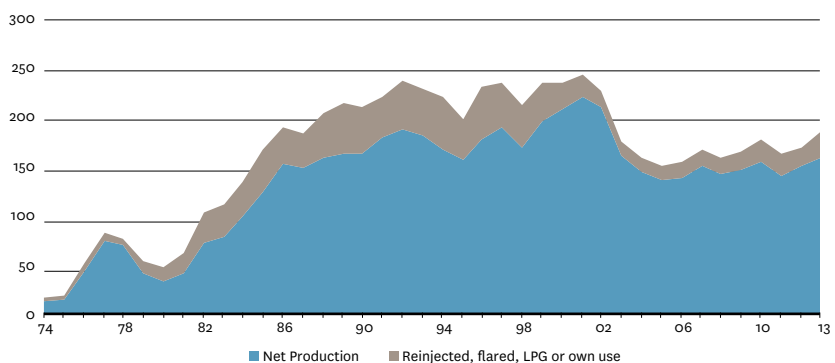
In 2013, 186 Bcf of gas was produced, of which 160 Bcf was fed into the gas supply network. Gas production dropped from a peak in 2002 but production has recovered since 2006.

CRUDE, CONDENSATE, NAPHTHA, NGL AND LPG PRODUCTION, 1974 TO 2013 (MMBLS)



Source: MartinJenkins, data sourced from MBIE

GAS PRODUCTION, 1974 TO 2013 (BCF)



Source: MartinJenkins, data sourced from MBIE

## MAJOR GAS PRODUCTION FIELDS 2013

### LARGEST GAS FIELDS BY PRODUCTION (BCF)



The six largest gas fields accounted for 92 percent of gas produced in 2013. Pohokura is the largest producer of gas with close to 40 percent of gross production while Maui remains the second largest producer accounting for 20 percent of gross production.



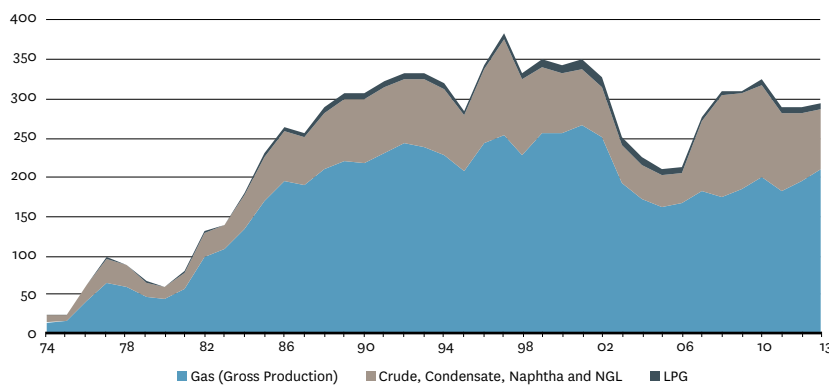
Source: MartinJenkins, data sourced from MBIE

## COMBINED PRODUCTION

In 2013, the combined production of oil and gas was equivalent to 292 PJs. This is down from the most recent peak of 322 PJs in 2010.

**THE COMBINED PRODUCTION OF OIL AND GAS WAS EQUIVALENT TO 292 PJ IN 2013. GAS PRODUCTION HAS INCREASED STEADILY SINCE 2005, WHEREAS OIL PRODUCTION HAS BEEN REDUCING SINCE PEAKING IN 2008.**

### OIL AND GAS PRODUCTION, 1974 TO 2013, (PJS)



Source: Ministry of Business, Innovation and Employment

## RESERVES

Reserves are the estimated total amounts of oil and gas that are able to be recovered from a known petroleum reservoir. Ultimate recoverable reserves are the total reserves before any oil or gas is produced. Remaining reserves are ultimate recoverable reserves, less production to date.

Reserves are adjusted annually in line with production, and when additional geological information becomes available. Reserves data usually shows remaining reserves sufficient to cover between 11 and 13 years of annual demand.

Ultimate recoverable gas reserves (P50) increased 11% from 2013, with Pohokura, Maui and Mangahewa providing most

of this increase. Remaining recoverable gas reserves (P50) increased 31% from 2011 PJ to 2642 PJ.

New Zealand's reserves (P50) as at 1 January 2014 were:

- Gas – 2,355 Bcf (2,642 PJs)
- Oil – 138 million barrels of oil (826 PJs)

The latest P50 reserves are sufficient to meet annual demand for 14.5 years.





# ECONOMIC CONTRIBUTION – EXPENDITURE, JOBS & GDP

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**Just what does the oil and gas industry contribute to the employment and GDP of Taranaki and New Zealand? This chapter reveals all.**

**T**his section explores the contribution of the industry by way of expenditure, jobs and GDP to the Taranaki and New Zealand economies.

The assessment looks at expenditure underpinning E&P activity for the 2013 year. This was a relatively quiet period for the industry in New Zealand. While the total metres drilled is increasing, the number of wells drilled and production are down. The recent focus for the

industry has been on expanding and enhancing the performance of existing producing fields.

The analysis was independently undertaken for Venture Taranaki by MartinJenkins utilising expenditure data sourced by the government, and employment data acquired through survey, publicly available information and direct company contact. Further details on their methodology is outlined in Appendix 2.

## OIL AND GAS EXPENDITURE

### EXPENDITURE

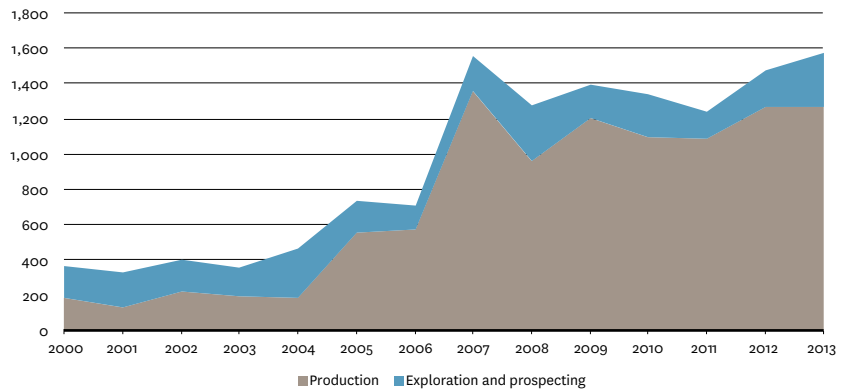
Exploration and production company expenditure data is collected by MBIE and is the most robust publicly available information on expenditure in the industry, and was used to calculate output and GDP in this analysis.

Oil and gas industry expenditure occurs across the seismic, exploration and production phases.

Of the \$1.577 billion spent by E&P companies in 2013 on exploration and production, the vast majority of this expenditure, \$1.509 billion or 95 percent was spent in the Taranaki region.

The largest proportion of expenditure was on production (80 percent) and all of this occurred in the Taranaki region. Similarly, almost 80 percent of the \$313 million spent on exploration occurred in the Taranaki Basin.

EXPENDITURE ON PETROLEUM PERMITS, 2000 TO 2013 (\$, MILLION)



Source: MartinJenkins, Data sourced from MBIE; Note: Data on Seismic expenditure has only been identified separately in 2013.

TABLE 1: E&P EXPENDITURE 2013

2013 (\$000)	EXPLORATION	PRODUCTION	TOTAL
Taranaki	244,000	1,264,600	<b>1,508,600</b>
New Zealand	312,700	1,264,600	<b>1,577,320</b>

Source: NZ Petroleum & Minerals





## EMPLOYMENT DIRECTLY IN THE INDUSTRY

To calculate employment, companies that were either directly active in the O&G industry or were heavily involved in the industry as first round contractors or suppliers to the E&P companies were identified. A total of 246 companies were recognised, mainly through the Energystream and PEPANZ databases.

Through a combination of surveys, telephone interviews, publicly available information and best estimates, employment for the majority of O&G associated companies both nationally

and within the Taranaki region were identified.<sup>1</sup> These are shown in Table 3.

The analysis estimated that there were 4,653 FTE jobs in the O&G industry, of which 3,936 (85 percent) were in the Taranaki region.<sup>2</sup>

The greatest share of employment is in the engineering category followed by specialist and technical services. The third largest group is made up of drilling companies and well services<sup>3</sup>. As all production and a large proportion of exploration is occurring in the Taranaki region the vast majority of employment in those three categories is based there.

**TABLE 2: O&G INDUSTRY EMPLOYMENT IN TARANAKI AND NEW ZEALAND, 2014**

TYPE OF COMPANY	NO OF COMPANIES	TARANAKI EMPLOYMENT	NEW ZEALAND EMPLOYMENT
E&P companies	12	140	236
Logistics	18	264	446
Engineering/maintenance/ engineering consultancy/ I&E/civil engineering	59	1,427	1,736
Specialist & technical services	69	1,201	1,238
General suppliers of products/services	22	60	79
Professional and consultancy	55	159	208
Drilling company/well services	11	685	710
<b>Total</b>	<b>246</b>	<b>3,936</b>	<b>4,653</b>

Source: MartinJenkins

- <sup>1</sup> Where companies were identified but associated employment could not be identified, a proxy of three was applied for Taranaki companies and one FTE for companies outside of Taranaki.
- <sup>2</sup> This differs from calculations derived from the Statistics New Zealand Business Frame. In 2013, the two O&G categories of Oil and Gas Extraction and Petroleum Exploration employed 976 people, of which 748 were from the Taranaki region. Employment in businesses categorised in other industries that provide direct services to the O&G industry are not captured within the O&G definitions.
- <sup>3</sup> These categories are specific to the O&G industry. Companies were further categorised across 20 industries defined in the input/output (IO) tables. The largest industries were: exploration and other mining support services (1,260), scientific, architectural & engineering services (1,104), fabricated metal product manufacturing (508), road transport (397) and machinery manufacturing (344).

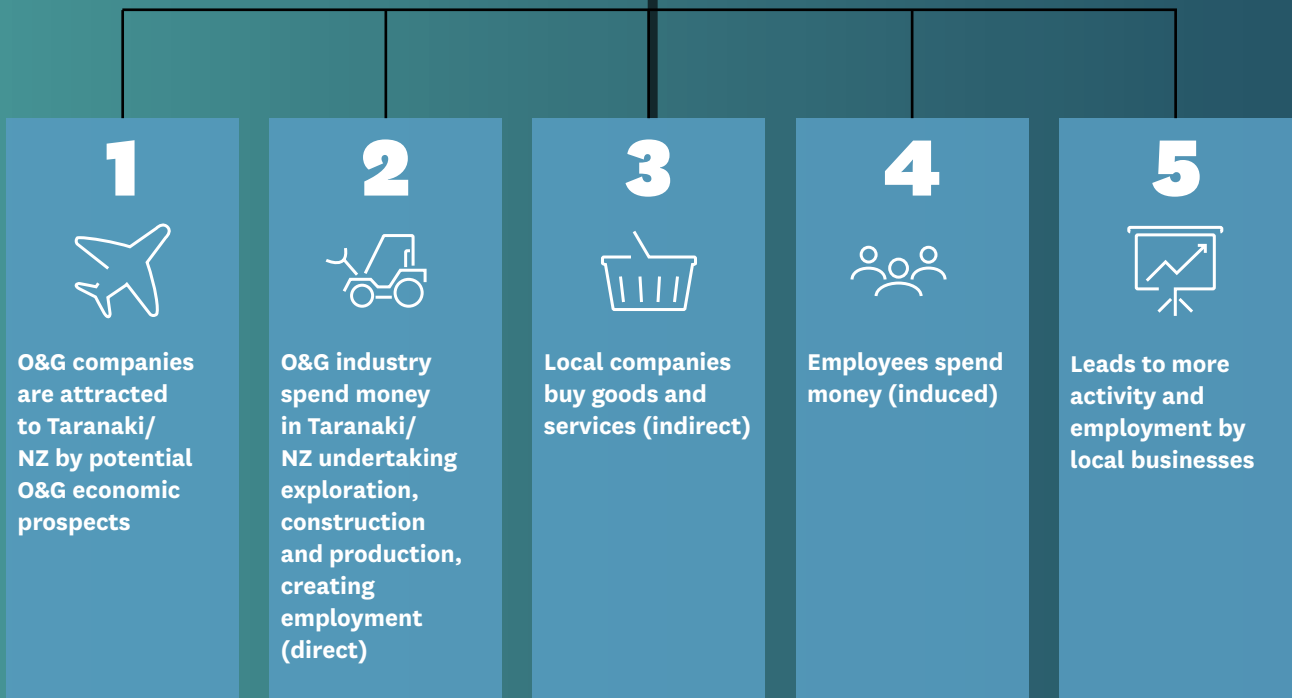
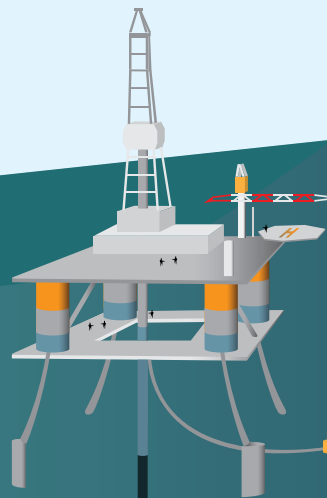
**OF THE \$1.577 BILLION SPENT BY E&P COMPANIES IN 2013 ON EXPLORATION AND PRODUCTION, THE VAST MAJORITY OF THIS EXPENDITURE, \$1.509 BILLION WAS SPENT IN THE TARANAKI REGION.**

## ECONOMIC IMPACT OF THE O&G INDUSTRY

The direct estimates were then used to determine indirect and induced ('flow on') impacts for Taranaki and New Zealand<sup>4</sup>.

These flow on impacts are important to include in the analysis as the oil and gas industry not only generates economic benefits for those directly employed or contracted to undertake work, but their expenditure in turn, also flows to the broader economy in areas such as retailing, housing, food, transport and restaurant trade.

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## TARANAKI

**The O&G industry contributes \$1 billion in GDP to the Taranaki economy and results in the employment of 5,940 FTEs.**

According to NZP&M, E&P companies spent a total of \$1.509 billion on exploration and production in 2013 in Taranaki.

The analysis suggests this contributed \$662 million to regional GDP. Including indirect and induced impacts, the total contribution of the O&G industry to the Taranaki region was \$2.301 billion in output generating \$1.006 billion in regional GDP.

The O&G industry employed a total of 3,936 FTEs directly<sup>5</sup>. Adding indirect and induced impacts increased employment as a result of the O&G industry to 5,941.

## NEW ZEALAND

**The O&G industry contributes \$1.74 billion in GDP to the New Zealand economy and results in the employment of 8,480 FTEs.**

At a national level, the E&P companies spent a total of \$1.577 billion on E&P in 2013. Direct and first round employment associated with O&G activity totalled 4,653 FTE jobs. The economic impact of the O&G industry on the New Zealand economy is shown in Table 4.

Direct expenditure of \$1.577 billion in the O&G industry in New Zealand generated \$685 million in GDP. Including indirect and induced impacts, the total contribution of the O&G industry to New Zealand was \$3.929 billion in output generating \$1.742 billion in GDP.

The O&G industry employed a total of 4,653 FTEs directly (including first round employment). Adding indirect and induced impacts increased employment as a result of the O&G industry to 8,481 FTEs.



**TABLE 3: OIL AND NATURAL GAS SECTOR, ECONOMIC IMPACT ON TARANAKI REGION, 2013**

TARANAKI	DIRECT	DIRECT + INDIRECT	DIRECT + INDIRECT + INDUCED
Output (\$m)	1,509	2,164	2,301
GDP (\$m)	662	933	1,006
Employment (FTEs)*	3,936	4,718	5,941

**TABLE 4: OIL AND NATURAL GAS SECTOR, ECONOMIC IMPACT ON NEW ZEALAND, 2013**

TARANAKI	DIRECT	DIRECT + INDIRECT	DIRECT + INDIRECT + INDUCED
Output (\$m)	1,577	3,195	3,929
GDP (\$m)	685	1,378	1,742
Employment (FTEs)*	4,653	5,940	8,481

Source: MartinJenkins. \*Note: For employment direct includes first round employment as well.

<sup>4</sup> Indirect and induced multipliers were revised down to reflect that first round employment effects were captured with the direct employment.

<sup>5</sup> including first round employment.

## ADDED-VALUE MANUFACTURING – THE CONTRIBUTION OF FEEDSTOCK

All natural gas produced is consumed domestically either as a source of energy in itself, or as a feedstock in the manufacture of other products. Feedstock companies include Methanex (methanol), Ballance Agri-nutrients (fertiliser), AICA New Zealand (glue) and Contact Energy's combined and peaker plants (electricity). These feedstock companies (or their production facilities) are all located in the Taranaki region.

It is very unlikely this activity would occur in New Zealand without the O&G industry and therefore can be

considered additional activity as a result of the O&G industry.

The following table summarises the employment and GDP contribution of such added-value production<sup>6</sup>.

### TARANAKI

**Feedstock companies contribute a further \$569 million to the Taranaki region's GDP and employ 1,130 FTEs.**

In the Taranaki region, a total of 407 FTEs were directly employed in feedstock companies. The economic impact of feedstock companies in the Taranaki region is presented in Table 5.

This employment generated an estimated output of \$1.014 billion, which contributed \$319 million to regional GDP. Including indirect and induced impacts

increases employment to 1,130 FTEs, output to \$1.588 billion and GDP to \$569 million.

### NEW ZEALAND

**Feedstock companies contribute a further \$1.04 billion to New Zealand's GDP and employ 3,240 FTEs.**

In New Zealand, a total of 415 FTEs were employed in feedstock companies. The economic impact of feedstock companies on New Zealand is shown in Table 6.

This led to an output of \$1.015 billion, which contributed \$320 million to national GDP. Including indirect and induced impacts increases employment to 3,237, output to \$2.665 billion and GDP to \$1.043 billion.

**COMBINING O&G AND  
FEEDSTOCK ACTIVITY  
SUGGESTS AN ADDITIONAL  
\$2.79 BILLION TO  
NEW ZEALAND'S GDP  
AND EMPLOYMENT OF  
11,720 FTEs.**

**TABLE 5: O&G FEEDSTOCK, ECONOMIC IMPACT ON TARANAKI, 2013**

TARANAKI	DIRECT	DIRECT + INDIRECT	DIRECT + INDIRECT + INDUCED
Output (\$m)	1,014	1,488	1,588
GDP (\$m)	319	515	569
Employment (FTEs)	407	943	1,130

**TABLE 6: O&G FEEDSTOCK, ECONOMIC IMPACT ON NEW ZEALAND, 2013**

NEW ZEALAND	DIRECT	DIRECT + INDIRECT	DIRECT + INDIRECT + INDUCED
Output (\$m)	1,015	2,203	2,665
GDP (\$m)	320	810	1,043
Employment (FTEs)	415	2,189	3,237

Source: MartinJenkins

<sup>6</sup> The methodology for calculating the economic impact of feedstock is different from the upstream calculation in that it is derived solely from direct employment. That is, employment estimates are used to calculate output, which is then used to determine GDP. However, direct output for Methanex has been identified separately through an earlier EIA (BERL, 2013). The report suggested direct output of \$634 million in 2013, but in 2011 dollars. This number was inflated by 2.4 percent to align with the current analysis, which is in 2012 dollars. This revised number represented a more accurate measure of direct output from Methanex and was then applied to the regional and national multiplier tables to determine indirect and induced impacts. As indirect and induced impacts were recalculated outcomes were slightly different from the BERL report.



## TOTAL ECONOMIC IMPACT

Combining the O&G industry economic impact and the feedstock economic impact we can get an estimate of the total economic impact of the sector on the Taranaki and New Zealand economies.

### TARANAKI

**Combining O&G and feedstock activity suggests an additional \$1.57 billion to the Taranaki region's GDP and employment of 7,070 FTEs.**

In the Taranaki region, a total of 4,343 FTEs are employed in O&G and feedstock companies. The economic impact in the Taranaki region is presented in Table 7. Applying input-output (IO) analysis suggests these 4,343 FTEs generated output of \$2.522 billion, which contributed \$982 million to regional GDP. Including indirect and induced impacts increases employment to 7,072, output to \$3.889 billion and GDP to \$1.574 billion.

### NEW ZEALAND

**Combining O&G and feedstock activity suggests an additional \$2.79 billion to New Zealand's GDP and employment of 11,720 FTEs.**

In New Zealand, a total of 5,068 FTEs are employed in O&G and feedstock companies. Applying IO analysis suggests this generated output of \$2.593 billion, which contributed \$1.005 billion to national GDP. Including

indirect and induced impacts increases employment to 11,718, output to \$6.594 billion and GDP to \$2.785 billion.

The economic impact in the national economy is presented in Table 8.

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**TABLE 7: O&G FEEDSTOCK, ECONOMIC IMPACT ON TARANAKI, 2013**

TARANAKI	DIRECT	DIRECT + INDIRECT	DIRECT + INDIRECT + INDUCED
Output (\$m)	2,522	3,652	3,889
GDP (\$m)	982	1,448	1,574
Employment (FTEs)	4,343	5,661	7,072

**TABLE 8: O&G FEEDSTOCK, ECONOMIC IMPACT ON NEW ZEALAND, 2013**

NEW ZEALAND	DIRECT	DIRECT + INDIRECT	DIRECT + INDIRECT + INDUCED
Output (\$m)	2,593	5,398	6,594
GDP (\$m)	1,005	2,188	2,785
Employment (FTEs)	5,068	8,128	11,718

Source: MartinJenkins

## WHAT'S CHANGED SINCE 2010?

*Has employment within the industry increased and is it contributing more to local and national economies? A comparison of 2013 results with the 2010 economic impact analysis documented in *Wealth Beneath Our Feet* (first edition) indicates the following outcome:*

There have been a number of changes in the methodology between this report and the 2010 report that means

the numbers in the two economic impact assessments are not directly comparable.

For example, direct output in the 2013 EIA is taken directly from information supplied to MBIE by the E&P companies, whereas it was derived from employment in the 2010 study. Output is then used to estimate GDP rather than employment.

The quality of the employment data collected in the 2013 analysis has improved due to a better understanding of companies directly engaged with the

O&G industry and an increase in the number of businesses for which actual employment was identified.

In determining the economic impact of feedstock, the definition has been expanded to include electricity production and adhesives manufacture. Further, direct output for methanol production is taken from a recent report commissioned by Methanex identifying the economic impact of Methanex on the Taranaki and New Zealand economy. There has been a significant increase in methanol output since the 2010 EIA.

**THE QUALITY OF THE EMPLOYMENT DATA COLLECTED IN THE 2013 ANALYSIS HAS IMPROVED DUE TO A BETTER UNDERSTANDING OF COMPANIES DIRECTLY ENGAGED WITH THE O&G INDUSTRY AND AN INCREASE IN THE NUMBER OF BUSINESSES FOR WHICH ACTUAL EMPLOYMENT WAS IDENTIFIED.**



This has resulted in differences between the 2013 and the 2010 EIAs as shown in Table 9.

The main difference between the two studies is that direct employment is higher and direct output is lower under the 2013 study. The latter study is seen as more accurate as the output is actual reported E&P expenditure, and the employment estimate captured actual information from a greater number of companies.

The variance in ratios and indirect and induced multipliers is due to the different allocations of output and employment across industries and their individual ratios and multipliers. For example, in the 2013 EIA, output and GDP calculations are based on expenditure in two O&G industries – oil and gas extraction and exploration and other mining support services, whereas employment multipliers are based on an aggregation of multiplier ratios for 20 different industries.

With feedstock there has been a significant increase in production out of Methanex, with close to a tripling of activity. Further, electricity generation is a new and relatively large addition to the economic impact of feedstock.

## WITH FEEDSTOCK THERE HAS BEEN A SIGNIFICANT INCREASE IN PRODUCTION OUT OF METHANEX, WITH CLOSE TO A TRIPLING OF ACTIVITY.

**TABLE 9: COMPARISON OF 2013 AND 2010 ECONOMIC IMPACT**

		DIRECT		TOTAL	
		2010	2013	2010	2013
<b>TOTAL ECONOMIC IMPACT</b>					
<b>Taranaki</b>	Output (\$m)	2,893	2,522	3,416	3,889
	GDP (\$m)	1,790	982	2,022	1,574
	Employment (FTEs)	3,556	4,343	5,089	7,072
<b>New Zealand</b>	Output (\$m)	3,104	2,593	4,343	6,594
	GDP (\$m)	1,903	1,005	2,480	2,785
	Employment (FTEs)	3,730	5,068	7,774	11,718
<b>OIL AND GAS SECTOR</b>					
<b>Taranaki</b>	Output (\$m)	2,541	1,509	2,894	2,301
	GDP (\$m)	1,684	662	1,843	1,006
	Employment (FTEs)	3,206	3,936	4,221	5,941
<b>New Zealand</b>	Output (\$m)	2,703	1,577	3,544	3,929
	GDP (\$m)	1,782	685	2,182	1,742
	Employment (FTEs)	3,375	4,653	6,062	8,481
<b>FEEDSTOCK</b>					
<b>Taranaki</b>	Output (\$m)	352	1,014	522	1,588
	GDP (\$m)	106	319	179	569
	Employment (FTEs)	350	407	868	1,130
<b>New Zealand</b>	Output (\$m)	401	1,015	799	2,665
	GDP (\$m)	121	320	298	1,043
	Employment (FTEs)	355	415	1,712	3,237

Source: MartinJenkins



*The presence of the oil and gas industry inspires young curious minds: On a geoscience field trip to Taranaki, led by GNS Science, students studied the landscape and rock outcrops, working out the geological processes they revealed.*

## OTHER BENEFITS

### **Beyond dollars and jobs, what else does the oil and gas industry mean for New Zealand?**

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*Oil and gas is about more than royalties, exports and jobs: it is central to almost all of our nation's economic activity.*

*The oil and gas industry provides intangible benefits associated with: the presence of a highly technical, capital-intensive industry, including the introduction of global business systems, a heightened workforce commitment to health and safety, international connections and regional contributions which enhance infrastructure, vibrancy and the social fabric of our communities.*

*These are very important facilitators of economic growth and in some cases may have a greater impact than some of the more quantitative outcomes.*

**O**ur oil and gas industry generates wealth for Taranaki and New Zealand and provides fuel for industry and households. The skills, expertise and technologies required by the complex industry also flow over into other sectors in a number of ways, with businesses developed to service oil and gas providing important engineering and specialist services for many other sectors, such as geothermal energy.

The large investments in the science associated with oil and gas creates knowledge about New Zealand's underground resources, such as the location of water aquifers and landslide and earthquake risks.

The high salaries paid by the sector help to build and retain talent, and attract world class expertise. Local businesses associated with the sector have been able to leverage their industry experience to create export opportunities which generate further revenue and showcase New Zealand's expertise and innovation.

### **SECURITY OF ENERGY SUPPLY**

Given the importance of energy in the daily activities of New Zealand's residents and businesses, ensuring reliable and secure energy supply is paramount. It is critical that we retain the ability to generate our own energy, and create systems that buffer against potential fluctuations, such as natural disasters or international events, that could impact on energy sources. Ensuring resilience and reliability in our networks as well as global partnerships that can be activated in the face of change or energy threats is also important.

Oil and gas can help meet these energy needs and alongside other natural resources such as hydro, solar and wind, form part of our nation's energy portfolio. Ensuring this portfolio includes a diverse range of energy sources is critical to meet the need for uninterrupted supply against the variability and irregularities that can



## WHAT HAPPENS WHEN WE LOSE ACCESS TO GAS?



### MAUI GAS PIPELINE OUTAGE

In October 2011, land movement at Pukearuhe caused a leak in the Maui Gas Pipeline leading to a shutdown that lasted for more than five days. At the height of the outage, all non-residential users in the top half of the North Island were directed to stop using natural gas. This affected electricity generators, hospitals, milk processing plants, bakeries, restaurants, and other businesses reliant on process heat or steam from natural gas-fired boilers.

Whilst the outage did not cause harm to any people, it did cause significant disruption to many businesses and social services. Impacts of the outage included:

- Five Fonterra processing plants and Tatuā's plant ceased milk drying operations.

- Cancellation of some elective surgery at Counties Manukau District Health Board's Manukau SuperClinic for one day, the loss of hot water and heating in the outlying facilities of some hospital campuses, and the disruption of hospital linen services.
- Gas-fired electricity generation north of Taranaki was reduced to zero, causing a temporary shortfall.
- Temporary concerns of food shortages as some commercial bakeries were unable to operate.

The Ministry of Business, Innovation and Employment estimated that the gross economic cost of this disruption was \$200 million, which was largely borne by the dairy industry and large industrials.<sup>1</sup>

occur with renewable sources, for example prolonged windless periods or droughts.

### THE IMPORTANCE OF GAS TO OUR ENERGY SUPPLY

While the vast majority of oil is exported, gas plays a key role in meeting New Zealand's energy needs. All natural gas produced in New Zealand is used domestically, representing 22 percent of our annual energy supply.

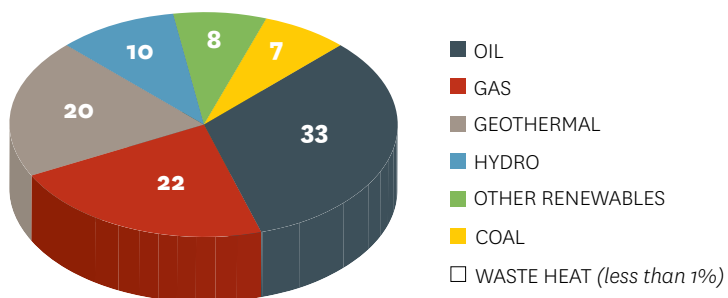
There are around 258,000 natural gas consumers in New Zealand, 95 percent of which are households, though these represent only three percent of total consumption. Natural gas offers instant and continuous hot water supply, heating and cooking. Natural gas is used by around 10,000 businesses – including restaurants and hotels, greenhouses and dry cleaners – and community amenities like hospitals, public swimming pools and schools.

### SECURITY OF SUPPLY

NET OIL IMPORT DEPENDENCY IS 70 PERCENT (2012)

ENERGY SELF-SUFFICIENCY IS 83 PERCENT (2013)

### NEW ZEALAND'S PRIMARY ENERGY SUPPLY (%)



<sup>1</sup> Ministry of Business, Innovation and Employment, October 2012.



*Oil and gas is key to realising goals of lifting the ratio of New Zealand's exports to GDP by 40 percent by 2025.*

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## FOSTERING EXPORTS

New Zealand is a small open economy dependent on commodity exports. Exporting allows businesses to access far larger markets than the domestic economy, providing economies of scale and allowing specialisation in areas of competitive advantage.

By value, half of our exports are milk powder, butter, cheese, meat, logs and fruit. Fifteen percent of exports are from dairy alone. These sectors have served New Zealand well for decades, and will continue to do so, but expose the national economy to risks in terms of international commodity price movements, shifts in market preferences or market access, or climatic change.

Through its Business Growth Agenda the government has set an ambitious target to raise the ratio of New Zealand's exports to GDP by 40 percent by 2025.<sup>2</sup> New Zealand has already extended its export base beyond traditional primary sectors to include horticulture, wine, forestry, fisheries and aquaculture. This is complemented by a strong niche manufacturing sector in resource-based and high-tech areas, and service exports including tourism, education and commercial services.

Achieving the Business Growth Agenda targets will involve expanding of traditional export sectors, and growing others. The nation's natural resource portfolio already makes a significant contribution to New Zealand's exports, but there remains opportunity to generate further export value.

**THE WORLD BANK RANKED NEW ZEALAND THE EIGHTH MOST ENDOWED NATION WITH NATURAL RESOURCES, AND FIRST IN THE WORLD FOR RENEWABLES.<sup>3</sup>**

<sup>2</sup> <http://www.mbie.govt.nz/what-we-do/business-growth-agenda/export-markets>

<sup>3</sup> <http://www.mbie.govt.nz/pdf-library/what-we-do/business-growth-agenda/bga-reports/BGA-Natural-Resources-report-December-2012.pdf>

## OIL EXPORTS

**The value of oil exports in the year to June 2014 was \$1.61 billion.**

Almost all of the oil produced in New Zealand is exported. The relative mix of petrol and diesel we consume in New Zealand, and the configuration of the Marsden Point Refinery, mean that it is better to import crude oil for refining into petrol and diesel, and sell our higher quality oil for a premium to overseas markets.

The value of oil exports has grown significantly since 2007, predominantly due to development of a number of new fields in Taranaki, including Pohokura, Tui, Maari and Kupe.

In the year to June 2013, oil exports generated export income of \$2.0 billion, accounting for 3.7 percent of all of New Zealand's exports. In the year to June 2014, the value of exports dropped to \$1.61 billion. At its 2008 peak, oil exports accounted for 6.7 percent of all exports.

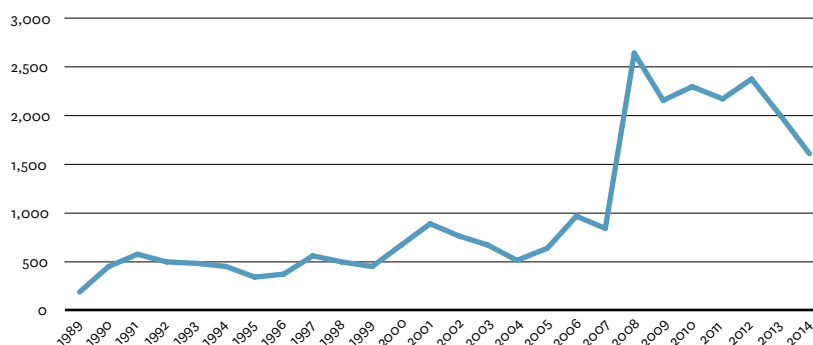
In the 2013 calendar year, 11.36 million barrels of crude oil were exported. Oil exports by volume peaked in 2008 at 19.9 million barrels.

Oil is New Zealand's fourth-largest export after dairy, meat and logs/timber. In the year to June 2014, oil exports represented 3.7 percent of national export revenue.

Increasing oil production represents a significant opportunity to further grow exports. Were a 'second Taranaki' found and developed, economic modelling shows that New Zealand's export revenue could increase by \$1.5 billion for each year of production.

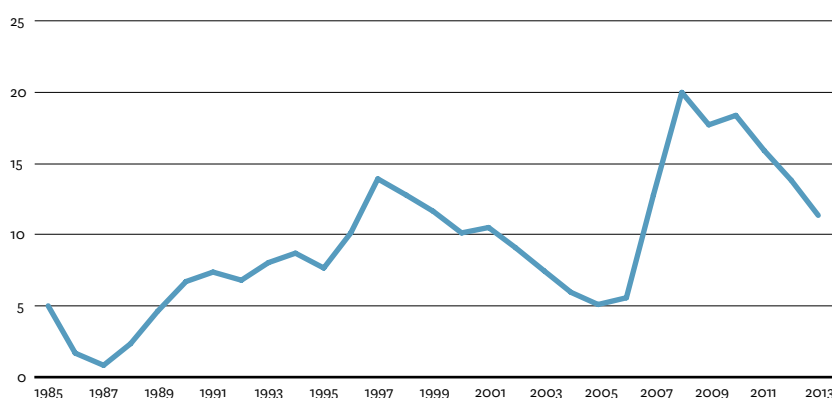
The 2008 increase to \$3 billion in oil and gas export revenue was primarily due to two oil and gas fields coming on-stream, which indicates the profound impact that a major discovery or increased production from existing fields could have on New Zealand's export earning capability. This is in contrast to the productivity and activity efforts required to increase the potential earnings from other industries.

VALUE OF CRUDE OIL EXPORTS, 1989 TO 2014 (\$, THOUSANDS)



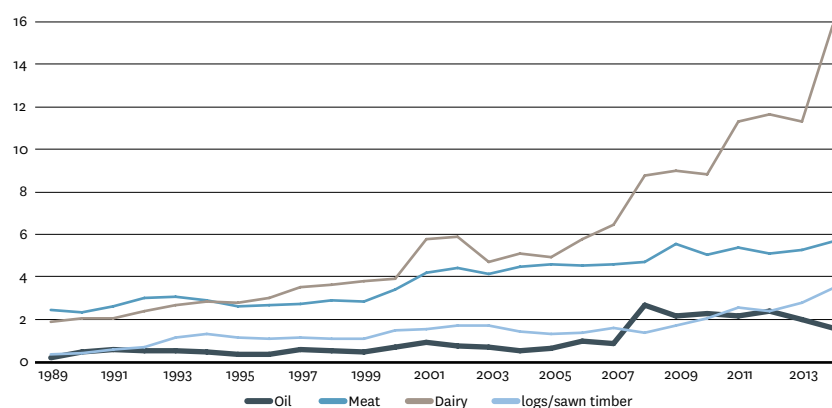
Source: Statistics New Zealand; Note: Year ending June

CRUDE OIL, CONDENSATE AND NAPHTHA EXPORTS, 1985 TO 2013 (MILLION BARRELS)



Source: MBIE

VALUE OF EXPORTS, KEY SECTORS 1989 TO 2014 (\$, BILLION)



Source: Statistics New Zealand. Note: Year ended June. Methanol export values became confidential after 2005.

**THE DISCOVERY OF A NEW FIELD COULD HAVE A SIGNIFICANT IMPACT ON NEW ZEALAND'S EXPORT EARNING CAPABILITY.**

## COMMODITIES

**Methanol produced from gas potentially adds a further \$1 billion to New Zealand exports, while urea production reduces imports by 40 percent.**

Oil exports tell part of the story about the importance of the petroleum sector in New Zealand's export performance, with natural gas completing the picture.

Natural gas is used as a fuel in a number of other production and export sectors:

- Natural gas accounts for almost half the energy used for food processing and a third of the energy used in wood processing, which collectively represent most of New Zealand's exports.
- New Zealand produces and exports a large quantity of methanol from the Methanex plant in Taranaki, all of which uses locally produced natural gas. Methanol exports reached \$260,000 in 2005. Confidentiality means exports are unknown, though based on current production of 2.3 million tonnes at an average price of US\$506 tonne, methanol exports are estimated close to NZ\$1 billion.<sup>4</sup>
- Oil and gas can support import substitution. Urea – a nitrogen-rich compound used in fertilizer – produced by Ballance Agri-Nutrients provides 40 percent of total domestic urea demand, with the remaining 60 percent imported.

There are many smaller export operations reliant on natural gas that do not appear in the national statistics, but are collectively and locally significant. For example, 20 percent of the sugar refined at Chelsea's Auckland facility is exported. The plant operates a natural gas fired boiler.



Ballance Agri-Nutrients' manufacturing plant, South Taranaki.

## ENERGY TRANSITION AND CLIMATE CHANGE

There is growing consensus and aspiration that we are transitioning away from fossil fuels. The question is how long this will take. The International Energy Agency states:

**Fossil fuels currently meet 80 percent of global energy demand. Even if current policy commitments to tackle climate change and other energy-related challenges were put in place, global energy demand in 2035 is projected to rise by 40 percent – with fossil fuels still contributing 75 percent.**<sup>5</sup>

The energy density and transportability of oil makes it an extremely effective transport fuel, and difficult to displace. Hybrid and electric vehicles and biofuels as a transport fuel, are growing rapidly, but face significant challenges in matching the cost and convenience of oil.

In 2011, the International Energy Agency (IEA) released a special report entitled *Are We Entering a Golden Age of Natural Gas?*<sup>6</sup> The report indicates that natural gas will likely play an increasingly important role in future energy, citing uncertainty around energy supply and climate change as key drivers. The IEA predicts that natural gas will overtake coal by 2030 and account for a quarter of global energy supply by 2035. Demand for natural gas is predicted to increase by 2.0 percent

annually, compared to a 1.2 percent increase for all energy types.

According to the IEA, natural gas is a crucial element in maintaining a secure energy supply during the transition to renewables and addressing climate change. Natural gas is relatively abundant and has much lower emissions compared to other non-renewable sources of energy.

In the longer term, renewable energy technologies are the answer to a secure and sustainable energy mix, together with efficiency gains and other low carbon options. Growth in renewables for electricity production is outstripping that of fossil fuels and is expected to surpass that from natural gas and double that from nuclear power by 2016 (IEA, 2013).

Governments the world over are actively supporting renewable energy technologies through investment in science and innovation and providing direct subsidies for use of renewables. Energy companies are making significant investments in renewables, recognising their ongoing relevance requires them to be at the forefront of technology development.

Renewable technology development and manufacturing challenges will draw on expertise and knowledge from fossil fuel technologies. A strategic review would recognise we are in an energy transition, and that all energy sources will contribute to meeting demand and advancing renewable energy technologies during this period.

<sup>4</sup> Based on the Methanex Asian Posted Contract Price over the year to June 2014 and an average conversion of US\$ to NZ\$ of 0.83.

<sup>5</sup> Resources to Reserves 2013, International Energy Agency, October 2013.

<sup>6</sup> World Energy Outlook Special Report 2011, Are we entering a golden age of natural gas? International Energy Agency, June 2011.

## ROYALTIES AND COMPANY TAX

Any company producing and selling oil and natural gas in New Zealand is required to pay a royalty to the government. This ensures the government receives a revenue stream throughout the life of an operation, and benefits in the upside of highly profitable operations. These monies contribute to the delivery of the full range of Crown services that benefit New Zealand.

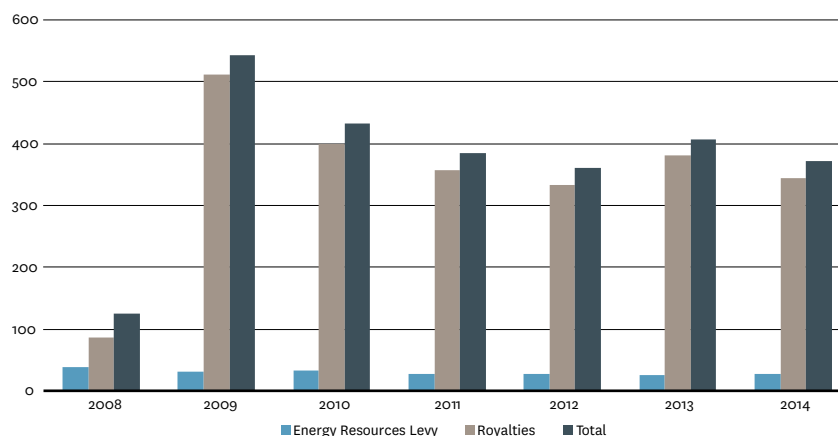
**In the 2013/14 financial year the government received \$371 million in royalties and energy resource levies from exploration and production companies.**

Over the last four years around \$1.5 billion has been collected by the Crown in petroleum royalties and levies. To put this into perspective, this is equivalent to the annual budget for the New Zealand Police.

**PEPANZ estimates the government collects around \$300 million in company tax from E&P companies each year. This is likely to be a low estimate.**

The government also collects PAYE and income tax from those employed by oil and gas companies, and Goods and Services Tax (GST) from sales. The exact amount for these forms of taxes is harder to determine.

### ROYALTIES AND LEVIES FROM OIL AND NATURAL GAS PRODUCTION, 2008 TO 2014 (\$MILLION)



Source: New Zealand Petroleum & Minerals, year ending June

## INTERNATIONALISATION, VIBRANCY AND GROWTH

The oil and gas industry has had a noticeable impact on regional economies, largely due to the cosmopolitan nature of its employees.

In Taranaki the industry makes a key contribution to the region's overall viability and vibrancy by attracting skilled individuals and their families to the region, with benefits in terms of employment and the quality and value of that employment.

A large proportion of the oil and gas workforce are highly-experienced overseas experts who bring with them an international dimension, cultural diversity and new ideas. A number of industry employees apply these skills and experiences across other sectors and throughout the community. They become active participants within the region and often, because of their expertise, take social and community governance roles. Their presence, as a result of oil and gas, has helped Taranaki attract a high calibre of skilled

people – often a significant challenge for smaller regions.

At the same time, locals in the industry often work globally, and in doing so become exposed to international ideas and cultures, bringing these experiences back to the region. Taranaki benefits from this international connectivity which offsets geographic insularity – perceived or otherwise – and encourages diversity.

## REPUTATION AND BRANDING

The concentration of activity within a region and the country has led to the emergence of a reputation for oil and gas-related activity. On a regional basis, the presence of the industry has provided a point of national difference, competitive advantage and brand identity for Taranaki.

This brand has been leveraged to support regional and national efforts in competing globally for investment in exploration and production of oil and gas, as well as for local supply

chain companies to bid for contracts to explore, build, maintain and decommission projects overseas, and for inward skills attraction.

The emergence of Taranaki's brand as an oil and gas destination has been organic, growing over many years alongside the industry, and has been propagated through international connections within and beyond the sector. The region's capability and expertise in the sector, supported by brand awareness as a good place to do business, has helped to open doors for other industries. The presence of global companies further reaffirms regional capability to attract and support major international players, supply chains, personnel, projects and investments.

Taranaki and New Zealand are often cited by the industry as offering a living environment which compares favourably against other bases of oil and gas activity such as the Middle East, Perth, Aberdeen and even Houston. This is particularly true when it comes to the quality of life for families relocating with partners in the industry.



## EXPORT DEVELOPMENT

The skills, technology, standards and capabilities developed through involvement in the oil and gas industry have enabled New Zealand companies to expand and pursue offshore opportunities.

### BUILDING GLOBAL MOMENTUM: JLE

**A** privately owned New Zealand company, the industrial electrical and instrumentation expertise of JLE has been involved in some of the nation's major oil and gas projects.

This has included the provision of specialist project management, material supply, installation, testing and commissioning of instrumentation and electrical works for the Kupe Production Station in South Taranaki and their offshore wellhead platform as well as work programmes associated with the offshore floating vessel/production station (FPSO) for the Tui oil field. JLE's involvement in this latter project commenced in the Kepel Shipyards

in Singapore with scoping and work package development, followed by the supply of electricians, instrumentation technicians and automation engineers to complete the work while the FPSO Umuroa was anchored 52km off the coast of Taranaki over the Tui Oil Field. More recent work has included the provision of instrumentation and electrical expertise for the offshore Maari oil field, Pohokura Production station and Todd Energy LPG Plant.

The wings of JLE have continued to spread around the globe with their company expertise involved in projects in Australia, Papua New Guinea, Canada, United States and Brunei.



The specialist capabilities of industrial electrical and instrumentation company JLE are being utilised in Papua New Guinea to assist with major oil and gas projects.

### A GROWING INTERNATIONAL CLIENT BASE: DFE

**E**stablished in the mid 1980's by New Plymouth businessman Alan McGregor, Drilling Fluid Equipment (DFE) is an original equipment manufacturer of specialised and innovative O&G equipment, especially in the area of drilling fluid handling equipment.

Drilling fluid, often called drilling muds, are used extensively in drilling operations to bring the drill cuttings to the surface during operations. There are requirements for equipment to store drilling fluid and to help with their treatment and disposal. It is in these areas that DFE specialises, especially through the provision of mud tanks and

associated equipment such as screens and shakers. The company has also designed and developed innovations such as a drilling mud temperature control system which is proving popular in the middle east where they are drilling holes up to 5km deep. When drilling at this depth the earth's temperature is higher so additives in the drilling mud need to be kept at a certain temperature otherwise they lose their effectiveness. While its head office remains in New Plymouth, DFE has set up offices in Melbourne and the Middle Eastern country of Oman to service its international client base.



### FROM THINK BIG TO EVEN BIGGER: FITZROY ENGINEERING

**F**itzroy Engineering is a provider of heavy engineering, construction and maintenance services particularly to the O&G industry. Once a small engineering firm, the company developed significantly during the 1970s and 80s working alongside international firms during the development of Maui and Think Big petrochemical plants.

Today Fitzroy employs several hundred personnel and boasts a track record of substantial projects which include construction of the Shell Catalytic Reactor (the largest and most detailed pressure vessel ever fabricated in New Zealand); the provision of fabrication and project teams for the Pohokura re-injection plant, and the 'restart' of the Methanex Waitara Valley as well as turnarounds at their Motunui plant methanol operations.

Being awarded the EPC of the Yolla Mega Module has been a particular highlight for Fitzroy Engineering. This included the construction of a 35m long accommodation unit to be attached to the offshore Yolla gas platform in Australia's Bass Strait enabling the facility to be converted from an unmanned to a manned operation. The completed module incorporated bunkrooms, a state of the art kitchen, mess hall, laundry, gymnasium, offices, associated power and water facilities and even a fire-fighting installation.

The module, which was constructed at Fitzroy Engineering's workshop in New Plymouth, was loaded onto purpose-built heavy lift road trailers, and transported via the city's heavy haul route to Port Taranaki, where it was loaded onto a special heavy lift vessel for transportation across the Tasman.

## BUSINESS, CAPABILITY AND SYSTEM ENHANCEMENT

The specialist requirements of oil and gas have triggered many opportunities for local businesses and overall improvements in their business performance. The high specifications required by the sector have resulted in requirements for suppliers to upskill, enhance their

systems and ensure accreditation meets global standards. This has not only enabled qualified local companies to service the oil and gas industry, but has enhanced overall competitiveness, given many local supply companies the ability to service a diversity of sectors.

### GROWING BEYOND OIL AND GAS: WELLS INSTRUMENT AND ELECTRICAL

Formed in 1984 with a focus on Taranaki's emerging petrochemical and oil and gas industries, Wells gained a number of initial contracts carrying out instrument and electrical work on the gas pipeline block valve and compressor stations and the commissioning activities around the Motunui 'Gas to Gasoline' plant.

More recent projects have included the provision of technical staff to South Taranaki's Kupe Production Station, I&E construction activities at the Contact Energy Stratford Peaker Power Station and an ongoing involvement with WorleyParsons and the STOS Integrated Services Contract.

This experience, and the positive track record built throughout the oil and

gas industry over the last thirty years, has positioned Wells as one of the key companies in Taranaki's supply chain.

While the oil and gas industry has been the backbone of the company's growth, it is the exposure to the industry's stringent health, safety, quality and business management systems that have had a bigger impact – opening doors to broader energy and industry projects and becoming an integral part of Wells' philosophy, competitive advantage and point of difference.

The company has benefited not only from the oil and gas work itself, but the opportunities to build long-term, mutually beneficial relationships with new clients across other industry sectors.



### BEYOND Y2K: ECL

From humble beginnings solving Y2K issues in a Taranaki garage, ECL has grown to become one of New Zealand's foremost instrument and control specialists in the oil and gas industry. The Millennium Bug gave founders Guy Heaysman and Greg Chapman an opportunity to introduce their expertise and build solid relationships across Taranaki's oil and gas and other industries. From there, the number of O&G industry customers grew to the point the pair required additional staff, outgrowing the garage.

ECL specialises in process control and automation. Each plant has a distributed control system with the software that runs the plant written and commissioned by ECL to enable it to run automatically and safely across the lifespan of the project – from delivery to installation to ongoing maintenance. Recent successes include involvement in the development of the Todd Energy MET2 and Mangahewa Field developments.

Their work has extended from the Kupe Production Station to working on the Cheal Production Station, from green field site to operation. Today Guy and Greg are joined by a team of over 25 engineering staff, and have established an Australian office exporting its O&G expertise across the Tasman.



**EXPOSURE TO THE HEALTH, SAFETY, QUALITY AND BUSINESS SYSTEMS THAT HAVE COME WITH THE OIL AND GAS INDUSTRY HAVE MADE A BIG IMPACT ON WELLS' PHILOSOPHY AND COMPETITIVE ADVANTAGE.**



## TECHNOLOGY AND INNOVATION

Transferability of skills and capabilities into other energy projects, such as geothermal, marine and wind, is also occurring. A number of Taranaki businesses have become involved, adapting their knowledge to advance energy projects nationally and internationally.

The presence of O&G projects and their international connections have catalysed the introduction of new technologies, requiring innovative solutions and encouraging technology stretch.



### CAPABILITIES FROM OIL AND GAS DRIVE GLOBAL WAVE ENERGY: EHL

Taranaki-based EHL Group (EHL) is demonstrating how the smarts they utilise in the O&G industry can be diversified to foster global ground-breaking developments in wave technology.

Known for their ability to design and manufacture high quality motion and control solutions for the oil and gas industry in New Zealand, EHL is now at the forefront of innovative automation and motion and control developments for wave energy conversion, currently being tested in the US – one of the world's biggest and most important energy markets.

The wave energy converter extracts as much energy as possible from waves and their variety of motions. This includes 'heaving' (up and down wave motion), surges (back and forth) and those that 'pitch' (roll back and forth). Moored to the sea floor in an upright position, the wave energy device converts the energy from these movements into electricity via a system of on-board hydraulics.



### APPLYING INNOVATION UNDERGROUND: KAPUNI

New high-resolution seismic imaging entailing Dual-well walkaway Vertical Seismic Profiling (VSP) was utilised by the operators of the Kapuni field in Taranaki to gain a better understanding of the gas reserves of this mature field (discovered in 1959, Kapuni is New Zealand's longest serving field). This is the first time the cutting edge technology has been applied in New Zealand, and is only the second time it has been utilised in the world.

Led by Shell's local team, several dozen overseas experts stayed in Taranaki for several weeks. The project enhanced both national capability by providing team members with exposure to some of the most innovative and leading-edge technology currently available in this field), and showcased New Zealand to the international experts as being a progressive and welcoming location to test innovation and where international technology providers can do business.



### WHERE LOGISTICS MEET INNOVATION: SYMONS TRANSPORT

Symons Group is a Taranaki family business operation which began with the establishment of Symons Transport in 1984. Since then business has grown substantially and provides extensive services to the energy sector. One of Symons Transport innovations is a new type of road tanker specifically developed to carry the Cheal crude from the production station to the tank farm, by Port Taranaki, ready for export. Cheal oil is a typical Taranaki waxy crude that hardens to the consistency of shoe polish unless it is kept warmer than 40 degrees Celsius. While TAG Oil keeps the Cheal crude hot enough in its onsite storage tanks, Symons Transport's new "double walled" tankers significantly reduce the temperature drop off compared to previously used transportation methods, ensuring the crude remains in a more liquid state during transportation which greatly assists mobilisation and unloading of the product at its destination.

## DIVERSIFICATION AND TRANSFERABILITY

The presence of the oil and gas industry helps provide economic diversity which can ease the impact of market and supply peaks and troughs exacerbated by dependency on only a few industries.

Oil and gas also provides the potential for its industry techniques and capabilities to be applied and adopted in

other industries and for other purposes. The technology requirements have added to New Zealand's engineering capability and are transferable to other industries such as those which involve the containment and transportation of high pressure products.

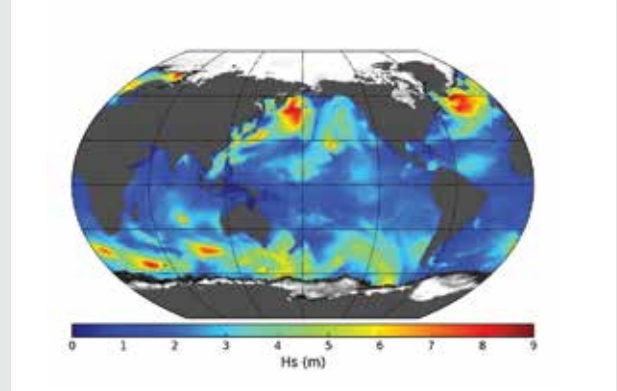


### FROM OIL AND GAS TO THE DEFENCE SECTOR: EHL

**E**HL has worked closely with the NZ Defence Force on improving technology on Navy ship HMNZS Canterbury. Through designing, building and installing the Navy's two automated gangway systems EHL has been pivotal in advancing the Navy's capabilities, and reducing their requirement for multiple staff being involved in a process, to a mere few. Health and Safety was a big factor in advancing these systems; the less human input the less risk to their personnel.

The diversity of EHL's skill-set and proven ability to work in high-risk sectors, such as the oil and gas industry, have been pivotal in the company's success.

EHL has since gone on to design further products for the Navy, including a stabilisation device for their Landing Craft, Mechanised (LCM). Again, personnel safety was a number one priority in improving the launch process.



### PROVIDING ENVIRONMENTAL GUIDANCE THROUGH SCIENCE: METOCEAN SOLUTIONS

**M**etOcean Solutions are an innovative team of scientists offering high quality environmental data, weather forecasting and numerical modelling services to the offshore O&G and maritime industry. The Managing Director, Dr Peter McComb, is an O&G industry veteran with over 25 years' experience.

The science team analyse the historical ocean weather and wave conditions for any location on Earth, and produce very specific guidance for all aspects of offshore operations, such as expected extreme weather conditions, downtime and waiting-on-weather scenarios, oil spill trajectory and dispersal of drill cuttings. The company's high-resolution forecasting capability provides invaluable information to inform response strategies and operational requirements in emergency situations and was put to good use by Maritime New Zealand in the Rena grounding incident.

The innovative environment of MetOcean Solutions attracts talented scientists from round the world to their offices in New Plymouth and Raglan. The team of 24 leverages the latest developments in science and technology to provide a world-class R&D facility that is focused on solving real-world problems for ocean-based industries.

In 2013, MetOcean Solutions extended its services and global reach through a partnership with the New Zealand Meteorological Service, who are now a 49% shareholder in the company. The combined expertise in meteorology and oceanography is now exporting a new generation of powerful weather intelligence to the world.

## HEALTH AND SAFETY

Because of the risks associated with the oil and gas industry, great emphasis is placed on the development and adherence to rigid environmental and health and safety standards. Due to this, the industry has substantially raised awareness of environmental and safety issues.

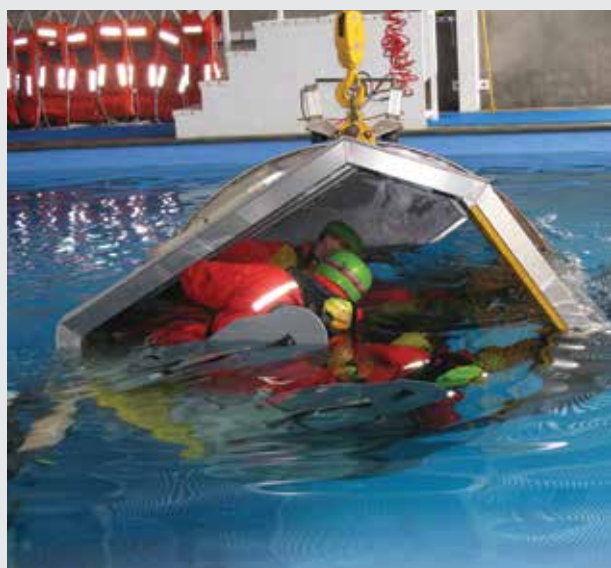
This has permeated their extensive supply chain network and in the case of Taranaki, has become an integral component of the region's DNA. The health and safety experience of companies involved in the oil and gas industry is not only considered advantageous to their operations but increases their competitive advantage in other sectors given its increasing significance.



### SAFETY A PRIORITY: SHELL NEW ZEALAND

**OUR FOCUS ON THE SAFETY OF OUR BUSINESS AND PEOPLE IS OUR PRIORITY. WE HAVE THE MOST ADVANCED SAFETY SYSTEMS AND WE CONSTANTLY TRAIN AND EXERCISE TO MAKE SURE EVERYTHING IS WORKING AS IT SHOULD. AS A COMPANY WE SEEK TO IMPROVE ALL THE TIME.**

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### UNDERWATER HELICOPTER TRAINING

*Helicopter Underwater Escape Training showcasing people in the pool getting 'out of the helicopter' as part of the specialist simulation training facilities provided by Ultimate Safety Training and Consulting based in New Plymouth. The facility prepares people for extreme conditions and potential real life situations.*



### BUILDING HOT FIRE RESPONSE: ULTIMATE SAFETY

*Specialist 'hot fire' training facilities are available at Ultimate Safety Training and Consulting in Taranaki for the O&G industry. This knowledge is being leveraged by other industries.*

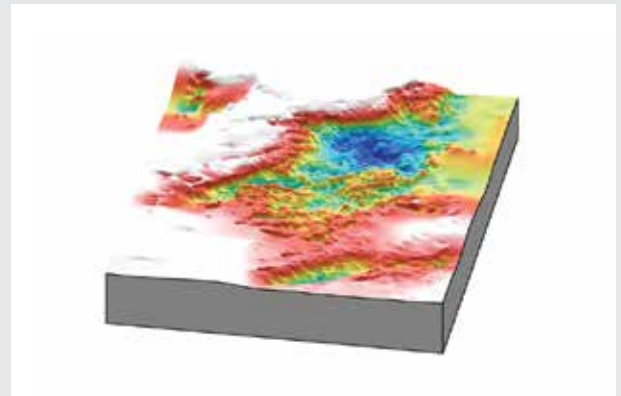
## SCIENCE, KNOWLEDGE, TRAINING AND CAREERS

The presence and potential of the industry has driven knowledge and skill development across a range of disciplines within New Zealand's research, education and business communities. Furthering understanding and skill development in relation to leveraging New Zealand's natural resource, science, engineering, energy potential are encouraged.

Industry scholarships, papers and electives, trades and training have been introduced at tertiary level, including universities and polytechnics and through industry training

organisations. Specialised industry-specific training facilities and initiatives have been established which have been leveraged by other sectors.

Crown Research Institutes, such as NIWA and GNS Science provide scientific activities which build understanding of New Zealand's petroleum resources, their potential and relationship with the environment. Research by GNS played a major role in New Zealand's successful bid to the United Nations to extend the offshore territory beyond its EEZ.



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### DEVELOPING A NICHE: IPL

**E**stablished in 1999, *Independent Petroleum Laboratory Limited (IPL)* is New Zealand's specialist petrochemical testing laboratory. The company has labs in New Plymouth and Northland and their chemists and laboratory technicians are used by the upstream oil and gas industry to perform crude assay analysis. A crude assay is the "evaluation" of a crude oil. This specialised analysis enables the oil and gas companies to determine the suitability of the crude for its end use and to help predict the commercial value of the crude. They can also use the data obtained from a crude assay to identify changes over time in the hydrocarbon quality. Finally, oil traders will use the data to find an appropriate market for a crude.

*IPL* is the only company in New Zealand to offer this type of analysis and one of the few to hold this type of technology in the southern hemisphere. Without the expertise and investment of the company in bringing this valuable testing capability to New Zealand, such specialist analysis would have to be undertaken overseas.

### BUILDING UNDERSTANDING OF NATURAL RESOURCES AND HISTORY: GNS

**S**eismic data collected for the purpose of understanding our oil and gas reserves is also being used by GNS scientists for enhancing knowledge in other ways which will be beneficial for New Zealand and its future. For example:

Work on the offshore fault systems of the East Coast Basin, using oil and gas industry seismic data is contributing to assessments of earthquake risk from faults in the accretionary wedge, such as the Lachlan and Kidnappers Fault. There has been similar work done in the offshore Wanganui Basin, also using oil and gas seismic data.

Paleogeography/paleobiology work which utilises outcrop mapping as well as oil and gas drillhole data, has helped to inform the debate on whether Zealandia was ever completely submerged beneath the sea. These results are also contributing to models for assessing the distribution and evolution of terrestrial species in ancient NZ.

Related work being undertaken on the paleoclimate since the Cretaceous Era is also informing GNS scientists on past extremes in global temperatures and circulation systems that serve as insights on future planetary response to climate change.

## TEACHING INDUSTRY SKILLS

Recognising the importance of offering comprehensive industry-based training for the oil and gas sector, Taranaki's central tertiary provider the Western Institute of Technology (WITT) has introduced two oil and gas operations training programmes.

The pre-employment training provides new entrants to the industry with the skills to hit the ground running, with the Certificate in Process Operations (Oil & Gas) and Certificate in Industry Trades (Hydrocarbon Drilling) both

being offered at level three, spanning 32 and 17 weeks of training respectively.

Both programmes have extensive on-job learning components, underpinned by strong industry collaboration and support.

With courses covering everything from an industry overview to drilling equipment, chemistry and gas testing to permit, and safe working methodology, the next generation of industry workers look set to hit the ground running.



WITT also offers courses in engineering, electrical, welding, civil engineering and other skills necessary to grow both the industry and its supply chain.



## MAKING THE CLASSROOM COME TO LIFE: VAUSE TRAINING

The Vause O&G training centre, based in Bell Block, New Plymouth, is unique in the southern hemisphere. Not only does the facility provide modern classroom facilities but theory is balanced with a practical learning environment. Participants have the opportunity to see, touch and utilise the actual equipment utilised in the O&G industry. The centre boasts its own 'Christmas tree' atop a 300 metre training well, plus it has a practical workshop set up for groups of students to work on stripping and redressing the range of downhole tools they will be running in wells. The simulation attributes of the centre mean that trainees can learn safely and still experience 'genuine' equipment so when they go out to the workplace they are in a more work-ready state.

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A Methanex scholarship programme, in partnership with the Petroleum Skills Association of New Zealand, provides two \$5000 scholarships to undergraduate tertiary students, who are also offered summer work at the Motunui plant.

## INVESTMENT IN THE COMMUNITY

In addition to their commercial investments, the oil and gas industry makes substantial contributions to many community initiatives, events, social and education programmes. In the case of Taranaki, these investments have contributed significantly to the vibrancy of the region, across both economic and social spheres. Here are some examples:



### LINKING ENGINEERING AND ART

*The strong links between regional innovation, engineering skills and the global energy sector have been recognised in a major partnership between Todd Energy and the Len Lye Centre, a spectacular new addition to New Zealand's creative sector.*

*Integrated into the long-standing Govett-Brewster Art Gallery, the art museum will establish a centre for the exhibition, research and development*

*of kinetic art works and films of New Zealand-born artist Len Lye (1901-1980), a pioneer in both film and moving sculpture.*

*Todd Energy is the sole founding partner of the Len Lye Centre and naming partner for the centre's foyer and learning centre. Their support enabled the project to begin after decades of planning, and will add cultural, innovative and lifestyle vibrancy to New Plymouth.*



### BRINGING THE WORLD TO WOMAD

*Of the five major festivals the Taranaki Arts Festival Trust delivers in Taranaki, WOMAD – the World of Music, Arts and Dance – is the biggest, and since 2003 has attracted over \$4 million in sponsorship from the oil and gas industry. While WOMAD annually injects more than \$10.5 million in economic benefit into Taranaki, its contribution to regional vibrancy and changing people's perspective of Taranaki are seen as more important outcomes. "This commitment from the sector to making this region vibrant, economically healthy and a fun place to work and live has meant their support of the arts is enviable throughout New Zealand," says TAFT chief executive Suzanne Porter.*



### TRAINED TO MONITOR THE MARINE ENVIRONMENT

*Recognising the role of Māori as Kaitiaki – guardians – of the land and marine environment drove Maryjane Ngaone Waru, of Ngāti Rahiri, to become one of the first two Māori Marine Mammal Observers in New Zealand. Maryjane was encouraged and supported by Shell to gain the qualification, and is now looking forward to getting out on seismic boats around New Zealand to monitor marine life. The link between Shell and the Ngāti Rahiri Hapū is longstanding – the Pohokura natural gas field sits within their rohe.*



### RESTORING SANDY BAY

*A community partnership between neighbours, the Taranaki Regional Council, Department of Conservation, local schools and community groups, and STOS has transformed the point at which the Maui gas pipeline reaches shore, just north of Opunake. Since the 1980s the Ngāti Tara Sandy Bay Society has been actively restoring the area with extensive planting in the dunes. The sustained efforts have resulted in a more stable coastal environment which offers a protected habitat for species such as the gold stripe gecko and a range of sea birds, as well as a focal point for the local community in retaining a unique landmark.*

## SUPPORTING THE WHOLE COMMUNITY

A long-term relationship between Iwi group Ngaruahine Maatua Whangai and the Kupe Joint Venture Partners has helped to deliver a comprehensive programme to improve the community. Over the last 30-plus years, Maatua Whangai – a voluntary organisation – has run youth initiatives, and with the support of the Kupe Project has been able to extend activities to train volunteer youth counsellors, offer financial literacy programmes and assist the elderly. The philosophy of Maatua Whangai is one of inclusion with assistance being available to any person, regardless of their ethnicity or Iwi affiliation, which means their services are reaching right across their South Taranaki community.

## RELOCATING RARE BIRDS TO ROTOKARE

Rotokare Scenic Reserve is a 230-hectare forested catchment 12km inland from the South Taranaki town of Eltham. Protected by more than 8km of predator-proof fence, the reserve has become a haven for regenerating native species. In May 2014, following more than a century of extinction in Taranaki, Tieke (Saddleback) were returned to Rotokare, and Popokatea (Whitehead) were reintroduced. Early monitoring reports that both species are settling into their new environment with numbers growing. The project was supported by international E&P company OMV, who have had a long relationship with the Rotokare Scenic Reserve Trust.

## TAKE A KID MOUNTAINBIKING

Training company Wood Group PSN has helped Taranaki Mountainbike Club's annual Take a Kid Mountainbiking event get more kids riding bikes and building skills to enjoy themselves safely, with sponsorship of the event encouraging and rewarding participants through a range of prizes.

"Being socially responsible is integral to what we do," says Kerry Martyn, Wood Group PSN General Manager. "We aim to make a positive difference to the communities where we operate and seek ways to assist them, and building kid's skills and safety in a fun way is at the heart of what we're about."

## SUPPORTING THE BUSINESS COMMUNITY

Having the oil and gas industry as part of Taranaki's regional economy has made a difference to businesses of all shapes and sizes.



### ACCOMMODATING INDUSTRY GROWTH

Stratford's Amity Court Motel opened in 2009 and since then has ridden a wave of increased oil and gas and energy sector project and production work in central Taranaki.

"We're seeing a lot of subcontractors to the sector staying here – from mud loggers, drillers through to management," says manager Jason Kowalewski. "It's helped us launch our business strongly, and the momentum from the sector has helped us grow and progress our own projects which will benefit the community in the long term. This would not be possible if we did not have their industry here."



### BENEFITS COME IN MANY SIZES

The energy industry and its impacts on population and the accommodation sector have created a growing market for La Nuova Apparelmaster.

"We deal directly with the industry, engineering and support companies, right through to the cafes and motels that look after them," says director Brad Craig. "Our services range from overalls and safety gear for industrial sites to suits worn in the corporate offices to the linen used in the accommodation providers."

Recognising customers' commitment to managing environmental impacts La Nuova has built the most environmentally awarded laundry in New Zealand.



### BLACK GOLD OF A DIFFERENT TYPE

For the Empire Tea Room's Colin and Pam Webby business is driven by a different type of black gold. Their cafe's location, metres from a number of Taranaki's oil and gas company offices, has seen their coffee sales defy economic fluctuations since they bought the business in 2007.

"We see a lot of people from across the industry every day, and a lot of meetings are held here," Colin says. "But the business also benefits in other ways, like the events that the industry supports – for instance WOMAD is our busiest weekend. It's different to the other parts of the country we've worked in."

# AROUND NEW ZEALAND

What's happening exploration-wise around New Zealand.



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**T**hough New Zealand's commercial oil and gas production has centred on the Taranaki region, there is a growing level of activity around the nation.

## TARANAKI – PUNCHING ABOVE ITS ECONOMIC WEIGHT

Statistically Taranaki has a small population and number of businesses – around 2.5 percent of the nationwide total – but neither measure accurately reflects the strategic importance of the region to the nation's current and future economic development.

To date, all of New Zealand's commercial oil and gas discoveries and production have been in the Taranaki region. Oil from the region is the nation's fourth highest export earner and natural gas from Taranaki's fields heats households, powers businesses, energises manufacturing and electricity plants. It even fires up the barbecue. Taranaki's oil and gas industry is crucial in ensuring the energy supply that supports our economic growth as well as our social activities and wellbeing.

Royalties are paid to the Crown which are then redistributed through the full range of government services for the benefit of all New Zealanders. In the 2013/2014 year royalty payments amounted to \$371 million.

The region has an extensive system of infrastructure and capability that supports the industry, including oil and gas production and storage facilities, facilities at Port Taranaki and pipelines that transport gas throughout the North Island.

Manufacturing plants such as Methanex and Ballance Agri-Nutrients are large companies that exist in New Zealand because of the availability of local gas, which is used to create added-value products such as fertiliser and urea which in turn adds to the productivity of New Zealand's farming industry, and methanol, which is a significant export earner.



Also domiciled in the Taranaki region are most of the exploration and production companies and the supply chains and capability that support the industry. Taranaki accounts for over 4,300 of the 5,068 FTEs directly employed in the industry. These are high calibre skilled individuals that add to New Zealand's professional, engineering and scientific talent and their projects both attract new technologies to the nation and foster local innovation.

Their presence, combined with the proven and developed reserves of Taranaki's fields and the associated infrastructure, create a more attractive investment proposition for international explorers to come to New Zealand.

While the Government promotes the nation's prospectivity potential and industry-friendly policies, Taranaki reaffirms to the potential investor the track record of New Zealand's reserves, and provides developed infrastructure, specialist skills and capability and established systems, lowering the risk for the investor and enhancing the attractiveness of New Zealand's proposition. The reputation and track record of Taranaki is critical to assist in this process as it is not always the country that is the focus but the prime hub within a nation.

***Few other industries have the same potential to radically transform New Zealand's economic and social wellbeing, should anticipated reserves be successfully developed. To achieve transformation, New Zealand must successfully attract exploration investment from a globally competitive arena, and Taranaki's track record can help make this happen.***

Consequently, Taranaki plays a key role in the past, present and future of the oil and gas activity and industry in New Zealand. As more exploration activity occurs outside the region, the lessons learnt, industry expertise and infrastructure that exists in Taranaki will be further leveraged to attract and support oil and gas activity throughout the country, enabling New Zealand to



## TARANAKI'S OIL AND GAS INDUSTRY SUCCESSES AND EXPERTISE HAVE MADE A SIGNIFICANT CONTRIBUTION TO THE NEW ZEALAND ECONOMY, AND WILL PLAY A PIVOTAL ROLE IN ATTRACTING FURTHER INVESTMENT.

capture a greater share of the economic activity the industry generates. As the industry grows into frontier regions, more local businesses will build the capability and capacity to secure project work locally and offshore. New Zealand will achieve its growth aspirations, creating jobs, skills, wealth and export development.

### **Taranaki's current contribution:**

- Royalties: \$300-\$400 million annually – into government accounts
- Export earnings: oil and methanol 4<sup>th</sup> highest
- Talent centre: unique expertise, technologically advanced, globally connected.
- Energy security: major contributor to domestic and industrial energy supply

### **Future economic transformation enabler:**

- Key asset in bid to unlock New Zealand's petroleum potential
- Proven oil and gas region
- Brand Taranaki (O&G) = Brand NZ (O&G)
- De-risks inward investment
- Adds weight to New Zealand's offering.

### **ECONOMIC SIGNIFICANCE OF THE EMERGING REGIONS**

Whereas Taranaki has traditionally been

the focus of oil and gas activity there has been increasing investigation and exploration of the potential reserves in frontier locations such as the east coast of the North Island, the Great South Basin off the South Island and offshore Northland. Commercial discoveries in other parts of New Zealand could significantly contribute to the regional economies in those areas, potentially proving a game changer on a range of levels spanning export earning, employment and lifestyle growth and energy supply.

Supported by a proactive government campaign centred on the nation's petroleum potential, greater information is now available to investors about the diversity of opportunities available throughout New Zealand, promoted through the annual Block Offer. This multi-basin approach is paying off with greater levels of investor and exploration interest spread across both traditional and frontier areas, on and offshore and within and beyond the Taranaki region.

Many exploration and production companies are currently in very early stage investigations of these emerging regions, mostly comprising initial data gathering, consenting activities or enquiries, undertaking company establishment, seismic surveys and analysis, community and stakeholder engagement and in some localities, drilling activities.

# WHERE IS THE ACTION?

## NORTHLAND & REINGA BASIN

The Reinga Basin extends to the north of the Taranaki Basin for approximately 750km to the Norfolk Ridge, at the limit of New Zealand's economic territory – a total area of about 170,000 km<sup>2</sup>.

There has been limited exploration activity with just four wells drilled in the area, none of which have led to commercial development. In 2009 the government commissioned a seismic survey of the area and published the findings. Interest in the Basin is increasing with further prospecting committed.

## TARANAKI ON & OFFSHORE

The traditional area of focus for much oil and gas exploration and New Zealand's only producing basin to date, Taranaki is the hub of the nation's industry expertise and infrastructure. The region is still considered under-explored by global standards with potential for further discoveries, particularly across the deepwater frontier.

## CANTERBURY & GREAT SOUTH BASINS

The little-explored Canterbury and Great South Basins sit over a large area of nearly 400,000 km<sup>2</sup> to the southeast of the South Island.

Fourteen offshore exploration wells have been drilled to date, and while all have identified a petroleum resource, none

have yet been determined commercially viable. Despite this, the geology and information gained through the seismic surveys and exploration wells to date have created strong interest in the area, with a number of new exploration permits being awarded in recent Block Offers. This area is a particular focus for offshore and deep-water exploration.

## EAST COAST & PEGASUS BASINS

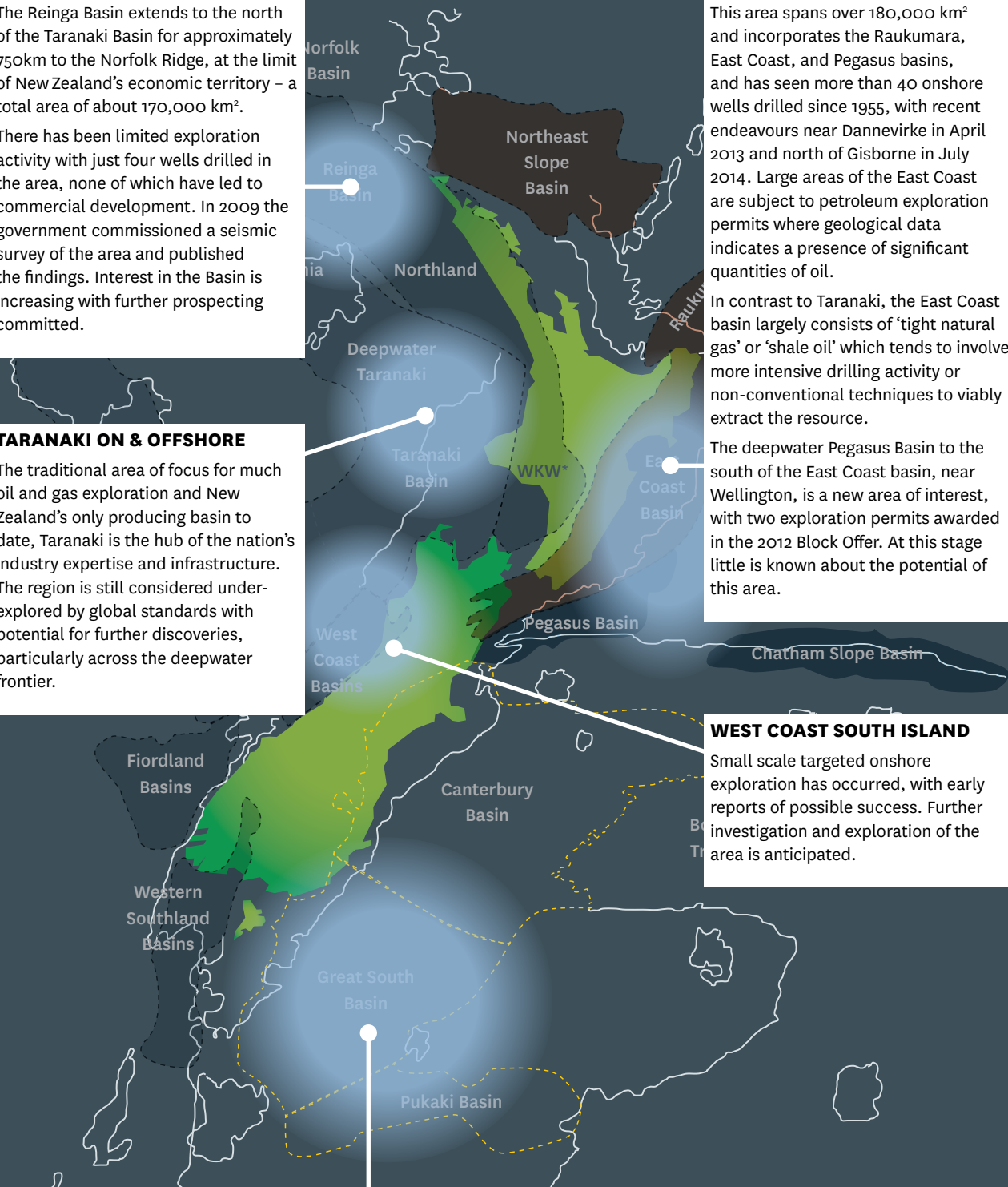
This area spans over 180,000 km<sup>2</sup> and incorporates the Raukumara, East Coast, and Pegasus basins, and has seen more than 40 onshore wells drilled since 1955, with recent endeavours near Dannevirke in April 2013 and north of Gisborne in July 2014. Large areas of the East Coast are subject to petroleum exploration permits where geological data indicates a presence of significant quantities of oil.

In contrast to Taranaki, the East Coast basin largely consists of 'tight natural gas' or 'shale oil' which tends to involve more intensive drilling activity or non-conventional techniques to viably extract the resource.

The deepwater Pegasus Basin to the south of the East Coast basin, near Wellington, is a new area of interest, with two exploration permits awarded in the 2012 Block Offer. At this stage little is known about the potential of this area.

## WEST COAST SOUTH ISLAND

Small scale targeted onshore exploration has occurred, with early reports of possible success. Further investigation and exploration of the area is anticipated.



There has also been heightened public awareness of the oil and gas upstream industries, particularly within these regional communities.

Local and central leadership have adopted a proactive approach to fostering understanding of the oil and gas industry, including regional implications, challenges, requirements and potential benefits within these frontier localities. This has included investigations to better understand the geology and science of the resource, hosting public forums about the industry, undertaking reviews of regional plans and regulations, consideration of future implications for infrastructure, community social and economic possibilities and visits to Taranaki to view industry activity first-hand, meet with regulators, businesses and stakeholders.

## TARANAKI'S EXPERIENCE

Emerging oil and gas regions are leveraging Taranaki's experience in terms of systems, capabilities and specialist skills as well as potential regional development implications. There is opportunity and benefit attached to collegiality between regions, sharing lessons and achieving system efficiencies.

This is not to say that the 'Taranaki way' should or could be replicated by those areas as regional differences exist including geological variations as well as divergent economic, social and cultural circumstances and aspirations.

What can be taken from Taranaki's experience is the region's recollection of the emergence of the oil and gas industry and the development of knowledge, systems, infrastructure and capabilities through a steep learning curve, to evolve from what was predominantly a dairy region to also being an energy province. And this journey is ongoing.

Some specific lessons acquired about the oil and gas industry include:

## TARANAKI HAS HAD TO EVOLVE FROM A PREDOMINANTLY DAIRY REGION TO ALSO BEING AN ENERGY PROVINCE. THIS JOURNEY IS ONGOING.



***“To some extent both the oil exploration companies and local authorities in the 1970’s grappled in deciding their respective stances towards each other as onshore development began to mushroom. It is no secret there were some problems, divergent views and results that probably pleased the media more than any other party...”***

***Billions of dollars have been invested in pursuit of these valuable commodities, which has resulted in hundreds of new jobs, changed the landscape of parts of the region and given a high profile to Taranaki. The socio-economic effects have been more positive than negative.***

***The need for and impact of energy developments seems likely to increase, with further challenges, risks and benefits ahead. We should be able to face these with confidence and optimism, based on our experiences in Taranaki.”***

*Extract of paper presented by former Stratford Mayor David Walter at the 1994 New Zealand Petroleum Conference (abridged)*

### Managing expectations is important

- Oil and gas exploration and development takes time
- The impacts of the industry are gradual and do not occur overnight
- Reactions to possible regional outcomes in the face of exploration activities can reflect the extremes – either ‘really good’ or ‘really bad’ consequences
- There can be visions that a region will turn into a ‘Saudi Arabia’ when the reality is usually more a case of ‘a hole here’ and ‘a hole there’
- Providing perspective and facts is important
- It is important that the community plans ahead, is informed and aware

The presence of the oil and gas industry does not lead to overnight riches, successes or immediate changes to a regional economy. It has taken Taranaki over 30 years to evolve a track record, expertise and significant economic gains from the industry's presence. There will be successes and there will be dry holes. Of those which are successful, it is a long process for the company to assess and develop the identified resource. Seldom are all the answers known from the outset, such as implications for communities, anticipated job numbers or infrastructural requirements.

Furthermore, decisions are often global, and investors will often weigh up development of their New Zealand discovery against other global opportunities: a find may not be in

sufficient levels or cost-effective to commercially develop, timing or other conditions may not be right, or it may not be a priority relative to other global opportunities.

**The importance of the supply chain**

- Industry preparation will assist local content opportunities
- What is acceptable in other sectors won't cut the mustard in oil and gas
- There are high standards, especially around health and safety work practices
- Partnerships with experienced supply chain companies are recommended

Although focus is often on the E&P companies, it is the supply chain which is key to local content and contractual opportunities. While there are likely to be few employment opportunities in the initial exploration phase, due to the short term and specialist nature of tasks involved, where development proceeds there could be greater potential for local companies to become involved in

facility construction and ongoing site maintenance.

Supply chain work tends to be project oriented, and not full-time or ongoing. Therefore oil and gas work should be supplementary to other work the supply chain company undertakes across a diverse mix of clients and sectors. Those new to the industry or seeking work for the first time may find securing work in the industry challenging due to the high standards, health and safety requirements and prior experiences required. Building collaborative arrangements with experienced supply chain companies – such as those established in Taranaki or offshore – may offer the best entry strategy for local businesses.

**Regional development – the biggest benefits may prove the least quantifiable**

Though the focus of local long-term benefits seemingly lies with jobs, there are often many less tangible or quantifiable outcomes, including:

- The attraction of new families to live in the area
- Fresh ideas and global expertise on boards of schools, voluntary groups and other leadership involvement
- Improvements in the general housing stock
- Involvement of the industry in areas like arts, events, sport and education, and social welfare initiatives
- Contributions to a diversified and well-rounded community
- Underpinning the demand for air transport and public services including building special elements of capability in health, police, fire, training/polytechnic and other social services.

Benefits to a region will extend beyond jobs to a wide range of economic and social impacts, many of which are not quantifiable but should not be underestimated. For example, communities can benefit from an emphasis on the value of skill sets

**ALTHOUGH FOCUS IS OFTEN ON THE E&P COMPANIES, IT IS THE SUPPLY CHAIN WHICH IS KEY TO LOCAL CONTENT AND CONTRACTUAL OPPORTUNITIES. BUT WHAT IS ACCEPTABLE IN OTHER SECTORS MAY NOT CUT THE MUSTARD IN OIL AND GAS. THERE ARE VERY HIGH STANDARDS ESPECIALLY AROUND HEALTH AND SAFETY PRACTICES.**



such as science and engineering, international connections that foster lateral thinking, the introduction of new ideas that can challenge the insularity of a region and its people, and a greater consideration of health and safety across businesses, workforce, families and the community. These factors have become part of the Taranaki 'DNA' and have demonstrably contributed to the region's economic and social fabric.

### Risks and responsibilities for emerging regions

The arrival of the oil and gas industry, albeit over what is often a prolonged time frame – the process from exploration to production can take many years – also brings with it a number of other requirements and risks that need to be considered at a regional level.

- There is the potential for industry intensification around communities and sensitive areas, with noise, safety, roading, infrastructure and lifestyle implications
- Due to the project nature, workload peaks and troughs may result in workforce and economic implications
- Although the industry is highly health and safety conscious and the likelihood of something going wrong is extremely small, there is the possibility of a high-risk event which, if it does occur, could have catastrophic consequences from environmental and human perspectives
- Challenges and interface with other industries and resources (real or perceived), such as the dairy industry
- The need to keep pace with the changing nature of the industry, and regional implications
- Building a comprehensive understanding of the industry, how it operates and its global interface is necessary to understand its differences from other industries while also avoiding the 'halo' effect of creating a different focus/treatment when it should be considered on the same basis as other industries.

- The responsibilities and capability enhancements as well as implications for regional planning, policies and infrastructure can be significant for smaller local authorities

**A key step in addressing risks and responsibilities is ensuring that regional leaders and regulatory agencies have the credibility and capability to understand the industry and its systems, and interface with international staff. Collaboration across central and local government is also important.**

### The industry is not homogenous

- While exploration and production companies may share commonalities, they are also a diversified unit in terms of their values, community approach, methods of work and investment in new technologies, capabilities and international management expertise

There is a stereotypical view of the industry that it solely comprises major international companies. The reality however is that the sector is made up of a wide range of business sizes and ownership models: some are New Zealand owned and may be listed on the stock exchange, many are small and face the challenges of any small business. While direct staffing levels may be minimal, E&P companies usually make extensive use of contractors.

Caution should be exercised when applying generalisations about global oil and gas activities and practices to New Zealand. What occurs in other parts of the world may be specific to that country, geology, culture, circumstance or regulatory regime – and may differ to the approach adopted by New Zealand or companies operating here. To a lesser extent this also applies between regions, where a number of factors may differ.

### To exploration and production companies

- Resist the urge to establish a corporate office in Wellington – setting up in-territory may provide greater traction

## PROJECT WORK OPPORTUNITIES

*Shutdowns and other non-routine projects create short but intense phases of workforce demand within the O&G industry supply chain.*

*For example, the Rimu shutdown undertaken in February 2013, involved around 90 contractors on site. The shutdown ran for approximately three weeks with crew running back to back 12 hour shifts. The work entailed comprehensive vessel, exchanger and column inspections, along with some additional project tasks to overlay and weld repairs on the various pieces of equipment on site.*

- Invest in direct engagement and first-hand regional community involvement
- The use of consultants can be useful but can have limitations – there is no substitute for living in, getting to know and directly involving the community in which you will be operating

Good community engagement is crucial. New entrants are encouraged to visit Taranaki and explore the strategies and engagement models adopted by successful companies in that region, which can include establishing a local office, regular community and stakeholder engagement, investing in a sustained communication strategy and new technologies and initiatives which foster local benefits and minimise environmental disruptions.

### Regional hub and spoke industry relationships and new capabilities

There is a growing range of oil and gas business opportunities throughout New Zealand, spanning data collection, onshore surveying and seismic work, drilling, community consultation and consenting and more. As a result new businesses are being established in frontier regions, and a series of 'hub and spoke' relationships are being forged between these regions and Taranaki to further leverage the experiences there. Specialist staff are being engaged and new capability developed.



**BUILDING A BUSINESS ON EXPERTISE: RON BERRY**

*As often is the case in Taranaki, one person’s experience and innovation leads them to set up their own firm offering niche services to the national and multinational corporations operating the region’s oil and gas fields and petrochemical plants.*

*So it is with Ron Berry, who has over 35 years of experience in the corrosion management industries in New Zealand, Australia and the South Pacific.*

*He first worked for Shell Todd Oil Services on corrosion protection and control work for the offshore Maui field and, later, for a private corrosion control company. He also gained training and accreditation in Houston, Texas, which is widely regarded as the centre of US energy expertise, and is a certified protective coatings and linings inspector.*

*But then the lure of being his own boss became strong and he set up NZ Inspection Rentals and NZ Corrosion Services about six years ago.*

*“I started out working for STOS and then started out on my own as a one man band – now I have three full-time certified inspectors, including myself, and three part-time people working for me while my wife Sue acts as HSE&Q manager.*

*Their specialist knowledge, corrosion and inspection services play a critical part in the highly safety conscious oil and gas industry. The presence of corrosion can mean serious underlying issues for industry infrastructure and significance risk if undetected or unremedied including failure to obtain the necessary certification to continue to operate. Needless to say, their company services are in demand.*

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**THE BIGGEST BENEFITS OF THE OIL AND GAS INDUSTRY TO A COMMUNITY MAY PROVE THE LEAST QUANTIFIABLE, SUCH AS THE ATTRACTION OF NEW FAMILIES, IMPROVEMENTS IN HOUSING STOCK, INTRODUCTION OF GLOBAL SYSTEMS, NEW IDEAS, LEADERSHIP INVOLVEMENT AND UNDERPINNING DEMAND IN PUBLIC SERVICES.**



*Taranaki Regional Council undertaking an inspection of an oil and gas well site.*

**ENSURING THAT REGIONAL LEADERS AND REGULATORY AGENCIES HAVE THE CREDIBILITY AND CAPABILITY TO UNDERSTAND THE OIL AND GAS INDUSTRY AND ITS SYSTEMS, IS IMPORTANT IN RELATION TO MANAGING RISKS AND RESPONSIBILITIES. CENTRAL AND LOCAL GOVERNMENT COLLABORATION IS ALSO IMPORTANT.**



## DRONES

*The use of drones for activities such as investigating or monitoring oil and gas sites or high hazard areas, is enhancing efficiency and safety for industry personnel.*

**ABOVE:** Drone/UAV being utilised by New Zealand company, Landpro to assist with their New Zealand resource management and surveying activities.

**LEFT:** Moving into the South Island – the team at Landpro.

## BUILDING THE FOUNDATIONS FOR EMERGING BASINS

As the search for oil and gas moves beyond its traditional Taranaki base, a raft of new skills and services are being called on to pave the way for future developments.

One example of this is Landpro – previously BTW South – a South Island-based provider of a range of resource management, surveying, hydrological and consultation services for the primary and industrial sectors. Established in 2007 and with offices in Central Otago and Southland, Landpro draws heavily on its experience in the oil and gas industry in both Taranaki and Australia.

“While there’s less going on with O&G down south at the moment, there is certainly anticipation in the air and lots of discussion about what the Great South Basin could mean,” says Landpro Director Kathryn Hooper.

“We’ve put our full suite of oil and gas skills to the test for Greymouth Petroleum on Stewart Island, and are transferring this to the mining and dairying sectors in the South. This background has really benefitted our clients and their projects.”

Managing Director Kate Scott, who moved from Taranaki to Central Otago in 2006, has seen the value in getting there early.

“The potential of the Great South Basin is a hot conversation topic, and it made sense to transfer some of the Taranaki skills down here and be on the front foot.”

“It’s also been valuable to build our relationships, respect and trust with local authorities. We’ve invested heavily in building connections and capability – it’s now really started to pay off.”

A particular skill developed for the oil and gas sector that Landpro is transferring to its new industries is the robust health, safety and quality culture, with Kate noting that “our culture of safety has served us well and has definitely raised the bar down here.”

With challenges finding the qualified staff they need so far from a major centre, Landpro looked to technology to bridge the gap. In early 2014 they invested in the most technologically advanced UAV/Drone in New Zealand.

“It’s been a game changer” according to Kate. “The cost and turnaround benefits of the UAV have been excellent for both us and our clients, however we’ve been really impressed at how much safer the drone makes our work – especially on high hazard sites like mines”.

**“We’d love to see the oil and gas industry grow in the South Island, and there is no doubt in our mind that companies down here will rise to the challenges that servicing that sector will bring.”**

**AS A RESULT OF INCREASING O&G INDUSTRY OPPORTUNITIES, RELATIONSHIPS HAVE BEEN FORGED WITH THE FRONTIER REGIONS, NEW BUSINESSES ESTABLISHED, SPECIALIST STAFF ENGAGED AND NEW CAPABILITY EVOLVED.**



# THE FUTURE OF OIL AND GAS

**Opportunities to grow, diversify and leverage the industry.**

**D**espite the current depressed global prices, there remain a number of factors that would suggest a positive outlook for the oil and gas industry in New Zealand:

- Continued investment in existing fields
- Upward revision of gas reserves: 31 percent greater than previously thought and forward supply of 14.5 years
- Continued interest and exploration in our frontier basins
- A rising trend in drilling activity
- Entry by multi-nationals
- Expansions of production facilities
- A supportive policy environment that encourages exploration

Technological developments are bringing frontier production towards acceptable risk-return ratios. These include deep-water exploration and drilling, enhanced oil and gas recovery, new development configurations including floating LNG plants, and unconventional oil and gas reserves such as coal seam gas and shale oil.

Exploration is continuing in Taranaki and in most on-shore and near-shore sedimentary basins throughout New Zealand, suggesting it could be a matter of time before a commercial discovery is made outside of Taranaki. Despite this, New Zealand remains very sparsely explored and offers considerable prospectively.

Ninety-six percent of the nation's 4.3 million km<sup>2</sup> Exclusive Economic Zone (EEZ) is underwater, and incorporates several sedimentary basins which contain terrestrial sediments suggesting that much of the EEZ is submerged continent. Moreover, all onshore and near-shore sedimentary basins have been explored and have been shown to exhibit the components necessary to establish a petroleum system, though to date have combined to deliver commercial discoveries only in the Taranaki Basin. As deep sea exploration continues and production technology is extended, increasing portions of the EEZ are becoming accessible to oil and gas companies.

Even in the most intensely explored parts of the Taranaki Basin there remains anticipation of further discoveries. Numerous untested prospects and leads, step-outs from existing discoveries, and other new plays still exist. Further, the number of wells – and well density – in analogous producing basins in Australia and elsewhere are materially higher than even onshore Taranaki.

Statistical analysis of extensively explored (mature) petroleum basins shows a pattern in the size and type of discovery through time. Termed the 'Creaming Curve' this observes that large discoveries often occur early on in exploration history (the low hanging fruit), while subsequent discoveries exhibit a consistent pattern of smaller and similar size and type through

time. This indicates a series of 'gaps' in Taranaki's discovery profile, suggesting undiscovered potential from new horizons, new play types and step-out accumulations.

Any discoveries will generate significant economic benefit to the country, including:

- Investment and employment in construction
- Employment and GDP in production
- Exports, either direct through oil exports, or as feedstock into further value added production
- Energy supply

The infrastructure and capability that continues to build from project to project can be applied in other industries, leveraged to other regions and also exported as services to the global O&G industry.

## FUTURE SCENARIOS – WHAT IF WE FOUND SOMETHING BIG?

Although there is no ability to predict future events, it is prudent for New Zealand to plan for and encourage growth given the opportunities for our country are potentially significant.

Recently published reports<sup>1</sup> include 'what if' scenarios of major oil or gas finds in New Zealand and their potential economic and employment implications, and are summarised below.

<sup>1</sup> East Coast Oil and Gas Development Study (2013), Ministry of Innovation and Employment. Economic Contribution and Potential of New Zealand's Oil and Gas Industry (2012) Ministry of Business Innovation and Employment, Economic Development Group, Occasional Paper 12/07. Woodward Partners (2014), Commercialisation Issues, Opportunities and Challenges in the Event of Substantive Gas-rich Exploration Success in New Zealand.



## SCENARIO 1: MAJOR SOUTH ISLAND OFFSHORE DISCOVERY

The South Island scenarios included three discovery possibilities:

- A. A 'near' offshore oil field of 120 million barrels 2.5 times the size of the offshore Taranaki Tui field)
- B. A 'far' offshore oil field of 125 million barrels (ie similar size to the above scenario but discovered further from shore)
- C. A large 'far' offshore gas field – 12 trillion cubic feet – which is over 3 times the size of Maui, so very large.

These scenarios assume that exploration takes three years, with the discovery occurring in year 3, appraisal takes two years, at the end of which the Final Investment Decision is made, and oil and gas is processed via Floating Production, Storage and Offloading (FPSO's) or Floating Liquid Natural Gas (FLNG's) vessels which are purchased not leased, rather than being processed onshore. It is also assumed that production lasts 15 years for the oil fields and 35 years for the gas field, with no major reworks, followed by a decommissioning phase of 2 years.

The following is a summary of their possible economic impacts.

### SCENARIO 1A: NEAR OFFSHORE OIL FIELD

In this scenario the total estimated expenditure was \$3.2 billion, of which New Zealand companies capturing an estimated \$1.6 billion. Different phases of the project would require different skillsets, some being quite technical or specialist which may be outside the realm of local providers.

The economic gains highlight potential employment and GDP outcomes at different phases of the project with the highest period of activity occurring in the development phase – some 270 FTE's per year for two years.

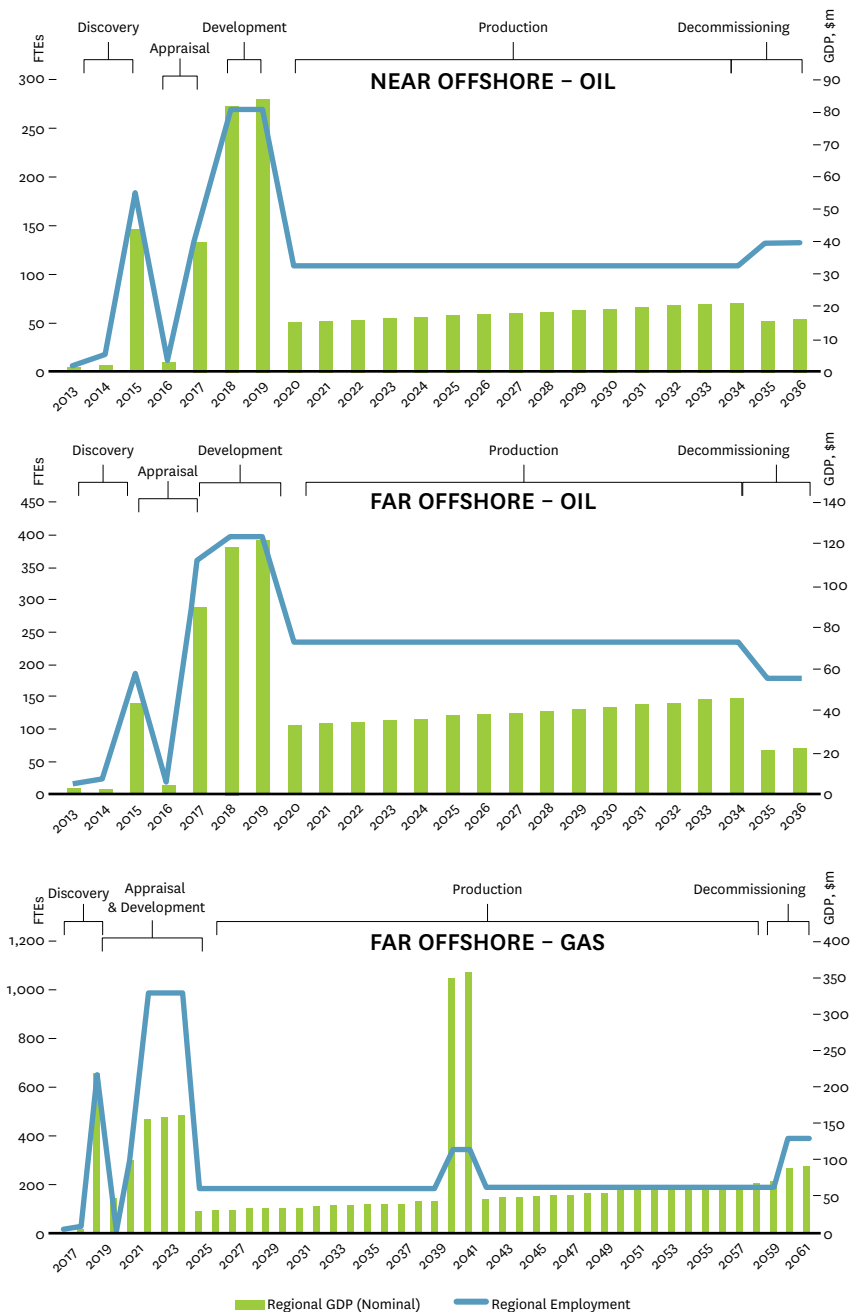
### SCENARIO 1B: FAR SHORE OIL FIND

Similar to the previous example, this scenario would see oil discovered further offshore, resulting in higher total expenditure at \$6.5 Billion, and greater regional benefit of \$2.8 billion, with the balance anticipated to go to specialist off shore suppliers.

### SCENARIO 1C: MAJOR OFFSHORE GAS

This optimistic scenario represents a very large gas find, resulting in expenditure of \$19.3 billion. This is anticipated to result in an export scale natural gas discovery whereby a floating LNG vessel is considered realistic. Under this model, gas is exported directly from the vessel and does not come to shore. \$8.1 Billion could be spent over the project time line within New Zealand.

## DIRECT REGIONAL EMPLOYMENT AND GDP IMPACTS OF A HYPOTHETICAL DEVELOPMENT



Source: BERL

**Why produce and export from an offshore vessel? Why not bring the resource to shore?**

In all the above scenarios while the economic impacts appear significant, all of the production is exported directly from off shore vessels (FPSO and FLNG) as opposed to being brought onshore. This reflects the likely preferred commercial development option of the project owners.

Although the highest period of activity would occur in the development phase, it is in the production phase where domestic companies could make the most gains. These activities may include support services and provisions to the subsea completions/FPSO, repairs and maintenance and operational support and staffing. Engaged local businesses are anticipated to be predominantly existing and experienced members of Taranaki’s supply chain, but as the domestic industry matures local companies could take a larger share, with benefits spread across regions as capability develops. Beyond the supply chain, localised benefits from the economic activity will be experienced across hospitality, accommodation, retail and other sectors.

An alternative scenario could be a gas field discovery coupled with a compelling investment case to bring the resource to shore, leading to gas development and downstream

processing. While the North Island has an established gas market infrastructure, the South Island represents a ‘blank sheet of paper’ where the introduction of gas and energy supplies to residential and commercial customers could offer new and potentially more environmentally friendly energy options. It could also result in green-field manufacturing developments such as the establishment of a petrochemical plant, and as such a find could become an economic game changer for the South Island and the nation as a whole.

**SCENARIO 2: MAJOR TARANAKI OFFSHORE DISCOVERY**

A major off-shore gas discovery in Taranaki would provide economic benefits for the Taranaki region and the country, though given the existing infrastructure and North Island gas markets, gains are anticipated to be less profound. Local supply chains are anticipated to be used in the construction and development of the fields. Depending on its configuration and whether it is brought to shore – there may be extensions to existing operations, such as new petrochemical plants or other developments. Rather than commencing from a blank sheet as in the South Island, the new gas supply could inject additional resource into the established market, with subsequent implications for the North Island energy markets.

**SCENARIO 3: COMMERCIAL DISCOVERY ON THE EAST COAST**

A plausible possibility could see known East Coast oil seeps and company interest result in exploration activity with no subsequent development through to commercially viable production ranging from small to very large scale production. Depending on the outcomes and scale of those outcomes, such results could entail:

- Employment of 177 to 1,805 direct jobs over the long term
- New or expanded infrastructure including wells, pipelines, production stations, and roading
- Export developments, including port terminals and system upgrades, storage tanks, loading facilities, dredging
- Energy developments on the East Coast
- Linkages to Marsden point refinery
- Power plant construction (large scale scenario)
- The arrival and utilisation of global energy and engineering expertise and specialist equipment
- Leveraging Taranaki expertise and building local business capability, skills and employment.

**WHAT IS DEEP-SEA DRILLING?**

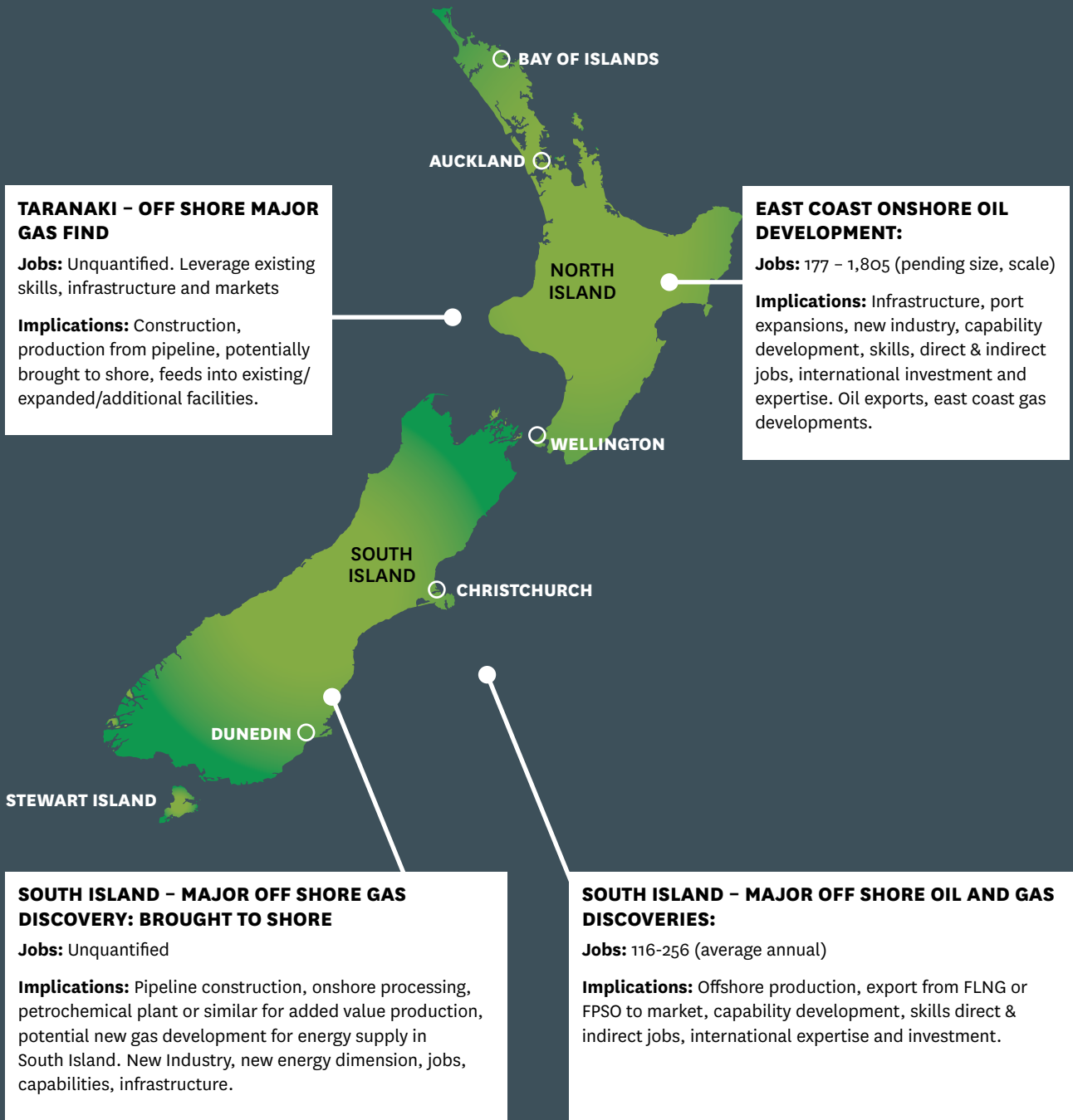
Deep-sea (also referred to as deep-water) drilling is offshore drilling for oil and gas that occurs at significant depth. There is no standard definition for what delineates ‘deep water’ from traditional offshore drilling, however it can entail depths of 300-1000 metres with ultra-deep drilling occurring at water depths

of 1.5 km or more. As skills and technology have evolved enabling drilling to occur at greater depths, then definitions have also changed.

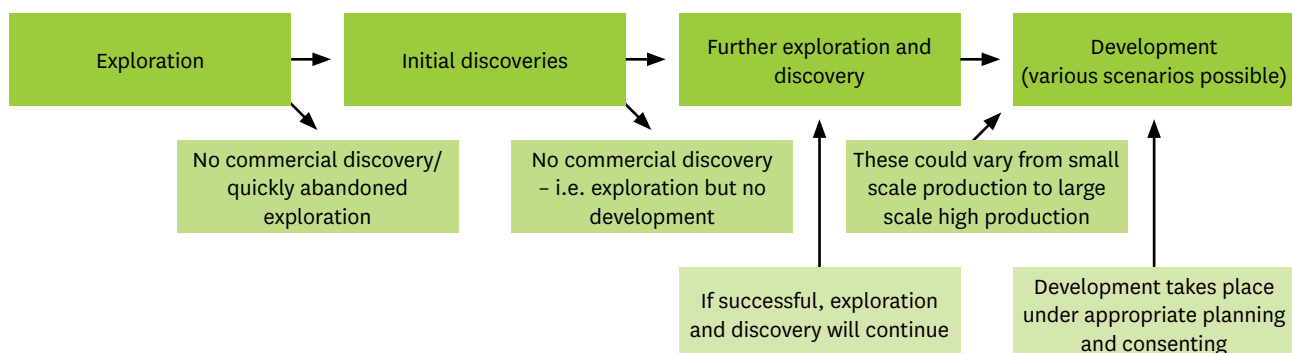
Compared to conventional offshore drilling, deep-water drilling presents additional considerations such as greater water pressure, temperature

gradients and heightened costs. Globally, the International Association of Oil and Gas Producers reports more than 14,000 deep-sea wells have been drilled over the past 20 years. To date, over 200 offshore wells have been drilled in New Zealand, 10 of which have been in deep water, without any significant incidents.

# WHAT IF WE FOUND SOMETHING BIG?



## HOW DEVELOPMENT MIGHT PLAY OUT IN PRACTICE<sup>2</sup>



<sup>2</sup> Based on diagram in East Coast Oil and Gas Development Study (2013), Ministry of Innovation and Employment.

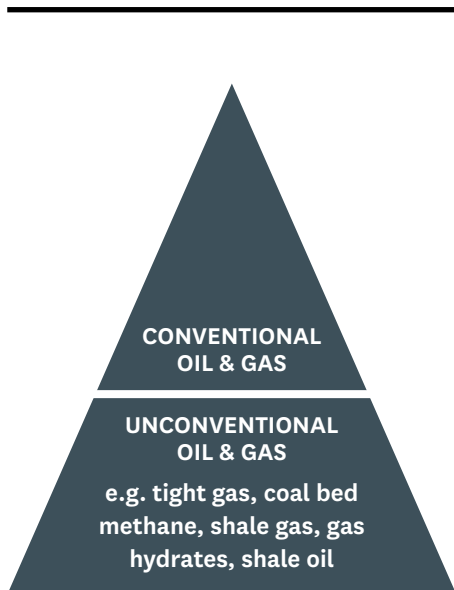
**UNCONVENTIONAL OIL AND GAS POSSIBILITIES**

New Zealand has potentially significant levels of in-ground coal resource, much of which could be conducive to coal seam gas (CSG) production. Some preliminary work has been undertaken but progress remains limited, suggesting there is some future potential, with regions such as Taranaki, Huntly, West Coast and Ohai remaining areas of interest.

East Coast oil shale targets, as previously discussed, are already under investigation by exploration companies.

Gas hydrates – a mixture of methane and water frozen into an ice which lie under the sea bed – have also been identified offshore and are the subject of investigations by GNS and others. If this resource could be commercialised it may provide energy for our country for several decades, though extraction and commercialisation of such a resource remains in its infancy not only nationally, but globally. While natural gas hydrates are currently prohibitively expensive to develop, this could present future generations with a significant resource, as and when the technology to extract advances. This has the potential to be an energy game-changer.

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**REALITY CHECK: CONFRONTING THE DOWNSIDE**

***Oil and gas remains a risk business. Just as the economic benefits should be recognised, so must its fragility.***

Whereas a number of government and independent scenarios have focused on the upside of a major discovery in New Zealand, there is also a need to confront downside scenarios.

What if, despite best efforts, companies found nothing significant new? Short-medium term, New Zealand would not run out of oil and gas, as over a decade’s worth of gas supply still remains. However, running fields down coupled with the unwillingness for continued investment even in existing fields, offers an uncertain future, an altered industry structure and serious repercussions for employment, the retention of specialist expertise and our national economic and energy strategy.

Scenarios must also look beyond prospectivity – as development of the resource is more than simply a function of what is in the ground but also broader influential factors. Global oil price declines are impacting on current investment decisions, and could see delays or shelving of key projects, with implications for the future.

Short term repercussions will include cost reductions impacting supply chain utilisation and workforce. These have long term consequences including the loss of skills from the industry (which may not be readily available when confidence and investment rebounds) and consequences for future availability of energy supply, given the length of time to bring investments to fruition.

Governments and their policies can change, including their stance towards petroleum exploration, as can New Zealand’s attractiveness relative to other global opportunities. While there have been increased promotional efforts to explore and develop our oil and gas resource, outcomes of recent

exploration have been disappointing. Just as a track record of success can foster increased investment, the opposite is also true, with potential negative impacts on investor confidence and decisions.

The age of our O&G facilities also need to be acknowledged, with some potentially reaching a natural point of commercial retirement in the coming decades.

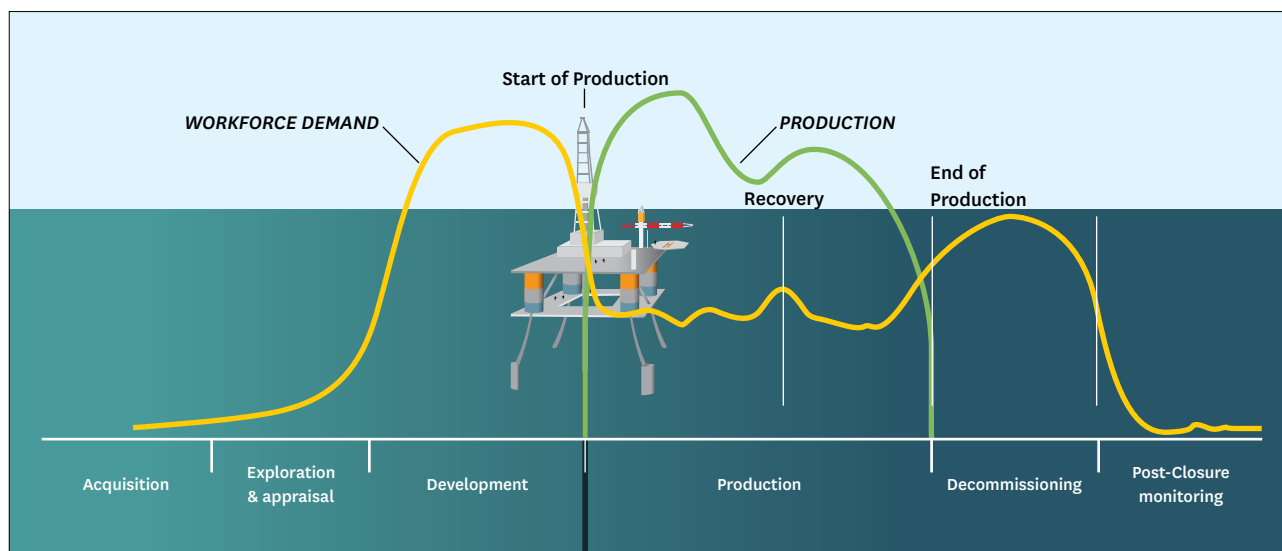
Decommissioning is bittersweet – while it reflects an end of economic life, it could also create substantial opportunities for local businesses as it entails many skills sets and can extend over several years. However, the timing of decommissioning can be uncertain as decisions can be impacted by a range of factors, including:

- Technical innovations that enhance oil and gas recovery and extend the life of fields
- Fiscal and regulatory regimes influencing the investment environment
- Long-term trends in oil and gas prices impacting economic viability
- Asset reuse options which extend the life of infrastructure or reduce the cost of decommissioning
- Social, political and other factors

**THE GROUND IS SHIFTING – A FUTURE OF CHANGE**

***Irrespective of whether there is a ‘big find’, what is known for certain is that the future of the oil and gas industry will not be ‘more of the same’.***

Technology is changing. There is an increasing shift to new horizons such as deep-water exploration and unconventional and this requires different skills sets and has broader implications for systems, regulations and risk/reward profiles. Furthermore, this has led to greater availability of gas, aided by hydraulic fracturing and facilities such as FLNGs, which has changed the global energy, economic and political equation.



### THE STAKES ARE GETTING HIGHER – RISK V REWARD

As prospects move further offshore, remoteness, water and target depth, reservoir characteristics, environmental and cost implications will impact on the return on investment, and development activity.

The nature of jobs within the industry is also changing. Technological developments, changing patterns of work and new ways of undertaking old tasks are all anticipated to have a growing impact on the shape of the industry and its workforce.

The sector is diversifying, in terms of both the historic geographic concentration on Taranaki and new exploration firms entering the market. This has implications for capability building as well as regional economic, social, and environmental factors.

The intensification of oil and gas activity in some areas of Taranaki has implications for communities and residential lifestyles if the increased activity occurs in close proximity to housing, schools and public zones.

Demands of the industry may have implications for other resources e.g. water, and/or other industries e.g. dairy, food production. The oil and gas industry does not operate in a silo, but within the

context of broader economic, social, cultural and environmental spheres.

Social media and communications will continue to highlight industry developments, public opinions and reactions.

Political policy, economic and social changes must also be considered, across district, regional, national and global levels.

### DOES THE OIL AND GAS INDUSTRY MATTER?

#### *Climate change, renewables and is it worth the focus?*

Continuing public interest in oil and gas activities, changing social values with a shift away from fossil fuels towards more renewable energy aspirations coupled with a focus on climate change will continue to challenge oil and gas investment, activity and policy.

However, the move away from fossil fuels will take some time and oil and gas looks set to remain a central component of the broader energy mix for the immediate future.

Furthermore, fossil fuels may form an important component of the global strategy leading to reductions in the carbon footprint if it is utilised to replace existing fuels such as coal.

### THE FUTURE CONTEXT

- More challenging for exploration
  - technically and economically and the possibility that the easy discoveries have been made
- A range of social and environmental factors impacting on the industry
  - Increasing environmental consciousness
  - Aspirations towards more use of renewable sources of energy
  - High expectations surrounding health and safety
  - Shifting policy or regulatory frameworks and support
- Technological advancements shifting investment decisions through:
  - Ways to extract difficult finds e.g. deep water exploration, Maximisation of existing assets
  - Enhancing safety in the workplace
  - Innovative environmental advances
- More challenging and uncertain economic future with greater consideration on cost-efficiencies, risk management and development partnerships.



# WHERE TO FROM HERE?

**What needs to happen to get the greatest benefit from our natural resources?**

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**O**n its release in 2010, the first edition of *The Wealth Beneath our Feet* sought to assess – for the first time – the economic value of the oil and gas industry and its supply chain for the Taranaki region and the nation as a whole.

Historically, the value of the returns from royalties was seen as the key benefit of having a strong oil and gas industry in New Zealand. The first edition gave a more comprehensive analysis that quantified employment and presented wider benefits not only as a direct result of those employed in the exploration and production phases, but right across the supply chain.

This 2015 edition builds on our understanding of the economic importance of oil and gas, and highlights the industry's contribution to the national economy: over 11,700 jobs and \$2.78 billion in GDP, as well as a critical component of our energy supply.

Since 2010 the number of jobs within the industry has increased considerably. While, to some extent, this reflects a greater understanding of the industry's makeup, it also echoes that New Zealand's oil and gas industry has evolved considerably since 2010, with more players entering the market and

exploration activity moving beyond Taranaki into other parts of the country.

During this time the supply chain has also evolved, and its members are increasingly servicing not only New Zealand's oil and gas industry but playing increasingly important and diverse roles on the world stage: the oil and gas industry is an innovative, technically advanced, value-add industry.

It must be acknowledged that this – and any – economic assessment represents a snapshot in time. This is a dynamic industry which is experiencing continuous and recently, significant pricing shifts. Employment levels move significantly with project demands, and investment decisions reflect factors around prospectivity as well as wider factors such as globally defined commodity prices.

The industry is operating in a world that has changed markedly since 2010: social values are shifting away from fossil fuels towards renewable energy, and there is increasing public awareness of the environmental and safety risks associated with the industry which is being exacerbated by moves into deep water drilling, hydraulic fracturing and other emerging technologies.

Our analysis has reinforced the economic importance of the industry, but is also cognisant of the wider challenges and the need to remain progressive, adaptable and nimble in changeable times.

To maximise the value of our petroleum estate, Venture Taranaki closes its analysis with some suggested next steps for the industry and its stakeholders, in order to maximise the value of the wealth beneath our feet.

## THE NEXT STEPS

### A BLUEPRINT FOR INDUSTRY GROWTH

Over the last five years New Zealand has been successful in attracting inward investment in oil and gas exploration and production. A blueprint for industry growth will help ensure the returns on this investment are maximised for the nation.

Such a blueprint will seek to maximise the economic production of our resources, sustain and promote the supply chain, and build a stronger and more collaborative partnership between government and the industry – both will be joint owners of the process.

The blueprint will look beyond the current attraction successes to identify, analyse and plan for scenarios that

could impact on future decades of oil and gas investment and production in New Zealand. Examples exist around the world – the UK recently developed their own Business and Government Strategy for Oil and Gas.

New Zealand's natural gas reserves-to-production ratio is currently sitting at 14.5 years, with natural gas availability upwards of 210 PJ/year. Demand is largely static – around 90 PJ is used for chemicals manufacture annually and 40 PJ for electricity generation – with the latter projected to decline as gas-fired generation capacity is reduced and there is new investment into renewable sources.

Thus, a 200 PJ/y gas market is insufficient to support ongoing exploration or development without either a major discovery or additional downstream investments – raising questions around the implications of a big find or what might incentivise further development of the gas market to help underpin existing exploration and development activity.

Future demand-supply scenarios including identification of downstream near-term development and investment options should form part of a strategic plan for the industry.

### **WHOLE OF GOVERNMENT APPROACH**

Realising the full potential of oil and gas requires a whole of government approach that goes beyond departmental priorities and builds a comprehensive shared understanding of the oil and gas industry and its barriers to growth.

While significant progress has been made, for example the strengthening relationship between New Zealand Petroleum and Minerals, wider Ministry of Business, Innovation and Employment and regulatory agencies, this needs to be extended across other areas critical to the industry's growth. Infrastructure,

capability development, skill attraction, exporting, energy markets, supply chain growth and retention, environment and technological advancement are all factors where government has considerable involvement that could be better aligned to help gain maximum value from the nation's mineral resources and their development.

### **STRONGER TIES WITH REGIONS AND REGIONAL DEVELOPMENT**

This report recognises that the aspirations and concerns of regional New Zealand can differ from the priorities of central leadership, but there exists an opportunity for stronger alignment between national, regional and local government, and a commitment towards how the industry can contribute to nation-building.

Developing stronger relationships and a collective vision could enable opportunities, sensitivities and concerns to be aired and strategies evolved. This is important where community expectations may not be adequately met using resource management tools.

New Zealand regions with oil and gas resources have the potential to make an important contribution to the nation's economic development. Establishing an oil and gas industry in a region can place significant demands on capability, systems and infrastructure. It is important that the necessary regional investment to realise such potential is not the sole responsibility of regional New Zealand, just as it is for any resulting benefits, to be used for nation building.

### **CREATING A WINNING INDUSTRY**

That New Zealand's oil and gas industry operates in a global context must be considered in the development of a smart and robust approach to the industry's development.

While offering an attractive global exploration investment prospect is

necessary, the Block Offer process enables the government to send a strong signal about industry leadership. In addition to the work programme, the Block Offer bid evaluation process considers an operator's technical, health and safety, environmental and financial capability and may seek verification from overseas regulators.

There is an opportunity to expand criteria to also consider the potential operator's company values, approach to community engagement, utilisation of local content, technologies utilised to minimise environmental impacts, and contribution to regional development.

There have been many examples of successful industry-community engagement experiences between the industry and communities in Taranaki. Such learning experiences could form valuable guidelines for new and existing oil and gas operators, particularly where they are moving into territories with no prior experience of oil and gas or mining in general.

### **BUILDING PUBLIC CONFIDENCE**

As the economic case for harnessing our mineral wealth has become more compelling, so has public interest and scrutiny of the oil and gas industry, its risks and its benefits. Education, awareness and promotion about the value of the industry, how it operates, how it contributes to economic and social outcomes, and its stringent health, safety and environmental regime has helped to build public confidence.

Relationships and trust also matter, and there is still opportunity to build this aspect of the communications matrix, particularly as new communities are engaged and as deep-water exploration becomes prevalent.

Beyond communications strategy, assurance is needed that response strategies and capabilities are sufficient to offset New Zealand's distance to global resources should things go wrong.

As exploration moves into deeper water, the stakes become higher. So too does the need for proper investment into fit-for-purpose response capability, not only for environmental response, but also for public confidence. A comprehensive, specialist oil spill readiness and rapid response facility – underpinned by human capital, systems, equipment and infrastructure – could also include research and development and training across a multi-agency platform, contributing to greater understanding of our ocean resource.

**THE IMPORTANCE OF THE SUPPLY CHAIN**

A comprehensive definition of the industry must be inclusive of its supply chain. Whilst exploration and production companies frequently attract attention, the vital role and important contribution to employment that the supply chain makes should be recognised.

While a local content policy is far from the panacea regions seek, a greater understanding of the supply chain and the opportunities to leverage local capability and capacity is still required. The economic benefits of regional development and local jobs cannot be overlooked, albeit tempered with the realities of managing expectations at both regional and industry levels.

**LEVERAGING INNOVATION**

The oil and gas industry is incredibly smart and technically advanced, yet the

innovations they attract and/or develop within our country are not widely known or appreciated. Given our nation’s aspiration to an innovative culture, these successes should be identified, celebrated and more actively fostered.

Technology gains made by New Zealand supply chain companies should be showcased and celebrated, helping to position New Zealand as an attractive, capable and solutions-focused investment destination.

Beyond oil and gas applications there are also opportunities to transfer skills and innovations to add value and competitiveness to other industry sectors. This could contribute to broader economic gains and underpin diversification strategies within our supply chain companies as a buffer against the peaks and troughs which typify commodity markets. Industry health and safety systems are often leading-edge, and knowledge and processes could add significant value to other sectors, lifting our competitiveness and safety record across the board, and ultimately saving lives.

New Zealand may be a small technology player in relation to the global oil and gas arena, but it can be nimble and progressive in its own leading-edge way and leverage these advancements.

**FAST TRACKING FUTURE ENERGY**

New Zealanders aspire to a progressive energy future which is environmentally conscious and offers greater levels

of renewables. There is opportunity to transfer expertise and capabilities developed in oil and gas to help fast-track such developments.

The oil and gas Industry should not be viewed as simply a passive component of our energy mix, nor a bridge to renewables, but as an active enabler and participant in our energy programme. It could play an integral part in helping the nation reach its future energy aspirations. Progress has already begun, and this should be promoted, encouraged and celebrated.

Oil and gas technologies have played a role in advancing our energy industry, and there is scope for them to help develop our burgeoning geothermal, wind, wave, hydro, bio-fuel and other renewable energy sectors as well.

**BENEFITS TO PRESENT AND FUTURE GENERATIONS**

New Zealand’s oil and gas resource is precious and has been built up over millions of years. The proceeds from their returns are currently injected into the Crown accounts and redistributed through a range of government service funding.

Better alignment of the costs and benefits of the industry’s contribution, and targeted reinvestment into infrastructure, innovation and regional value creation, will help to ensure that the wealth beneath our feet can deliver its potential value to all New Zealanders – present and future.





# APPENDICES

## APPENDIX 1: DEFINITIONS AND ACRONYMS

ACRONYM	DESCRIPTION
<b>Bbl</b>	Barrel
<b>Bcf</b>	Billion Cubic Feet
<b>E&amp;P</b>	Exploration and Production
<b>EEZ</b>	Exclusive Economic Zone
<b>EIA</b>	Economic Impact Analysis
<b>EPA</b>	Environmental Protection Authority
<b>EPC</b>	Engineering Procurement Contractor
<b>EPCM</b>	Engineering Procurement and Construction Management
<b>ERL</b>	Energy Resources Levy
<b>FTEs</b>	Full Time Equivalents. An FTE is one employee working full-time.
<b>GDP</b>	Gross Domestic Product. GDP is income earned from production.
<b>GJ</b>	Gigajoule (one billion joules)
<b>HSNO</b>	Hazardous Substances and New Organisms

ACRONYM	DESCRIPTION
<b>IEA</b>	International Energy Agency
<b>IO</b>	Input-Output
<b>MBIE</b>	Ministry of Business, Innovation & Employment
<b>Mmbbls</b>	Million barrels
<b>NZP&amp;M</b>	New Zealand Petroleum and Minerals
<b>O&amp;G</b>	Oil and Gas
<b>PEP</b>	Petroleum Exploration Permits
<b>PEPANZ</b>	Petroleum Exploration & Production Association New Zealand
<b>PJ</b>	Petajoule (one quadrillion joules)
<b>PML</b>	Petroleum Mining Licences
<b>PMP</b>	Petroleum Mining Permits
<b>PPP</b>	Petroleum Prospecting Permits

## APPENDIX 2: ECONOMIC IMPACT ANALYSIS METHODOLOGY

### METHODOLOGY

MartinJenkins was commissioned to update the economic impact analysis and provide further information on the industry, and this has been supplemented with an extensive collection of case studies and industry insight.

The analysis identifies economic activity generated by the oil and gas industry and uses regional input-output (IO) models and multiplier analysis to calculate both GDP and indirect and induced impacts from that initial activity.

This update builds on the methodology developed in the first edition, particularly drawing on improved availability of industry expenditure – now publicly available through the Ministry of Business, Innovation & Employment (MBIE) – and understanding of the businesses that make up the industry – where the previous analysis identified 139 companies directly associated, the current analysis has found 246 companies. As a result, this analysis offers a more accurate estimate of direct expenditure and employment, and allows GDP to be calculated from direct expenditure rather than employment.

The analysis uses the latest information available and as such the time scales vary in different parts of the document – for

example although the economic impact assessment is being presented as 2013, it comprises information for the years ending 2013 (expenditure and GDP) and September 2014 (employment).

The economic impact assessment follows the accepted practice of identifying the direct activity associated with the industry and then applying regional and national multipliers to determine the indirect and induced effects of that initial activity in terms of output, employment and GDP.

Direct activity can be in terms of output and employment. In the previous 2010 report, employment in the E&P and first round businesses was identified to determine employment, expenditure and GDP. In the current analysis, two sources of information have been used to calculate upstream activity – expenditure and employment.

Expenditure and/or employment is then assigned to the appropriate industry category and ratios and multipliers are applied. The totals for each industry are aggregated to provide the direct, indirect and induced economic impacts in terms of expenditure (output), value added (GDP) and employment (FTEs).

Direct expenditure is used to calculate GDP. Direct and first round employment has been calculated by identifying the range of companies that provide services to the E&P companies and determining their employment directly related to O&G activity.

There is a nine month difference between output and GDP activity, and employment activity. Output and GDP are calculated for the 2013 year. Employment is based on current activity and was collected between August and September 2014.

### UNDERLYING LOGIC

The underlying logic of economic impact analysis is that enterprises that create flows of expenditure (direct impacts) that are magnified or “multiplied as they flow-on to the wider economy. This happens in two ways:

- indirect impacts – the enterprise purchases materials and services from supplier firms, which in turn make further purchases from their suppliers and so forth.
- induced impacts – employees in the enterprises and in firms supplying services are paid a wage and the enterprises generate profits, which is then spent on consumption.

Total impact is then the sum of the direct, indirect and induced impacts.

### MULTIPLIERS

Regional multipliers are used to capture the indirect and induced impacts at a regional or national level. They are also used to calculate GDP. Multipliers are derived from the IO tables published by Statistics New Zealand and the Taranaki region IO tables supplied by Butcher Partners limited.

The size of the multiplier depends upon the degree of economic self-sufficiency. The more self-sufficient a region or nation is, the higher the multiplier is likely to be. Initial expenditure is assigned to the industry where it occurs. Each industry has a different multiplier based on the average pattern of purchases of goods and services, capital formation, profits, wages and salaries.

### MEASURES OF ECONOMIC ACTIVITY

Economic impact assessments provide three measures of economic activity – Gross Output, Value Added and Employment.

Gross Output is the value of production, which is built up through the national accounts as a measure of gross sales or turnover. It is basically the initial expenditure incurred by the activity.

Value Added is the increase in output generated along the production process, which when aggregated totals GDP. Value Added is the sum of compensation of employees (salaries and wages), income from self-employment, depreciation, profits and indirect taxes less subsidies.

Employment is generally expressed as full time equivalents (FTEs) to allow for comparison. FTEs is the number of full-time employees and working proprietors and provide a measure of total labour demand associated with gross output for one year. For example, four full-time jobs running for three months would be shown as one FTE.

### LIMITATIONS OF MULTIPLIER ANALYSIS

#### Additionality

It is assumed that the activity or event being analysed does not displace existing activity.

#### Impact

It is assumed that an activity will not have an impact in relative prices. The larger the activity, or the more concentrated it is in a single industry or region, the more likely it is that relative prices would change.

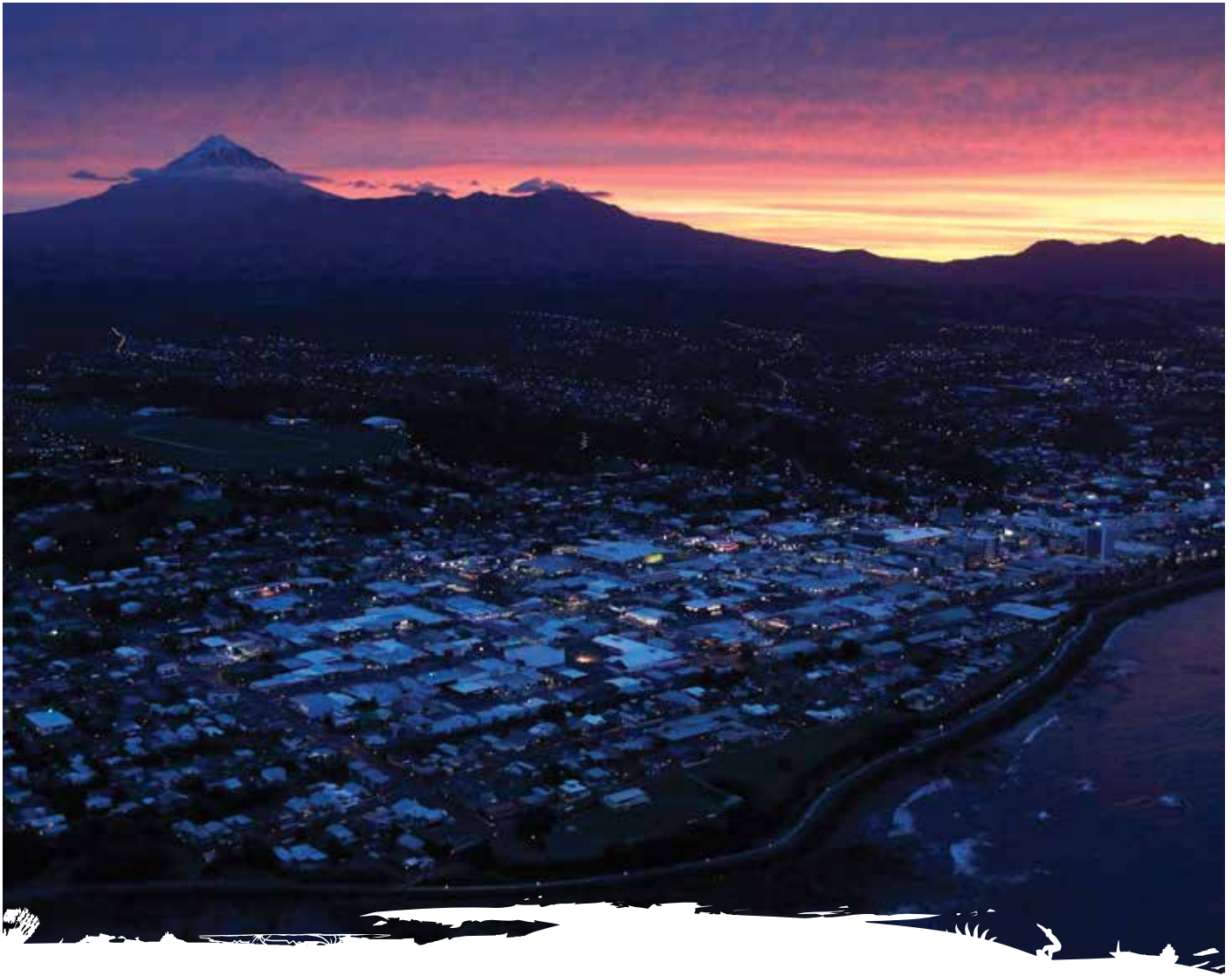
#### Aggregation

Each industry has its own unique inputs and outputs and thus multipliers. The more aggregated the level of analysis, the less accurate these inputs and outputs become. It is therefore important to apportion the initial expenditure to the industry where it occurs.

#### 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.

All prices in current (2014) New Zealand dollars.



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This followup edition to *The Wealth Beneath Our Feet* (2010) takes a close look at the economic, employment, social and business impacts of having the oil and gas industry present in New Zealand.

With an initial focus on the Taranaki region, the expanded report then looks at what's happening throughout the country, and what this means for the national economy.

It also drills down into the industry's supply chain, providing a comprehensive analysis of where the jobs, value and opportunities lie.



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