New Zealand's Taranaki Basin: An attractive investment opportunity

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Abstract

Mid-sized U.S. independent oil and natural gas companies have many reasons for considering New Zealand's Taranaki Basin as an attractive investment opportunity. As U.S. oil production continues a 30-year decline and U.S. natural gas production approaches its peak, independent exploration and production companies must increasingly look beyond North America for investment opportunities. With a democratic government, a modern legal and regulatory system, a favorable tax structure, good royalty provisions for oil and gas, and a growing economy with a stable currency, New Zealand provides a positive political and economic climate for investment. The country's well-developed and growing markets for both oil and natural gas also present adequate opportunities to sell oil and gas production, and its existing industry infrastructure provides access to sufficient equipment, manpower, and technical expertise to implement a successful exploration and development program. New Zealand is also blessed with good geological features that include a number of attractive drilling targets. The Taranaki Basin, for example, features a thick sediment wedge with proven reservoir quality rock. Multiple pay horizons in the basin have been shown to possess economic quantities of hydrocarbons. The basin features a variety of trapping mechanisms with a geological complexity that provides a natural fit for technically driven U.S. independents. Moreover, although the Taranaki Basin has been explored sufficiently to provide good technical information, it is still sufficiently under-explored to possess exploratory targets with attractive field size distributions and higher-than-average expected success rates. Exploring in New Zealand does entail risk, but those risks clearly have a significant potential for reward.

Introduction

New Zealand's Taranaki Basin can provide good investment opportunities for United States independent oil and natural gas companies. Swift Energy Company, a U.S. independent headquartered in Houston, Texas, has believed for some time that New Zealand is not only a scenic country with great people but also a good place to explore for oil and natural gas. This paper will summarize some of the reasons why Swift Energy believes that New Zealand's Taranaki Basin, in particular, can be a place of opportunity for U.S. oil and gas explorers.

Declining U.S. production

Independents in the United States must increasingly look overseas to find opportunities for sustained growth in reserves and production. Annual U.S. crude oil production peaked in 1970 at 3.5 billion barrels and since that time has continued to decline. By the end of 1999, U.S. domestic oil production had fallen to levels last experienced in the 1950s. Domestic natural gas production peaked at least temporarily in 1973, and although it is now growing toward that previous record, a more permanent peak in annual gas production could loom just a few years over the horizon.

New Zealand's investment climate

Of the hundreds of places around the globe where U.S. independents can look for international opportunities, New Zealand provides one of the more favorable investment climates. A survey of 99 countries by Petroconsultants, Inc., (now IHS) ranked countries in terms of their political and business risk in the petroleum industry. New Zealand ranked 7th, while the United States ranked 31st.

What are some of the reasons that New Zealand ranks so favorably? First, New Zealand is a constitutional democracy with a modern legal system and a long-standing tradition of representative government. This legal framework provides a more certain environment for capital investment.

Second, New Zealand has a growing economy with a relatively stable currency. The Reserve Bank of New Zealand expects growth in gross domestic product to average between 3.5% and 4% over the next couple of years, while inflation, as measured by changes in the consumer price index, is expected to decline to about 1.5%. Looking back over several years, New Zealand's track record on inflation compares favorably with other industrialized economies such as Germany and Canada.

Third, New Zealand's royalty and taxation policies help create a good climate for oil and gas investments. The Government collects its revenues from corporate income taxes with a normal rate of 33% and from either a 5% wellhead royalty or a 20% net profits interest. These terms compare favorably with the United States and most other parts of the world.

Finally, several general factors help create a positive climate for investment from the point of view of U.S. independents. The United States and New Zealand share a common language. The modern information infrastructure in New Zealand—ranking in the top 10 OECD nations worldwide in Internet hosts per capita—makes real-time transfers of information efficient and cost-effective. And perhaps most important of all, the Government has demonstrated in both words and deeds that it wishes to attract international investment.

Crude oil markets

Clearly, New Zealand's government and economy provide a good environment for investment, but what about the nation's markets for oil and gas? If significant discoveries of new oil and gas resources are made, can the production from these discoveries be sold at prices that can achieve reasonable rates of return? The answer is yes.

Like New Zealand, the United States is a net importer of petroleum. U.S. oil and gas companies therefore understand very well the implications of imported oil for a nation's balance of trade. As New Zealand's Minister of Energy stated in 1998, every barrel New Zealand produces "is one less barrel we have to buy from overseas, reducing our foreign debt…" New Zealand has every incentive to produce more oil in order to reduce its net imports of this very important commodity.

It is interesting to note that although New Zealand imports most of the petroleum it consumes, it exports most of the crude oil it produces. This is just another way of saying that New Zealand's oil markets are well integrated into the international economy, particularly the fast-growing economies of the Pacific Rim where crude oil consumption has grown more rapidly than for the world as a whole during the last few decades. Since New Zealand has a good transportation infrastructure for reaching these markets, it rests secure in its ability to market the crude oil it produces.

Natural gas markets

Natural gas markets are more tied to energy consumption in New Zealand itself. The two largest consuming segments are methanol production and electricity generation. Methanol production, which used about 39% of New Zealand's gas production during the 12 months ending in March 1999, is expected to run near capacity for the next three years, while electricity generation, which used 41% of the country's gas production, is expected to continue to grow.

Over the last 25 years, electricity generated by natural gas in New Zealand has grown from essentially nothing to about a quarter of all the electricity produced. Natural gas is the cleanest-burning fossil fuel for electricity generation, and when capital costs are considered, it is also the most economical fuel. The environmental and cost advantages of natural gas are the major reasons that electricity generation is also the fastest growing segment of natural gas demand in the United States. The fact that clean gas-fired generating capacity can be economically added in smaller increments than other fuels like coal is particularly important for a nation like New Zealand, where the grid does not reach hundreds of millions of persons across a continent.

Looking at the long-term supply of natural gas, over 70% of the gas currently consumed originates in the Maui Field, and production from that field is expected to decline over the next decade. Where is New Zealand going to get its additional supply? The answer has to be from additional exploration of New Zealand's undiscovered natural gas resources.

New Zealand's industry infrastructure

Fortunately, New Zealand has the infrastructure needed to increase its exploration and production activity. The first producing oil well in New Zealand was drilled in the mid 1860s, so people have been exploring for oil in New Zealand almost as long as they have been exploring for oil in the United States. On the other hand, the modern era of exploration in New Zealand is only about 30 years old. New Zealand's oil and gas industry is therefore a good blend of old and new. The industry is well established, contributing roughly NZ$ 1.5 billion to the nation's economy. On the other hand, it is young enough to still be full of possibilities and potential.

The *Explore New Zealand—Petroleum* booklet published by Crown Minerals lists scores of companies and organizations active in some way in New Zealand's oil and gas exploration and production industry. Not only does this industry infrastructure provide access to technical and operating services, it also provides access to potential joint venture partners who are already familiar with the area's geological and operating environment. The onshore Taranaki Basin, where Swift Energy is involved, lists 16 oil and gas companies engaged in work on 21 exploration permits.

Taranaki Basin

All of the advantages enumerated up to this point are preliminary from the point of view of an oil and gas explorer. A good investment climate, growing oil and gas markets, and a vibrant industry infrastructure are prerequisites for a successful exploration and development program, but they are not sufficient by themselves. The most important precondition for a successful drilling program is the existence of geological features that include a number of attractive drilling targets.

New Zealand has the proper geologic potential. Its onshore and offshore areas fall within a number of Cretaceous-Cenozoic aged basins, but the most important of these is the Taranaki Basin. Although this basin has been explored sufficiently to provide good technical information, it is still sufficiently under-explored to possess exploratory targets with attractive field size distributions and higher-than-average expected success rates.

In evaluating the Taranaki Basin, a multitude of geologic, geophysical and engineering parameters must be considered. These include, but are certainly not limited to, the following: basin size, stratigraphy and tectonic history, reservoir rock quality, hydrocarbon source rocks, depth and time of burial, maturation and migration, trapping mechanisms, surface conditions and restrictions, and the presence and distribution of economically feasible field sizes. All of these parameters are important and much could be said about each, but for the sake of brevity, this paper will examine five key parameters: the availability of technical data, the occurrence of reservoir quality rock, the presence of hydrocarbons, the existence of traps, and viable field size distributions.

Availability of technical data

The accessibility of data—either newly acquired or preexisting—is always important in the creation of an exploration project. New Zealand offers a balanced mix of confidentiality and availability. An operator has the right to retain confidentiality on all data for a period of five years from the date of acquisition if the petroleum exploration permit is still active. After that date, or when the permit is released (whichever occurs first), the data becomes part of the public record. All of this data (including seismic, gravity, magnetics, well logs, test data, etc.) is then available for the cost of reproduction. This allows a company to maintain a competitive edge on its active permits for a period of time, but it also eventually allows the oil and gas industry to collectively benefit from the ideas and expenditures of everyone involved.

Surface conditions are not extreme or unusual. Restrictions or requirements associated with applications, procedures, and timing do little to hinder the acquisition of exploration data in the field. Involving only a limited number of agencies or departments, the consenting process is easily understood and relatively simple compared to the United States. The costs of reconnaissance and prospect-specific seismic and geophysical data are reasonable and comparable with what U. S. independents are accustomed to spending in the United States.

Reservoir quality rock

During the last 100 million years, an approximately 9 km-thick sedimentary stratigraphic section has been established in the Taranaki Basin on a pre-Cretaceous igneous and metamorphic basement. Proven reservoir quality rock has been encountered throughout the Tertiary (Paleogene and Neogene) strata from the Paleocene Farewell to the Pliocene Matemateaonga formation. Since the stratigraphic section in this basin is primarily clastic, it is reasonable to expect that most of the pay sections are sandstones. However, the clastic depositional history is quite varied, including fluvial braided stream systems, shoreline and lower coastal plain sands, shelf sands, deep-water fan and turbidite systems, and volcanic epiclastic sediments. The noteworthy exception to this rather continuous cycle of clastic deposition is the late Oligocene-early Miocene deposition of shelf and foredeep limestones.

To date, most of the more significant hydrocarbon reserve accumulations in the Taranaki Basin are associated with the Eocene-aged shoreline and coastal plain sand reservoirs. However, all the aforementioned depositional systems can, and in this basin do, create reservoir quality rock units of sufficient thickness and areal extent to support drilling and production activity.

Presence of hydrocarbons

Organic carbon content, hydrocarbon richness, depth of burial and maturity are all critical ingredients in the creation of recoverable hydrocarbons. The primary source of hydrocarbons in the Taranaki Basin is most likely the coal measures and interbedded carbonaceous shales of the late Cretaceous Pakawau and Paleogene Kapuni groups. The carbonaceous lithologies of the Rakopi, Kaimiro and Mangahewa formations appear to provide the greatest source rock potential. Although this basin was originally considered a gas/condensate province, the discovery of a nearly equal number of oil fields has provided evidence to support the economic presence of both types of exploration prospects. Production has been established in at least 11 different reservoir units from the Paleocene through the early Pliocene section. Of significant importance is the fact that some fields include multiple stacked reservoirs within one or more formations. In areas of thrusting, it is reasonable to expect that some pay zones will also occur in multiple thrust sheets. From the oil and gas explorer’s point-of-view, the potential of targeting multiple pay zones from a single exploratory well is an attractive feature of the Taranaki Basin, reducing the risk of failure without a commensurate increase in costs.

Existence of reservoir traps

The history of the Taranaki Basin is tectonically, structurally, and stratigraphically complex, having undergone several periods of basin evolution. There is anything but complete agreement on the various depositional, structural, and tectonic events that have shaped this region in general or this basin in particular. Without overly simplifying all that has happened, one can summarize and condense the creational history of the Taranaki Basin by saying that it was strongly impacted by the following four factors: plate tectonics, rifting, volcanism, and folding and faulting (including normal, reverse, and thrust). This tectonic history was imprinted throughout the sedimentary record that began with a significant Paleogene transgressive cycle that was followed by a Neogene regressive cycle. During these cycles, periods of uplifting, erosion, subsidence and sediment burial occur. The result is a basin that is rich in the number and variety of hydrocarbon trapping mechanisms.

The Taranaki Basin covers about 100,000 km^2, with all of the larger Western Platform and most of the Eastern Mobile Belt or Taranaki Graben occurring offshore. Less than 10% of the Taranaki Basin is represented by onshore acreage on the North Island of New Zealand. Many of the existing fields, including Swift Energy Company's recent discovery, occur onshore within an area dominated by the Tarata Thrust and Taranaki fault zones on the eastern edge of the basin.

At the present time, all of the significant hydrocarbon accumulations are associated with structural trapping mechanisms. These structural traps can occur with four-way closure or with anticlinal features that have trapping provided by normal or thrust faulting. Stratigraphic elements are associated with some of these structural traps, but thus far no purely stratigraphic trap has been brought to a productive field status. The sedimentary environments of deposition would strongly suggest, however, that stratigraphic traps do exist and ultimately will be exploited.

The complexity of the tectonic and stratigraphic history and the variety of trapping mechanisms present in this basin require an integrated exploration and evaluation approach. Swift Energy has developed, and continues to refine, a team approach in both exploration and development programs utilizing a combination of cutting edge and time tested technologies. For a technically driven independent such as Swift, the complexity of the area is a natural fit.

Swift Energy's recent successful exploratory well, Rimu-A1, was identified and drilled on the basis of subsurface data and existing two-dimensional seismic data supplemented with Swift's own two-dimensional seismic acquisition. However, the development of this discovery and the exploration of an adjacent offshore feature will be predicated upon a new seismic acquisition project.

This project will be designed, using the extensive wireline logging data from the Swift Rimu-A1, to properly image the steeply dipping beds and the expected contrast between the thrust beds and the sedimentary beds juxtaposed against them. The seismic program has been designed to straddle the coastline of the south Taranaki peninsula. Although this geographic area was ignored in the past because of the difficult surface terrain, the new program is designed to acquire transition zone seismic data extending into the offshore sufficiently to tie existing marine and onshore seismic data. This will be the first time that a seismic program coupling surface cables with water-bottom marine cables and streamer cables has been undertaken in New Zealand. This specially designed program should be capable of answering a multitude of exploration and development questions.

Field size distribution

The Taranaki Basin presents an interesting distribution of field sizes ranging from non-commercial to nearly a billion barrels of oil equivalency. To date, the largest field in this basin occurs in the offshore waters. Onshore accumulations have generally been less than 70 million barrels of oil equivalent (mmboe), the exception being the Kapuni Field with reserves approaching a quarter billion barrels of oil equivalency. The statistics concerning the distribution of field sizes tend to suggest that this basin is more suited to the independent oil and gas sector rather than large, integrated international energy companies.

While larger companies such as Shell and Conoco are present in the basin, most of their focus is directed toward the offshore concessions where the largest field has been discovered thus far. The challenging and smaller reserves are associated with the onshore portion of the Taranaki Basin. There companies such as Swift Energy New Zealand Ltd., Bligh Oil & Minerals NL, Fletcher Challenge Energy, Indo-Pacific Energy (NZ), Shell Petroleum Mining Company Ltd., Todd Petroleum Mining Company Ltd., Westech Energy Ltd., New Zealand Oil and Gas Ltd., and others find that the balance of risk/reward and potential field sizes are sufficient to warrant the expenditure of exploration capital.

A 15-70 mmboe field size is far more meaningful to an independent than it is to a major oil company. A Kapuni-sized field can literally be a "company maker" for an independent, while having little impact on a major oil and gas company's bottom-line value. The obvious conclusion is that the requirements, likelihood of success, and distribution of field sizes associated with the Taranaki Basin more closely fit the strategic plans or visions of an independent oil and gas company. Independents can also bring new ideas and innovative applications of technology to New Zealand. For example, independents' experience with horizontal drilling and directional drilling may provide opportunities to exploit oil and gas resources while minimizing surface impacts on the environment.

Conclusion

Clearly, mid-sized U.S. independent oil and natural gas companies have many reasons for considering New Zealand's Taranaki Basin as an attractive investment opportunity. The political and economic climate for investment benefits from the nation's modern, democratic legal system, its favorable tax structure, the good royalty provisions for oil and gas, and its growing economy and stable currency. The country's well-developed and growing markets for both oil and natural gas present adequate opportunities to sell oil and gas production, and the nation's concern for the environment favors clean-burning natural gas over other fossil fuels. The industry infrastructure provides a great blend of established performance and new possibilities. Most importantly, New Zealand is blessed with good geological features that include a number of attractive drilling targets. The Taranaki Basin features a thick sediment wedge with proven reservoir quality rock. Multiple pay horizons in the basin have been shown to possess economic quantities of hydrocarbons. The basin features a variety of trapping mechanisms with a geological complexity that provides a natural fit for technically driven U.S. independents. And although the Taranaki Basin has been explored sufficiently to provide good technical information, it is still sufficiently under-explored to possess exploratory targets with attractive field size distributions and higher-than-average expected success rates.

Oil and gas explorers know that in spite of all these advantages, searching for oil and gas in New Zealand entails significant risk. The U.S. independents that have closely examined opportunities in the area also know, however, that New Zealand exploration has exciting potential for reward.

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