

Petroleum Exploration Activities in New Zealand Since 1996

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Abstract

Since the March 1996 Petroleum Conference, exploration in New Zealand has sustained a significant resurgence. Key factors have been the Acceptable Frontier Offer (AFO) policy announced by the Minister of Energy at that conference, and a global upturn in exploration investment.

In the onshore Taranaki Basin, five permits have been relinquished, however with nine new permits being awarded, the province is now effectively fully leased. Two wildcat wells were drilled onshore Taranaki in 1996, and three in 1997, with two indicated discoveries. Fletcher Challenge Energy Taranaki Limited's (FCET) Piakau-1A oil discovery has extended the fractured Tikorangi Limestone play established by the Waihapa Field a decade ago. FCET's Mangahewa-2 gas test has successfully applied advanced completion technology to convert a 1961 low-rate gas test to commerciality. 1998 should be a record year for wildcat drilling in Taranaki. Besides at least two Mangahewa offsets, Swift Energy New Zealand Limited, Santos Petroleum (NZ) Limited, Indo-Pacific Energy (NZ) Limited and Bligh Oil and Minerals (New Zealand) Limited are all due to drill onshore prospects in a range of plays. Exploration for new pools within the Kapuni permit is also a possibility.

Offshore Taranaki Basin was a focus in early 1996, but wildcats drilled by FCET (Awatea-1) and by Shell Todd Oil Services (STOS) (Rahi-1) were both dry holes. Permitting activity has been subdued compared to onshore and frontier basins, but there are indications of increased exploration effort over the next few years. Five permits have been awarded under the AFO regime, while two permits have been relinquished in late 1997. Shell (Petroleum) Mining Company and Todd Petroleum Mining Company have farmed in to Cultus Petroleum NL's PEP 38413, and will be drilling the Maari prospect during 1998. New Zealand Oil and Gas Limited has identified a number of high-upside prospects west of Maui. There may also be further exploration within the Maui permit. Drilling on other current permits is likely to be in 1999 or later.

In other basins there has been a marked upturn in exploration permitting, and the beginning of a drilling campaign that will far exceed levels of the past decade. The East Coast of the North Island has experienced the strongest interest, with six permits awarded in the 1996 Blocks Offer, and three subsequent AFO awards. Two onshore prospects have been drilled in the past two years, and Westech/Enenco's multi-well programme onshore Hawke's Bay is getting underway. Offshore drilling is scheduled for four East Coast permits from early 2000. Offshore Northland, Conoco's joint venture is committed to two deepwater wildcats within the same period. Prospective basins of the South Island have also drawn permit applications and awards, with technical work underway offshore Canterbury, in the Great South Basin, and in several onshore areas.

Introduction

Exploration for oil and gas in New Zealand has been characterised by a pronounced cyclicity since the first hole was dug at New Plymouth in the 1860s. Two years ago, there were encouraging signs of a recovery from a pronounced downturn in activity. To foster increased activity and investment, the then Minister of Energy, Hon Doug Kidd, announced that the Acceptable Frontier Offer allocation mechanism that had been introduced in a limited fashion at the beginning of 1995 would be extended to all open areas.

The nature of the regulatory regime is one of several factors influencing exploration activity:

- Oil and gas demand and prices.
- Capital markets and sector outlook.
- Perception of prospectivity.
- Terms and conditions of access.
- Availability of services and technology.

Some of these factors are global and others specific to New Zealand.

In general, external factors have been strong over the past two years, although the weakening of Asian economies and of world oil prices in recent months has resulted in some easing of capital availability (but also, improved availability of key services such as seismic vessels and drilling rigs). Sentiment in the New Zealand gas market seems to have shifted over the past several months towards a higher degree of comfort in the medium-term sustainability of supply and therefore, very limited incentives to explore for gas specifically. This sentiment is always subject to incomplete market knowledge of key variables such as the ultimate capacity of the Maui Field; the longevity of methanol manufacture; and the capacity and price thresholds for development of new supplies such as Mangahewa and Kupe.

Consensus views on the fundamental prospectivity of New Zealand's sedimentary basins have probably improved over recent years, as discoveries (albeit modest) have extended into new plays, and research results have contributed to a better ability to properly factor in New Zealand's complex geology. Much has been done in the past five years to create a favourable regulatory environment.

On balance, then, the conditions have been favourable for an increase in exploration activity since early 1996.

Indicators

Exploration activity can be monitored via a range of indicators related to different points on the investment cycle.

Permitting, which is reasonably easy to track, is a leading indicator of overall exploration investment levels. The award of permits reflects the intention of companies and joint ventures to proceed via geological and geophysical prospecting work to exploration drilling. Under the AFO rules, permit-holders must commit within two years to drill within three years of the permit award. However it is not uncommon for permits to be relinquished without drilling.

Geological and geophysical evaluation, including the acquisition, processing and interpretation of seismic reflection surveys in particular, is a crucial step in the exploration process which is difficult to track on a national scale. There is a great deal of variation from venture to venture in the design, intensity, and cost of these programmes.

Drilling is the ultimate step in the exploration process and thus constitutes a trailing indicator of exploration activity levels. Almost all of the wells drilled in New Zealand during 1996 and 1997 have culminated pre-existing exploration initiatives, whereas new initiatives reflected in permitting and geophysical indicator trends will begin to be tested by drilling from 1998 onwards.

In this paper we review exploration activity in each of three theatres, as expressed by these indicators, since the 1996 New Zealand Petroleum Conference.

Onshore Taranaki Basin

Taranaki province is the cradle of New Zealand's petroleum industry, which came of age in commercial terms with the discovery of the still-producing Kapuni gas field in 1959. The eastern and north-central parts of the peninsula became a focus for Petrocorp (then a state oil company) and New Zealand Oil and Gas (NZOG) in the 1980s, and several commercial discoveries and developments have ensued. Over the past 20 years, some thirty wildcat wells onshore Taranaki have produced seven commercial discoveries, several of which continue to undergo development and extension drilling. The main plays are the Eocene Kapuni Group sandstones (Kapuni and McKee fields), fractured Tikorangi Limestone and related sandstones along the eastern margin overthrust trend (Waihapa Field and the Tariki-Ahuroa field complex), and late-Miocene Mount Messenger Formation turbidite sandstones (Kaimiro and Ngatoro fields).

Permitting Activity

Fourteen exploration permits covering most of the Taranaki Peninsula were active in early 1996. Of these, six had been awarded in a 1988 blocks offer and undergone partial relinquishments in 1993. The other eight had been awarded as a result of a 1995 blocks offer.

Four of the six 1988 blocks have been relinquished since early 1996. The other two are due to expire on 1 August, 1998. A mining permit was awarded for Ngatoro Field (formerly part of PEP 38706) in late 1996, and an application to appraise the Mangahewa discovery (currently within PEP 38705) is anticipated to follow delineation drilling which has commenced in the past month.

Three of the 1995 blocks have been relinquished, but with nine applications under the AFO mechanism, the onshore area of Taranaki is effectively fully covered by active exploration permits.

The main change which has taken place in the onshore Taranaki exploration theatre in recent years has been the proliferation of companies and types of company participating. Prior to the 1995 blocks offer, exploration in the province was effectively a duopoly of Petrocorp and NZOG. Now they are joined as operators by eight other companies, independents of various size from Australia, the US and Canada as well as New Zealand. Shell and Todd have extended their interest away from the Kapuni Field for the first time in several years with a recent application for the area immediately to the northeast.

Exploration Geology and Geophysics

The period has been reasonably active for onshore seismic acquisition, encompassing several of the mining permits as well as exploration blocks. In 1996, Fletcher Challenge Energy Taranaki (FCET; formerly Petrocorp) collected a 3D survey over the Kaimiro Field, and over 300 km of 2D data in various exploration permits. An aeromagnetic survey was also acquired over part of the eastern basin margin. In 1997, Swift acquired an extensive 3D survey in their permits in the southeast of the peninsula, and 89 km of 2D seismic was collected on behalf of various operators.

Drilling

FCET have operated all five of the wildcat wells drilled onshore Taranaki in the past two years. The only true wildcat of these was Salisbury-1 (PEP 38706), which in 1996 sought unsuccessfully to discover a new field in the waning Miocene turbidite play. Three wells, Manu-1 in 1996 and Piakau-1A and Kupara-1 in 1997, have targeted new pools within the Tariki-Ahuroa Field complex, the latter two successfully testing oil. Gaining the most attention has been Mangahewa-2 (PEP 38705) which was drilled during 1997 to appraise a 1961 Shell BP and Todd Kapuni Group gas discovery. FCET's trial of fracture stimulation technology has been successful in achieving apparently commercial flow rates.

Outlook

1998 will be the busiest year for exploration drilling onshore for several years, and possibly ever. While FCET focus on delineating Mangahewa and extensions to other existing fields, several of the newer operators, including Bligh, Santos, Swift and Indo Pacific have scheduled wildcat wells to test a range of prospect types.

Offshore Taranaki

With the development of offshore drilling and production technology in the 1960s, and substantial oil discoveries in the geologically similar Bass Strait, international oil companies commenced the exploration of offshore New Zealand in Taranaki Basin. The Shell BP and Todd consortium experienced almost immediate success with the discovery of the giant Maui gas field in 1969. Subsequent exploration campaigns, involving several major international companies as well as a range of independents, have had the frustrating result of discovering a number of fields too small to justify development. An exception, Kupe South (discovered by NZOG in 1986) remains undeveloped after significant appraisal campaigns operated by TCPL of Canada, and Western Mining of Australia. Both companies have exited oil and gas exploration and operatorship of Kupe South has passed to FCET (subject to a Commerce Commission ruling).

Permitting Activity

At the time of the last conference, there were seven active exploration permits offshore Taranaki, of which five had just been awarded to a Petrocorp-led joint venture in the late 1995 blocks offer.

Since early 1996, JFP Energy has relinquished PEP 38437 (after drilling Toka-1 from a location in the port of New Plymouth), two of the 1995 awards have been relinquished and most of FCET's joint venture partners have withdrawn from the others. Cultus has had to relinquish 50% of PEP 38413 on its fifth anniversary but have secured a farm-in from Shell and Todd. Five permits have been awarded under the AFO mechanism. Participants include NZOG who hold an extensive area west of the Maui Field; FCET who have extended their interests south from the Kupe Field; Shell and Todd who have taken out an area east of the Maui Field; Pacific Tiger, and New Plymouth start-up Spectrum Exploration.

Exploration Geology and Geophysics

The past two years have been an extremely quiet time for offshore seismic acquisition in New Zealand. This reflects the stages of most of the permits (which have either been surveyed in the immediately prior period, or are coming due for seismic this year), and a shortage of available vessels. Also, the quite comprehensive coverage of most of offshore Taranaki with reasonably modern data and its availability for reprocessing reduces the need for extensive new seismic data in many permits. The only seismic vessel to operate in New Zealand waters during the period has been the Australian Government's Rig Seismic, which diverted from a joint government programme to delineate the maritime boundaries of Australia and New Zealand in early 1997, to acquire over 1,000 km of seismic for NZOG west of Maui.

Drilling

During 1996, a semi-submersible drilling rig (Sedco 703) was mobilised to drill Awatea-1 for the FCET joint venture in northern Taranaki, and Rahi-1 for the Maui partners. Both wells were dry holes. There was no offshore exploration drilling in New Zealand in 1997.

Outlook

Maari-1 will be drilled by Shell Todd under farmout from Cultus as soon as a suitable rig can be contracted, probably before the end of 1998. This well offsets the Moki-1 oil discovery (sub-commercial according to the appraisal at the time) drilled by Tricentrol in 1983. It is highly likely that additional offshore wells will be drilled on the same rig mobilisation, with locations in the Maui mining permit under consideration. NZOG are due to drill west of Maui by 1999.

Other Basins

Early exploration programmes outside of Taranaki Basin focused on the East Coast, especially inland of Gisborne, and the West Coast of the South Island, but by the end of the 1960s wells had been drilled in most areas of New Zealand consisting of Tertiary sedimentary geology. The Maui Field discovery encouraged exploration of offshore basins, with the most substantial campaigns off the South Island led by BP Shell and Todd, and Hunt. Sub-commercial discoveries were made in offshore Canterbury and the Great South Basin but by the end of the 1980s, investment in basins other than Taranaki had reached a very low ebb.

Thus there was a very low level of exploration outside Taranaki Basin in early 1996. On the East Coast, PEP 38312 was active near Gisborne onshore with Waitaria-1 suspended awaiting deepening subject to the availability of a bigger rig. Todd held two adjacent offshore permits off the Wairarapa coast following the withdrawal of Amoco upon the unsuccessful drilling of Titihaoa-1 in late 1994. Westech and Enerco held PEP 38708 over the Wanganui Basin, where they had recently drilled Whangaehu-1. A Conoco-led joint venture held the large PEP 38602 off Northland that was awarded in 1993. As a result of a late 1995 blocks offer, two permits off Canterbury had been awarded to Pacrim, and two small permits onshore the West Coast of the South Island to a joint venture of NZOG, Pacrim and Cultus. The relative success of these two blocks offers signalled a pending recovery of interest in New Zealand's frontier basin opportunities. Occidental held the first permit awarded! under the AFO system (prior to its extension to cover all open areas), in the Great South Basin.

Permitting Activity

The 1996 East Coast blocks offer, which had been notified before the opening of the AFO mechanism, was quite successful in the award of six new permits, three onshore and three offshore. Most active were the Westech and Enerco joint venture, and Indo Pacific. A further three permits have been awarded on the East Coast under the AFO mechanism, and the province is now effectively fully covered by active permits except the small recently relinquished area around Gisborne.

Conoco have relinquished part of PEP 38602 off Northland and a further partial relinquishment is pending on the fifth anniversary of the permit. Pacrim extended their offshore Canterbury interests to the south, while Indo Pacific have acquired an extensive permit onshore Canterbury. Antrim International, of Calgary, has been awarded much of the Great South Basin as PEP 38211. Coal seam gas projects have proliferated with small permits in Southland, the West Coast, and Waikato.

Exploration Geology and Geophysics

Over 500 km of land seismic was shot in early 1997, all on the East Coast permits operated by Westech and Indo Pacific, except for a short line for Westech near Wanganui. The early stage of most offshore permits combined with the lack of a suitable vessel for acquisition of new seismic, limited

work in offshore frontier basins to reprocessing and interpretation.

Drilling

Whangaehu-1 was drilled near Wanganui in January 1996. Waitaria-1 near Gisborne, originally drilled in early 1996, was deepened without success in 1997, prior to the relinquishment of PEP 38312. Indo Pacific drilled Kereru-1 inland Hawke's Bay in late 1996, also without commercial success.

Outlook

Westech have initiated a multi-well drilling programme onshore northern Hawke's Bay in the past month. Otherwise there is no drilling scheduled in New Zealand's frontier basins before 1999. Conoco are committed to drill two wells offshore Northland and with Antrim also scheduled to drill in the Great South Basin (subject to relinquishment options) New Zealand can look forward to the first deep water exploration since the early 1980s. Pacrim are scheduled (but not committed) to drill off Canterbury before April 1999.

It is worth commenting briefly on the government programme to delineate New Zealand's legal continental shelf under the United Nations Convention on the Law of the Sea. New Zealand has a very large legal continental shelf encompassing sedimentary basins that in some cases are barely delineated let alone explored. Predominantly through two Crown Research Institutes, the Government has begun the scientific work required to support a claim to areas beyond the Exclusive Economic Zone delimited by the 200 nautical mile line. With the advances in deep water exploration and production technology in overseas theatres, the time must be at hand when industry attention is turned to New Zealand's substantial deep water opportunities. Any significant discoveries, especially of oil, in conventional regions, would accelerate that attention.

Summary

While exploration activity levels as measured by drilling have remained subdued over the past two years, other indicators reveal a significant resurgence. The principal factors have been the overall buoyancy of the petroleum sector internationally, and the effects of the New Zealand Government's decision, in 1996, to extend the Acceptable Frontier Offer mechanism to all open acreage.

There has been a subtle shift in the nature of participants in exploration in New Zealand. About thirty companies are involved in exploration permits, more or less level with two years ago. As then, these companies are quite diverse in terms of their principal nationality and overall business classification. Integrated major oil companies have been progressively supplanted by "junior", more focussed companies. Also, there has been some emerging participation by New Zealand downstream interests, notably Enerco in Wanganui and Hawke's Bay, and ECNZ in the Kupe South mining permit. Among the significant representation of Australian firms involved in exploration in New Zealand, there has been a notable expansion of companies focussed on oil and gas at the expense of those affiliated with mining companies.

Investment in petroleum exploration and development is characterised by a period, typically of about three years from project inception, of escalating costs; high and partly irreducible risks resulting in relatively frequent write-offs for unsuccessful initiatives, set against very high profitability for successful ventures. Historically the preserve of very large, integrated, multi-national corporations, the trend in recent years has been towards increased focus for each company, and greater use of contracting and alliances to optimise the efficiency and effectiveness of investment. The New Zealand exploration scene is very much dominated by niche players at this time. Some of the companies that have been most active under the AFO regime, such as Indo Pacific, Spectrum Exploration, and indeed GeoSphere, have a focus of expertise at the prospect generation stage of the investment cycle, and particularly deep expertise specific to New Zealand petroleum systems.

The next three years will test the true success of the Government's bold move in extending the AFO regime. If all or most of the permits awarded in the past two years sustain exploration through the drilling stage, the aggregate investment will approach, and may very well surpass, record levels. With the quality of geological and geophysical work being undertaken in many of these ventures, there is every likelihood of a significant positive outcome in terms of commercially significant discoveries.

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Mac Beggs and Glenn Thrasher formed GeoSphere Exploration Services Ltd in 1997, after holding scientific and management positions with the Institute of Geological and Nuclear Sciences and its antecedents. They have 25 years combined experience related to petroleum exploration in New

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