The view of the independent in today's changing industry

T E Swift

President and Chief Executive Officer, Swift Energy Company, 16825 Northchase Drive, Suite 400 , Houston, Texas, United States of America, 77060-6098 , Telephone, 001-281-874-2700; Fax, 001-281-876-8033, E-mail info@swiftenergy.com

Abstract

One of the greatest challenges facing the oil and gas industry today is the need to focus exploratory efforts on new horizons. If world oil production follows a bell-shaped Hubbert curve, as it has in the U.S., global production probably will peak sometime between 2005 and 2025. As this peak nears, oil and natural gas supplies increasingly will come from small- to intermediate-sized fields producing from deeper, less-explored horizons. In the United States, less than 4% of the wells completed from 1970 through 1999 were drilled at depths of 12,500 feet (roughly 4,100 meters) or greater. In New Zealand, less than 7% of the wells drilled between 1900 and 1998 were drilled to depths of more than 4,100 meters.

Companies best suited for prospering in today's environment are mid- to large-sized independents, as characterized by market capitalization, reserves, and revenues. These independents are skilled in applying innovative technology, in adapting to geographic niche areas, and in managing assets to achieve a proper balance of risk and potential reward.

Swift Energy Company's exploration of the Kauri prospect in New Zealand's Taranaki Basin is an example of the kind of world-class opportunities that remain for future discovery. In 2001, Swift drilled two wells in the Kauri area, which has an estimated potential of over 200 million barrels of oil equivalent with oil and gas shows at multiple horizons. Swift's size and technical expertise make it well suited to develop this type of project, which is large enough to have a positive impact both for the New Zealand economy and for Swift Energy Company shareholders.

Introduction

From the perspective of an independent exploration and production company, the changing environment in the oil and natural gas industry is presenting great challenges while at the same time providing great opportunities. The major product of the industry—petroleum—is a non-renewable energy resource, and the principal challenge is to discover as much of the remaining product as possible in order to better the standard of living for the world's burgeoning population. But the nature of the industry is such that this must be done in an environment in which product prices undergo cyclical volatility, placing a premium on both flexibility and foresight.

In order to find their future roles, independents must look at the big picture, both now and into the future. Such an examination shows that independents not only have an important role in continuing to supply the world's populations with needed energy, they have a critical role. For it is the independents who are structured in such a way that they can adapt quickly to new situations and new areas of exploration.

Long-term trends in global oil and gas production

U.S. oil production. The United States provides a good example of the inevitable decline in the production of petroleum. U.S. oil production peaked in 1970, and annual production has decreased by more than a billion barrels over the last three decades. As predicted by M. K. Hubbert, U.S. production has followed a bell-shaped curve. Assuming it continues to follow this curve, one is struck by the briefity of the oil era in the United States. Colonel Drake drilled the first commercial oil well in the U.S. in 1859. At first, production rose only gradually, but exponential increases began to take effect around 1910. Sixty years later production peaked. Since the bell-shaped curve is symmetrical and since U.S. domestic production has already declined for more than 30 years, only about 30 more years remain before U.S. oil resources will be largely depleted.

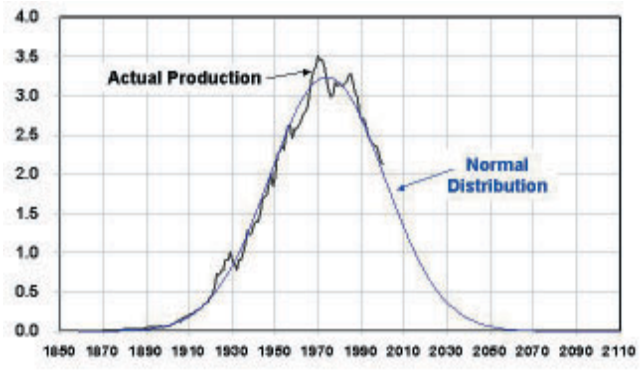

Figure 1: U.S. Crude Oil Production (1850-2100 in Billion Barrels per Year)Sources: U.S. Energy Information Administration and U.S. Bureau of the Census

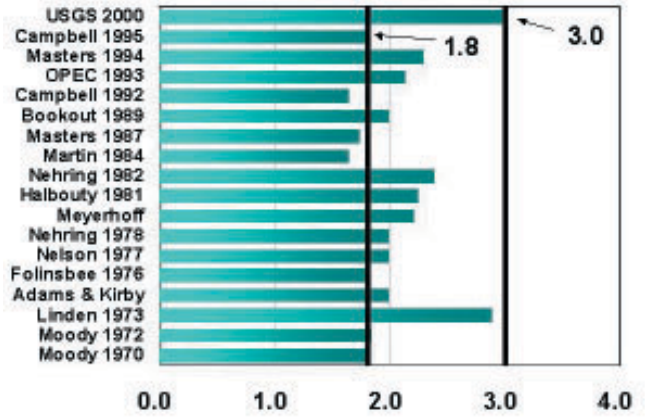

Figure 2: World Ultimate Recovery Estimates (Trillions of Barrels) Sources: U.S. Energy Information Administration and World Resources Institute

Global oil production

Because U.S. reserves were developed relatively early in the oil and gas industry's history, global petroleum resources are at an earlier stage of the Hubbert curve. Over the last 30 years, many estimates have been made about how much oil will be ultimately recovered during the world's oil age, with most falling within the range of 1.8 trillion barrels to 3.0 trillion barrels. Through 1999, the world had consumed a cumulative total of roughly 860 billion barrels. Within the estimated range, this leaves from about 1 trillion barrels to 2.1 trillion barrels remaining to be produced.

Under any reasonable scenario, this century will see the end of the petroleum age. When remaining world oil resources are plotted using a normal distribution similar to Hubbert's approach, world production is projected to peak from within a few years to around 2025. It is important to note, however, that growth rates will continue to slow long before the peak is reached. This is true whether one looks at rates of change for normal distributions or whether one extrapolates trend lines for historic growth rates in worldwide production. Obviously, the Hubbert curve is only a general trend. Considerable volatility will continue to exist from year to year, but the overall trend will be toward lower growth in petroleum production until the peak is reached.

Concentration in the Middle East

The coming peak in world petroleum production is only part of the supply story. World petroleum resources are becoming increasingly concentrated in the Middle East, adding significant volatility to the cyclical price swings that have always been present in the industry. OPEC countries in the Middle East and North Africa currently account for over two-thirds of the world's proved reserves of oil, which means that a much higher percentage of the world's oil supplies will come from the Middle East in the years ahead. Reference-case projections by the U.S. Energy Information Administration suggest that global oil production from the Persian Gulf will increase from about a quarter of the world's supplies today to over a third by 2020. By that time, OPEC as a whole will account for almost half of global supplies.

Contributing to this concentration of production is the fact that the Persian Gulf accounts for a substantial majority of the world's low-cost, easy-to-extract supplies. Therefore if prices remain low, less drilling will be done in other regions, and the world's dependence on Middle East oil will become even greater. Given the political instability of that part of the world, this growing dependence can be a significant threat both to the stability of oil prices and to the robustness of world's economic growth.

Population growth and world energy consumption

At the same time, global population increases will be driving long-term growth in energy consumption. Over the next 50 years, the world's population is expected to increase by over 50% to over 9 billion, up from about 6 billion today. In developing countries, where population growth is most rapid, current per-capita energy consumption is very low, creating pressure for growth in energy use. In the United States, the average person uses a little over 26 barrels of oil per year, about five times the average per-capita consumption for the world as a whole. The next most energy-intensive economy, Japan, has an annual consumption of about 16 barrels per capita. In comparison, the world's two most populous nations, China and India, which together account for about a third of the world's population, annually consume an average of 1.3 and 0.7 barrels of oil per capita, respectively. As one might expect, China and India have much faster growth rates in per-capita consumption than the United States or Japan. Between 1980 and 2000, per-capita consumption in both China and India more than doubled. Other examples could be used to tell the same story. Thus, population growth will combine with increased per-capita oil consumption to drive up the demand for oil in the decades ahead. But, as has already been established, over the long term that demand cannot be met with increased supplies and even now dependence on supplies concentrated in the Middle East is risky.

Increasing emphasis on natural gas

If less oil is available, how then will the world's growing demand for energy be satisfied? Since the beginning of civilization there has been a definite progression in mankind's

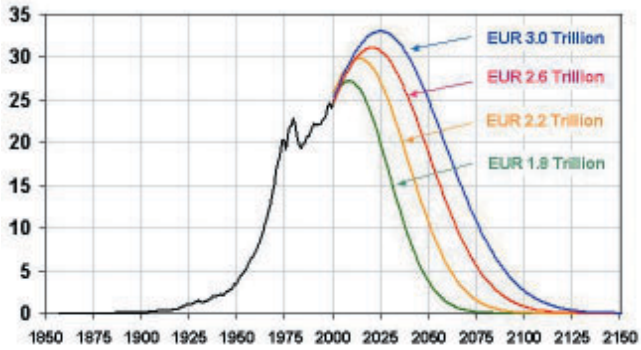

Figure 3: World Crude Oil Production. Actual and Projected (1850-2150) in Billion Barrels per Year Sources: U.S. Energy Information Administration and World Resources Institute

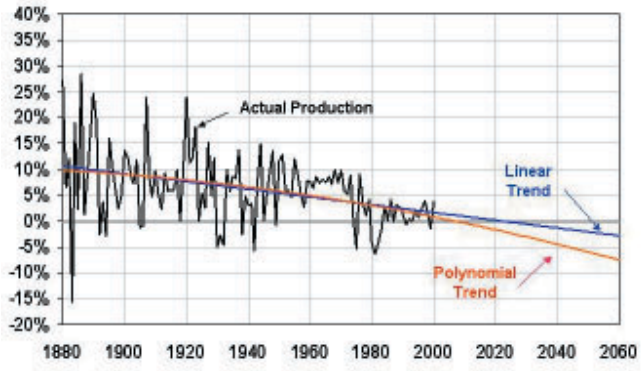

Figure 4: Growth in World Crude Oil Production. Actual and Projected (1850-2150) in Percent per Year. Source: U.S. Energy Information Administration

use of energy, and in this process, fuels that contain more energy per unit carbon— that is, fuels that are more efficient and less polluting—have increasingly been utilized. In fact, the history of energy usage is a story of transitions. First it was from wood to coal and then from coal to petroleum. Now, the obvious transition, which actually began some years ago, is from oil to natural gas, with other sources, such as nuclear power, solar photovoltaics, and other advanced technologies, largely relegated to the future.

Particularly in the first two decades of the 21st century, natural gas will take center stage. In both the United States and the world as a whole, natural gas resources are much more abundant than oil resources. And with natural gas being cleaner and more efficient than other available alternatives, it is especially suited for electricity generation. Over the last decade, gas-fired generating technologies have undergone tremendous technological progress. The new global high-tech economy will create strong incentives in both developed and developing nations to turn toward gas-fired electricity as a way of meeting growing energy requirements. For a host of reasons, natural gas will increasingly become the world's fuel of choice.

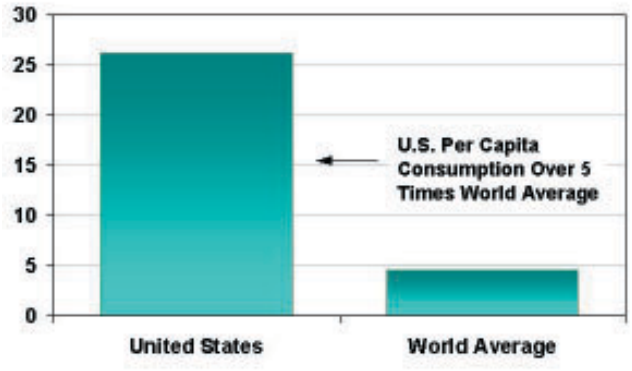

Figure 5: Per Capita Petroleum Consumption. 2000 Consumption in Barrels per Person per Year. Sources: U.S. Energy Information Administration and U.S. Census Bureau

Development of new production horizons.

As global oil production nears its peak, new additions to production will have to come from small- to intermediate-sized fields producing from deeper, less explored horizons since the large fields with shallower producing horizons have largely been exploited.

In the year 2000, 29% of the total U.S. oil production came from the nation's 20 largest fields, only five of which were discovered after the oil production peak in 1970. Seven of those fields were discovered prior to 1940, and the largest field, Prudhoe Bay, was discovered in 1967. As the Economist magazine recently noted, the world enjoyed a "dramatic wave of non-OPEC discoveries" in the 1960s and 1970s in Alaska, the North Sea, and other places, but now those fields are aging. For example, most of the large fields in the North Sea are 70-90% depleted. New comparably sized discoveries have not filled the void. Instead, a large number of smaller discoveries have helped maintain non-OPEC production.

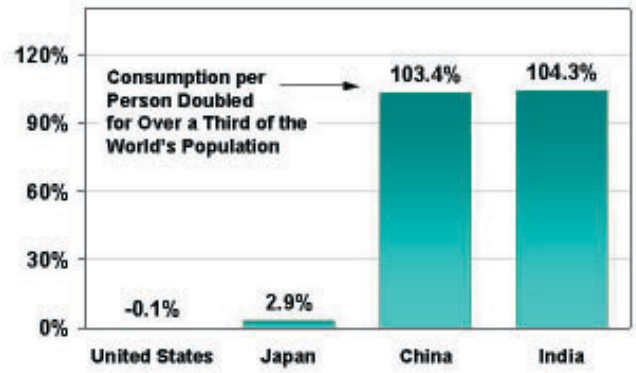

Figure 6: Cumulative Change in Per Capita. Petroleum Consumption: 1980-2000. Total % Change in Barrels Consumed per Person per Year. Sources: U.S. Energy Information Administration and U.S. Census Bureau

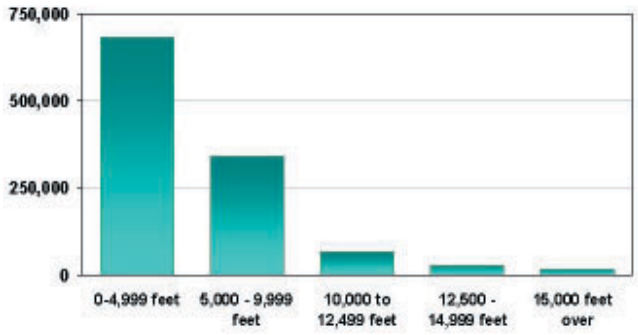

Figure 7: Cumulative U.S. Wells. Drilled by Depth: 1970-1999. Number of Wells, Depth in Feet. Source: Oil and Gas Journal

Some of these new discoveries have been found at greater depths than has been the norm in the past, and with the technologies now available, deeper wells are increasingly being included in drilling programs. In general, however, the deeper horizons are still largely unexplored. In the United States, for example, less than 4% of the wells completed from 1970 through 1999 were drilled to depths of 12,500 feet (roughly 4,100 meters) or greater, whereas over 60% of the wells during that period were drilled to depths of less than 5,000 feet (1,640 meters). In New Zealand, less than 7% of the wells drilled between 1900 and 1998 were drilled to depths of more than 4,100 meters. The deeper horizons therefore are under-explored areas, and, as indicated from the discoveries already made, they have tremendous potential.

As these new discoveries become less concentrated, bringing new production on line will depend on ever-larger capital investments for infrastructure requirements. The International Energy Agency has estimated that upstream investments by large firms will require about $1 trillion over the next decade.

Developing and producing newly discovered oil reserves also often requires the creation of markets for associated natural gas. Infrastructure investments in natural gas are therefore not only required as a means of increasing natural gas production to offset dwindling oil supplies, they are also necessary to economically develop the oil supplies themselves.

The role of independent producers

Exploration focus.

All of these trends have implications for independent exploration and production companies, who will be in a strong position to take advantage of the exploration opportunities that remain. The main characteristic that these companies share is their focus. Unlike the vertically integrated majors, whose focus is on both upstream and downstream activities, independents fully devote their resources to finding and developing oil and natural gas reserves. As the infrastructure requirements for adding new reserves continue to grow, the majors will have to concentrate on the array of upstream and downstream investments that will be necessary to develop, transport, and market new discoveries. Although larger independents will also focus on infrastructure investments, they will generally have a sharper focus on exploration than the majors.

Competitive advantages and strategies

After years of low prices in the 1980s and 1990s, surviving independents have developed several competitive advantages for oil and gas exploration. They have obtained considerable expertise in adapting innovative technologies to specific areas of opportunity. They have developed the organizational flexibility and financial discipline required to take advantage of price cycles. And they have learned to manage assets in a volatile pricing environment, continually balancing risk with potential reward. In the United States, independents have led the transition to natural gas as oil production has declined.

In the case of mid- to large-sized independents, which generally range from a market capitalization of a few hundred million to several billion dollars, the depth of their financial resources allows them to build infrastructure on their own or to partner with majors in building infrastructure. Although smaller than the majors, these independents can bring considerable financial strength to bear on the challenge of finding and developing new reserves while also making needed infrastructure investments. An analysis of 30 independents comprised of Swift Energy and its peers shows that during 2000 they ranged on average from about $200 million to $7 billion in market capitalization, from $395 million to $16 billion in assets, and from $60 million to $5.7 billion in annual revenues.

Smaller independents will play several important roles as well. Some will be niche players in exploration, specializing in finding reserves and then farming out development and production operations. Others may tailor their exploration and development activities to particular risk tolerances or focus on particular technologies. Still others will focus on geographic niches, exploring, developing, and producing oil and gas only after larger independents and majors have put substantial infrastructure in place.

The independents that choose to focus more broadly on exploration and development, rather than finding niches, will

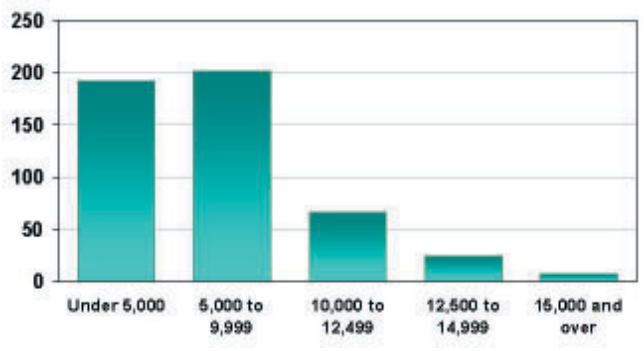

Figure 8: Cumulative N.Z. Wells. Drilled by Depth: 1900-1998. Number of Wells, Depth in Feet. Source: New Zealand Ministry of Economic Development

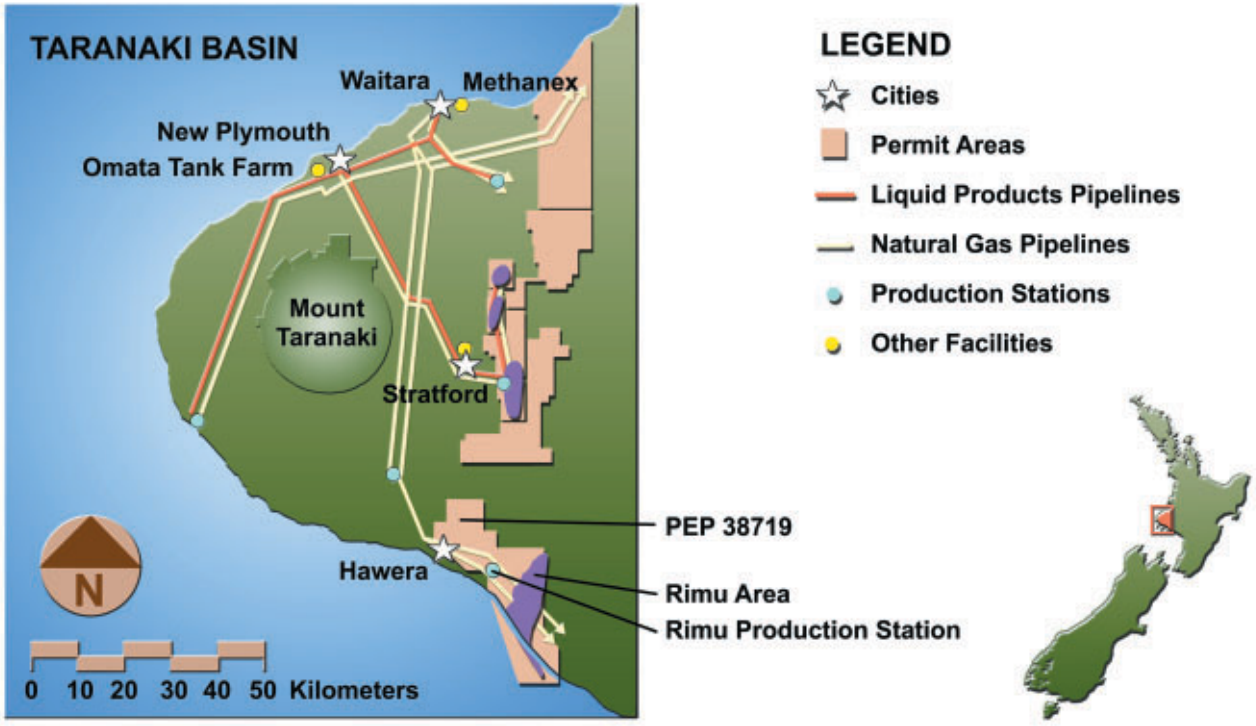

Figure 9: Areas of Swift Energy Activities in New Zealand

need to continue to grow. As an independent grows through drilling and acquisitions, ever larger projects are needed to maintain growth rates. With the opportunities in the United States for oil and gas exploration and development dwindling, more and more U.S. independents, including Swift Energy Company, are finding growth opportunities in exploratory efforts outside the United States.

Swift Energy's activities in the Rimu and Kauri areas

Swift Energy Company's exploration and development of the Rimu and Kauri areas on PEP 38719 in New Zealand's Taranaki Basin is an example of the kind of world-class opportunities that remain for independent exploration and production companies.

Kauri area

The Kauri area, which Swift began exploring after drilling several successful wells in the Rimu area to the north, may turn out to be the best onshore prospect currently being explored in New Zealand. To date, two wells drilled on the Kauri prospect have resulted in oil and gas shows in multiple horizons. The Kauri-A1 well, which initially tested hydrocarbons from the Upper Tariki sand, has recently been undergoing testing of the Kauri sands. The Kauri A-2 well was perforated in the shallow Manutahi sand. Together, these tests suggest that Kauri's multiple horizons provide a unique blend of opportunities to build short-term cash flows while also pursuing longer-term potential that could total more than 200 million barrels.

The Upper Tariki sand in the Kauri-A1 well was perforated over an approximately 30-foot (9-meter) interval beginning at a depth of 11,142 feet (3,397 meters) and flowed at an initial rate of approximately 500 barrels of oil equivalent per day (Boe/d), despite the lack of a good cement bond and an unsuccessful cement squeeze prior to perforation. After the well was shut in to install test separator equipment because of black smoke from the well, the flow rates ranged from 20 to 146 Boe/d of 34-degree API gravity oil with minimal amounts of water. Analysis of core samples taken from this interval indicates porosities of up to 22% and permeabilities of up to 180 millidarcies.

The Kauri sand, beginning at a depth of 9,473 feet (2,888 meters) in the Kauri-A1 well and extending approximately 872 feet (266 meters) to a depth of 10,345 feet (3,154 meters), largely consists of multiple sections of sandstones and claystones that yielded good oil and gas shows associated with drilling breaks and appears to be hydrocarbon bearing based on log analysis. Petrophysical analysis of the data from this well indicates a hydrocarbon-bearing sandstone interval of approximately 577 feet (176 meters) with good porosity. This same interval was also encountered, although not tested, in all of the previously drilled Rimu wells with varying degrees of hydrocarbon shows. This interval in the Kauri-A1 well has greater sand development and better mud log shows than any of the previous wells drilled at Rimu.

The shallow Kauri-A2 well, the second well drilled from the Kauri A pad, was perforated in the Manutahi sand over a 33-foot (10-meter) interval beginning at a depth of 3,815 feet

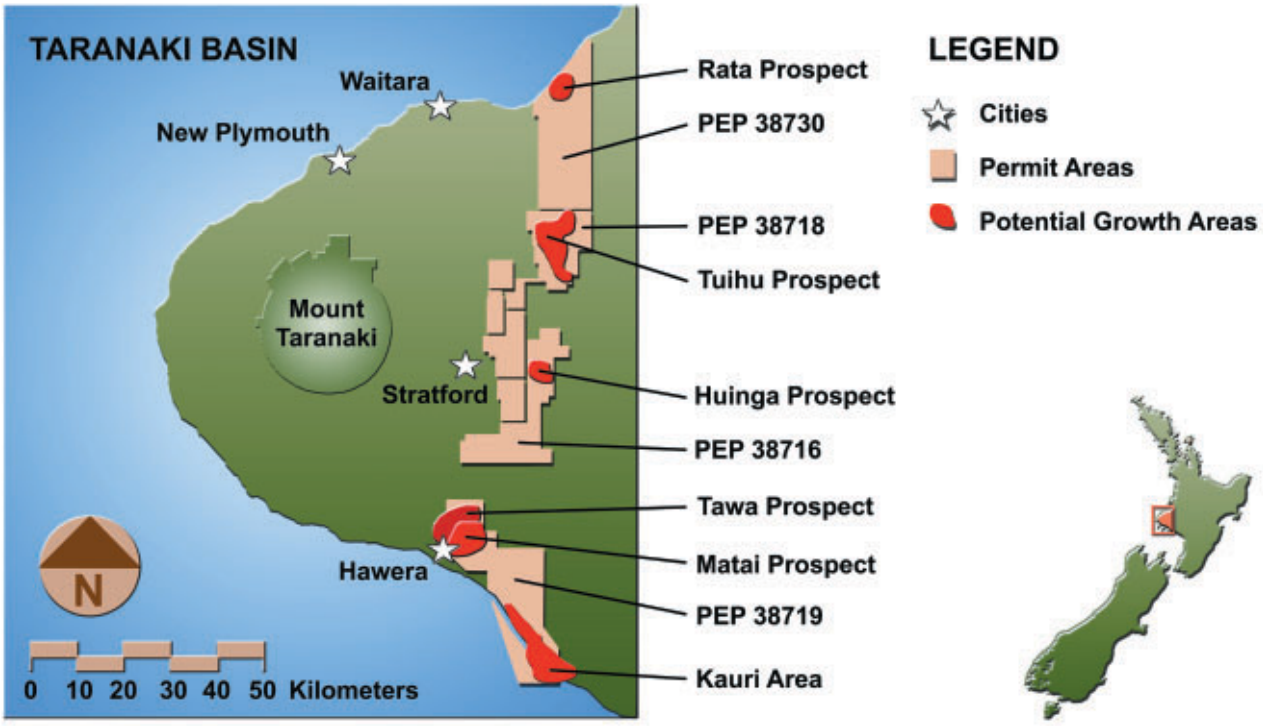

Figure 10: Exploration Prospects and Growth Areas

(1,163 meters). The well flowed under natural conditions at rates ranging from 39 to 55 Boe/d of 16-degree API gravity oil with minimal amounts of water. Preliminary testing of the well was performed using several jet pumping designs for the artificial lift system, without sand control measures. During this preliminary pumping evaluation, the well produced small amounts of sand (less than 2% by volume) and tested at rates of up to 133 Boe/d. Subsequent wireline operations confirmed that the well's productivity was not at capacity due to sand migration into the wellbore. Sand-fill was confirmed over 50% of the perforated interval. Following additional testing, the Company plans to gravel-pack the well and install pumping equipment with a capacity in excess of 400 Boe/d. Analysis of core samples taken from this interval indicates a hydrocarbon-bearing interval of approximately 66 feet (20 meters), which is about twice that determined from the initial log analysis. Laboratory core analysis indicates porosities of up to 29% and permeabilities of up to 810 millidarcies.

Although these are just interim results, the initial testing of each of the Kauri wells was quite encouraging. The productivity of the Upper Tariki sand at the Kauri location extends this play approximately five miles to the south of Rimu. In addition, the Kauri sand found in the Kauri-A1 well is much thicker than any of the other hydrocarbon-bearing zones seen in the Rimu wells, and the results of this testing operation will tell us a lot about the potential productivity and reserves for this sand.

The interim results from testing the shallow Manutahi sand in the Kauri-A2 well are also exciting. Swift has initiated plans to build new pads for additional drilling next year. It is also important to note that this crude oil did not have the higher wax content that is seen in many of the oil wells in the Taranaki Basin. Development of this shallow area could bring some early cash flow and increased economics to this project.

Infrastructure challenges

The tremendous long-term potential of the Rimu and Kauri areas has been accompanied by infrastructure challenges that are illustrative of the kinds of infrastructure issues that independent producers face around the globe. To meet these challenges, Swift adopted a two-part strategy.

First, Swift began construction of a Rimu production station, adopting a fast-track strategy that will allow the Company to move from its initial Rimu discovery in December 1999 to production in only 26 months. In addition, the facility's process equipment and utility systems were oversized to allow relatively quick expansion of capacity as Rimu production continues to grow. Swift Energy New Zealand's Facilities Manager, C. J. T. Bush, provides a more thorough discussion of the Rimu Production Station in his 2002 New Zealand Petroleum Conference paper.

Second, Swift moved to obtain access to infrastructure by developing a relationship with a major. Consequently, on December 3, 2001, the Company announced that Swift Energy New Zealand had reached agreement with an affiliate of Shell New Zealand (Shell NZ) to acquire Southern Petroleum (New Zealand) Exploration Limited (Southern NZ), which owns interests in onshore producing oil and gas fields, in

hydrocarbon-processing facilities with excess capacity, and in pipelines connecting the fields and facilities with each other and with export terminals and markets.

The assets being acquired are located in the Taranaki Basin of the North Island of New Zealand, approximately 17 miles north of Swift's Rimu discovery. Swift will be acquiring a 96.76% working interest in four Petroleum Mining Licenses (PML), collectively known as the TAWN properties and consisting of the Tariki Field (PML 38138), the Ahuroa Field (PML 38139), the Waihapa Field (PML 38140), and the Ngaere Field (PML 38141). The four fields include 17 wells which at year end 2001 had a total net production of about 31.5 million cubic feet equivalent per day. The net proved reserves as of November 1, 2001, were estimated to be approximately 65.0 billion cubic feet equivalent (Bcfe) with 74% of the reserves being natural gas. The natural gas is sold under a long-term contract to Contact Energy.

With this acquisition, Swift will not only be adding proved producing properties and immediate increases in cash flow, but more importantly it will be adding significant facilities and infrastructure that can enhance the value of the Rimu and Kauri areas and potentially accelerate their development. As a result of the TAWN acquisition, Swift will own and operate substantial additional oil and natural gas processing capacity, and by building pipelines from the Rimu and Kauri areas to the Waihapa Production Station, Swift would be able to export crude oil at New Plymouth and transport natural gas to electrical generation facilities through its own pipelines. The Company will also be adding skilled oil and gas professionals to its staff in Taranaki.

Conclusion

Swift's activities in New Zealand's Taranaki Basin are illustrative of the kinds of world-class opportunities that remain around the globe for independent oil and gas companies. Capitalizing on these kinds of opportunities is an important challenge, not only for independent oil and gas producers, but also for the world economy as a whole. Additions to oil and gas resources outside of the Middle East add to the world's energy security and provide the supplies necessary to meet the needs of a burgeoning global population.

Moreover, the wealth created by oil and gas explorers provides a foundation for continued economic progress. Economics has long known that increases to the supply of money have a "multiplier effect": as new money is reinvested, additional money is created. With major swings in the U.S. stock market in recent years, the "wealth effect" has also received considerable scrutiny. The bottom line is that wealth helps create additional wealth, leading to economic progress and a better quality of life. Oil is so essential to a modern economy and it influences economic output in so many ways that the positive feedback loops from newly discovered oil and gas wealth may exceed the impact of increases to the money supply itself. If this is true, then the Rimu and Kauri discoveries have considerable potential, not only for adding to the wealth of Swift Energy stockholders, but also for making a significant contribution to the New Zealand economy.

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Author

TERRY E. SWIFT is chief executive officer, president, and a director of Swift Energy Company of Houston, Texas. He is also president of Swift Energy International. He joined the company in 1981, serving as chief operating officer from 1991 to 2000. In earlier appointments he was vice president (1988-1990) and senior vice president (1990-1991) for exploration and joint ventures. Prior to joining Swift Energy, he was a reservoir engineer with H. J. Gruy and Company. He graduated from the University of Houston in 1979 with a bachelor of science degree in chemical engineering and obtained a master's degree in business administration in 1991 from Pepperdine University.