

THE ASIA-PACIFIC ENERGY SECTOR:

THAILAND, MALAYSIA, SINGAPORE & BRUNEI



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DANCING WITH TIGERS

The Asia-Pacific region of Malaysia, Thailand, Singapore and Brunei present new investment opportunities in the hydrocarbon industry.

The following report looks at one of the most dynamic areas of economic activity in the world—the Asia-Pacific region, specifically southeast Asia’s tiger economies: Malaysia, Thailand, Singapore and Brunei. It also casts glances at the vast energy issues facing China, their mighty northern neighbor.

The area witnesses spiraling demand, huge infrastructural projects, a frenzy of exploration activity and a plethora of opportunity.

A cursory glance at world history will reveal that most countries in the region were under the yoke of Britain as a colonizer during the 19th and 20th centuries and/or under Japanese occupation between the 1930s and the end of World War II.

Britain’s colonial expansion required stable supply lines. The British purchased the island of Singapore in 1824, which rapidly developed into an important shipping hub. The opening of the Suez Canal in 1869, and the steamship—a technological revolution of the time—assured Singapore’s continued prosperity.

The defeat of Japan at the end of the second World War guaranteed a continuation of British presence, maybe even a

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To complete the picture, *Oil and Gas Investor* will publish *Global Business Reports’ Asia-Pacific: II*, which will focus on the hydrocarbon issues facing the southern Pacific basin, specifically Australia and Indonesia.

prolongation thereof. From the many protectorates that Britain then formed, federations emerged. The federation of Malaysia gained independence in 1948. Singapore broke

About the Cover: Bongkot, Thailand’s largest gas field, contains reserves estimated at 4.5 trillion cubic feet. It is operated by state-owned PTT.

NOTE: All dollar figures in this special report are U.S.



The Bongkot gas field production facilities in the Gulf of Thailand.

away from the federation and became a republic in 1965. Brunei acquired full independence from Britain in 1984. Most legal structures in the region bear the unmistakable print of British presence.

American presence also has to be considered, with diplomatic exchanges

pore has maintained its obvious geographic advantage, and developed a strong refining capacity to accommodate crude oil imports.

Today, Singapore is the second busiest port in the world. Thailand, Malaysia and Brunei enjoy combined reserves estimated at more than 7 bil-

economy averaged nearly 10% growth per year until 1996, as did Singapore and Malaysia.

Yet all was not well.

Excessive spending by governments, coupled with financial speculation and poorly managed lending by banks, wreaked havoc on the regional economies. Investors and lenders pulled the plug. Whereas capital inflow to Asian countries had reached around 6.3% of their gross domestic product (GDP) in 1995, capital outflow was 5.2% of their GDP by 1998.

The Asian financial crisis was in full effect.

On the road to recovery

Structural reforms and tighter regulatory frameworks in the banking sector have been good medicine. The surge in global economic activity in 1999 and 2000 also contributed to the health of ASEAN economies. By 2002, Thailand's economy was again growing at a solid annualized rate of 6.6%.

Singapore is now America's 11th-largest trading partner, recently overtaking Brazil. Malaysia is the world's 18th-largest net exporter, and on the fast track to the next economic paradigm shift, the "knowledge society."

Brunei has also been moving to diversify its economy, and is planning to attract US\$6.7 billion of foreign direct investment (FDI) within four years. The ASEAN group has doubled in size. Literacy in Brunei, Malaysia, Thailand and Singapore average more than 90%.

The effect of the SARS virus on regional economies has turned out to be smaller than previously expected. The Asian Development Bank (ADB) recently announced that regional growth reached an annualized rate of 5.6% in the second half of 2003, and is expected to be around 6.3% in 2004.

The rise of China's economy in the last few years also bodes well for the economies of the ASEAN block. "The emergence of China is driving fundamental changes in the way people do business in the region," says John Perry, chief executive officer, the Brunei Economic Development Board.

Many opportunities and challenges lie ahead for regional economies. The key opportunity is China's energy needs, which have risen by leaps and bounds during the past five years. China's energy demands are now second only to those of the U.S. Even the most conservative estimates lead to the inevitable conclusion that China will



Thailand produces only about 20% of its energy requirements, which makes it crucially dependent on oil imports from neighboring Malaysia, and more recently, from Myanmar.

between the U.S. and Siam (Thailand) beginning in 1833. Siam was already an old country by any standard, having been established around the 13th century. By the middle of the 1800s, Siam had forged commercial and diplomatic ties with most Western powers.

Some have argued that this is why it was never colonized. After World War II, communist revolutions broke out in Vietnam, Laos and Cambodia. As a result, Thailand maintained very close relations with the U.S., and the U.S. has invested much to protect Thailand as a strategic partner in the region.

The great ethnic and religious diversity found in the region pre-dates this history by hundreds (if not thousands) of years of immigration, trade and commerce between the various local communities and empires. Studies have shown that modern-day Thailand was a center of metallurgic trade and manufacture as early as 4000 BC. Moslem Arabs ruled Malacca in the 15th century, and traded there with the Indians and the Chinese. Then came the Portuguese, followed by the Dutch, and then the British. Recent history has merely crystallized borders.

The Asian oil industry dates from the early 20th century. Discoveries were first made in Malaysia and Brunei, and then, much later, in Thailand. Singa-

lion barrels of oil and 102.1 trillion cubic feet of gas. Commerce and trade are yet again shaping a new course for the region.

The rise and fall of the Tigers

In 1967, the foreign ministers of Indonesia, Malaysia, the Philippines, Singapore and Thailand signed into life the Association of Southeast Asian Nations (ASEAN). This association's principal aim is to promote cooperation in all fields—economic, social, cultural and educational—and to foster and promote regional growth and stability.

The founding document reflects "the collective will of the nations of Southeast Asia to bind themselves together in friendship and cooperation and, through joint effort and sacrifices, secure for their peoples and for posterity the blessings of peace, freedom and prosperity."

Economic cooperation and diversification gained momentum in the 1980s. Economies moved from traditional trades such as tin and rubber to the manufacture of textiles, machinery, electronic goods, electrical appliances, cars, chemicals, pharmaceuticals and more. The countries of the ASEAN block became known as the Asian Tigers, a term used to highlight their fierce economic growth. Thailand's

be the biggest energy consumer by 2020. Southeast Asia is uniquely positioned to take advantage of this opportunity.

Moreover, the robust economic forecasts also point to a likely increase in regional energy consumption. Thailand, Malaysia, Singapore and Brunei have a combined population of more than 100 million. Sustained economic growth—combined with ever-improving educational opportunities, expanding industry and infrastructure, and higher standards of living—mean that the region's own energy requirements will need to be increasingly coordinated.

As shipments of crude from the Middle East are set to increase, greater refining and processing capacity will have to be built. In turn, this will benefit the development of peripheral industries, such as petrochemicals. In sum, the prospects for energy investors are excellent for the years to come.

Strategic challenges

Thailand, Malaysia, Singapore and Brunei each have unique strategic assets. Be they natural resources or geography, a distinct pattern is emerging: strategic planning based on hydrocar-

bon resources. Prepare for a massive upsurge in activity with excellent prospects for investors. Here are the key issues to look for:

Malaysia expects to run out of oil within 20 years. Brunei has put a ceiling on its production levels in an effort to maximize its production period. Production of mature fields has reached marginal recovery in Thailand, and a lot of money is being spent trying to increase the profitability of these operations. New technology and new ventures are going to make the difference.

Prepare for a massive upsurge in activity with excellent prospects for investors.

Recent offshore discoveries suggest huge potential. But the terrain is notoriously difficult, and territorial claims overlap in crucial areas. Resolution of these issues and investment in E&P activity could mark a second dawn for the entire industry.

Investment in infrastructure has been extensive throughout the region: LNG plants and trains, pipelines, refineries, and shipyards. National companies and service companies are redrawing the map of large-scale projects. Investors and partners will be needed.

The Malacca Straits pose security concerns, which can be addressed by investing in the right place. Thailand and Brunei are cooking up a storm of investment opportunities with plans to alter the traditional supply lines from the Middle East to China and the Far East.

Take a look at what 21st century supply lines will look like.

The articles that follow, made up of extensive interviews and research in the region, examine these issues in detail and portray one of the most exciting and rapidly developing areas of development in the hydrocarbons industry. □

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WHO HAS WHAT

Malaysia, Brunei and Thailand enjoy varying levels of hydrocarbon resources.

Malaysia undeniably enjoys the greatest hydrocarbon resources—some 4.5 billion barrels of oil and nearly 90 trillion cubic feet (Tcf) of gas—in measurement against those of Thailand, Singapore and Brunei.

The government plays a pivotal role in the exploitation of these resources through the national oil company, Petronas, which was bequeathed ownership of all the country's hydrocarbon resources through the Petroleum Development Act of 1974. Any company wishing to exploit Malaysia's resources must do so in partnership with Petronas, normally through a production-sharing contract (PSC).

Shell and ExxonMobil have for a long time largely dominated production, though recent years have seen a consider-

able number of new entrants join the foray and more than 60 PSCs have been signed to date.

The scale of production and the success of these PSCs have allowed Petronas to evolve from its indigenous beginnings into a world-class player, with operations as far as Sudan and Equatorial Guinea.

Despite the fact that the only major discoveries of oil still likely are to be found in deep water, such as that in the Kikeh Field announced in 2003 by Murphy Oil, Petronas remains confident that \$16 billion of new investment will be forthcoming during the next five years in both upstream and downstream developments.

Petronas (through its operating arm, Petronas Carigali),



Khun Prasert, president of PTT Thailand, aims to increase the country's domestic production of energy supply.

Despite the dominance of Petronas, Exxon and Shell, several other operators are involved in Malaysia.

Exxon and Shell dominate the E&P sector. Malaysia's oil production has been relatively stable in recent years, fluctuating between 650,000 barrels per day and 730,000 between 1996 and mid-2003. In 2002, daily production averaged 675,973 barrels. That figure has risen to 693,781 for the first nine months of 2003 to which another 90,000 barrels per day of condensate output can be added.

There are four principal areas of activity: offshore Peninsular Malaysia, offshore Sarawak, offshore Sabah on the northwest side of Kalimantan Island, and in the Malaysia-Thailand Joint Development Area (MTJDA) in the Gulf of Thailand.

ExxonMobil Exploration & Production Malaysia Inc. (EMEPMI) is by far the largest oil producer in Malaysia and supplies two-thirds of Peninsular Malaysia's natural gas output—at 1.3 billion cubic feet per day—and 44% of its oil production—approximately 280,000 barrels per day.

EMEPMI operates seven fields near the peninsula, and one-third of its production comes from the Seligi Field off the coast of Terengganu. The company has also begun production from Larut Field, which is expected to yield 140,000 barrels per day, going a long way in postponing inevitable declines in the company's production.

In February 2003, EMEPMI began the first gas production



Atwood Oceanics Inc. has drilled shallow-water wells for Shell offshore Malaysia.

from Bintang Field, 220 kilometers offshore Terengganu, on the east coast of Peninsular Malaysia. It is expected to produce about 1 Tcf of gas with a peak production rate of 355 million cubic feet per day. Gas from the two Bintang platforms—A and B—will flow via 11 kilometers of new pipelines to Lawit A for processing, and then to shore via existing pipelines.

Bintang is the second field to be developed under a gas PSC, a 50-50 joint venture of ExxonMobil, operator, and Petronas Carigali.

Most of Shell's operations are off the coast of East Malaysia (Sarawak and Sabah on the island of Borneo). The company has more than a century of history in the country, beginning when it first traded at local ports in the early 1890s.

Shell's key operations are focused in three main sectors: exploration and production; oil products, which comprises manufacturing, marketing and distribution; and gas. Shell's current Malaysian oil and liquids production is approximately 228,000 barrels per day and gas production is approximately

“Thailand has *many* strategic assets.”

*Khun Prasert,
PTT Thailand*

426,000 barrels of oil equivalent per day.

The company invested about \$265 million in oil and gas E&P projects in 2002. Shell will focus its efforts on continued exploration drilling in deepwater blocks E and G, offshore Sarawak and Sabah, respectively and plans to drill additional production wells at its South Furious Field, where it has so far located reserves of 5- to 6 Tcf of gas. The company hired Houston-based Atwood Oceanics Inc. to drill five shallow-water wells with an option to drill five additional wells.

Throughout its tenure in Malaysia, Shell has pioneered advances in local extraction and export methods. One notable achievement is the introduction of the single-buoy mooring (SBM) system in 1960. The SBM system, which eliminates the need for deepwater harbor facilities, was later adapted and used throughout the world.

Shell is also a shareholder in Malaysia's three liquefied natural gas (LNG) plants in Bintulu, Sarawak: MLNG (onstream in 1993), MLNG-2 (onstream in 1995) and MLNG-3 (onstream in 2003).

Despite the dominance of Petronas, Exxon and Shell, several other operators are involved in Malaysia. Three new operators—Amerada Hess, Talisman and Murphy Oil—entered the market in 1998 by signing PSCs. This was the goal of Petronas when, in the mid-1990s, it devised a flexible PSC, to attract more investors to smaller fields. The firm also loosened terms for all PSCs in 1997. In January 1999, Murphy Oil signed three PSCs as an operator.

Brunei

Brunei also enjoys considerable hydrocarbon assets. As of July 2003, proven reserves are estimated at 1.35 billion barrels of oil and 14 Tcf of gas. Production of oil is deliberately maintained at around 210,000 barrels per day, in an effort to extend the life of the fields and improve recovery rates. Production of gas was about 340 billion cubic feet (Bcf) in 2001.

There are four fields onshore Brunei and seven offshore. The giant onshore Seria Field, where the country's first discovery was made in 1929, produced its millionth barrel in 1991.

Some 90% of the country's hydrocarbons, however, are found in just two fields: Champion, which accounts for approximately 40% of known reserves, and South West Ampa, which holds roughly half of Brunei's reserves. Both of these fields are offshore, at depths of about 30 meters.

The remaining 10% is divided between five offshore fields, the most significant of which is Magpie, producing 10,000 barrels per day.

Brunei Shell Petroleum (BSP), a 50-50 joint venture of Brunei and Shell, has traditionally been the country's sole operator and producer. BSP also owns and operates the country's sole refinery, and supplies Brunei Liquefied Natural Gas (BLNG), itself a joint venture of Shell, Mitsubishi and Brunei.

Furthermore, BSP also ships LNG through another joint venture, Brunei Shell Tankers. Export markets include Japan, which consumes 90% of Brunei's production, and South Korea. Brunei is the world's fourth-largest exporter of LNG.

Mark Carne, BSP managing director, sees "the relationship extending long into the future."

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Thailand

Thailand's resources are comparatively more modest. Proven oil reserves are around 551.5 million barrels of oil, with production reaching more than 193,000 barrels per day in 2002. Natural gas reserves are estimated at around 13.3 Tcf.

The majority of these resources are offshore, in the Gulf of Thailand. Out of 37 producing fields comprising 43 blocks, 21 fields are offshore (26 blocks) and 16 are onshore (17 blocks). These fields are divided into 33 concessions among several operators, including Unocal, Chevron, Amerada Hess and the E&P arm of Thailand's national oil company, PTT.

Pending new discoveries, most reserves are held in three fields: Pailin, Arthit and Bongkot. Unocal operates the first of these, while PTT E&P is the operator of the other two.

The oil and gas industry in Thailand is dominated by state-owned PTT. This relatively young company, which celebrated its 25th anniversary in 2003, has grown from humble beginnings into Thailand's most valuable company. PTT has acquired a good reputation for

...Petronas remains confident that \$16 billion of new investment will be forthcoming during the next five years in both upstream and downstream developments.

sound business practices and solid management. Though it remains focused on the domestic market, PTT has a growing international presence through PTT E&P.

Thailand produces only about 20% of its energy requirements, which makes it crucially dependent on oil imports from neighboring Malaysia, and more recently, from Myanmar, which has been exporting some natural gas. Khun Prasert, president of PTT Thailand, says, "PTT is in healthy shape. We are Thailand's largest company by market capitalization. We do things on a different scale than Petronas, but we have managed to be very successful. We have excellent relationships with other operators. We welcome partnerships and invite international companies to participate

in the development in the Thai market.

"We expect the economic growth to remain buoyant, so the idea is to focus on our domestic market by using natural gas to power electricity demand. We may then use some of the profits to expand abroad, but for the time being we remain extremely focused on our domestic market.

"Thailand has many strategic assets. Our economy is strong, our people are skilled, and our government is strongly committed to strategic energy-related ventures."

The company's international expansion is done through PTT E&P. "Oman is one of our exciting new ventures, and we are currently in discussions with the Algerian government for some work on their LNG fields. We also have agreements with Myanmar and Malaysia." □



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RECOVERY ECONOMICS

New technology is the answer to maturing fields and marginal recovery in the Asian Pacific.

The producing fields of Malaysia, Brunei and Thailand share one unpleasant commonality: they are mostly either mature or maturing, and require increasing expenditure and care to produce profitably.

Malaysia's state-owned Petronas Carigali and foreign operators in the region face a challenge in their goal to maintain Malaysian oil output at at least 600,000 to 630,000 barrels per day. This requires them to find substantial new reserves, yet recent experience shows that the majority of new reserves are coming from incremental growth in existing fields, while virgin oil discoveries are becoming smaller and smaller. Deepwater exploration is likely to play a large part in the future of the upstream industry in Malaysia.

In Brunei, Champion Field already has 260 wells, drilled from 40 platforms. South West Ampa Field has 212 wells. Fairley Field has close to 50 wells, while Magpie has 32 and counting. *The Petroleum Economist* estimates an annual expenditure of \$300 million is necessary to merely maintain current levels of production.

The situation is analogous in Thailand, where Unocal alone operates more than 100 platforms in the Gulf of Thailand. Given the diversity of concessions and operators, one can guess the number of wells in the Gulf to be significant.

Randy Howard, president of Unocal Thailand, says, "We spend about \$400 million a year just to upgrade and maintain wellheads."

The reason is quite simple. As fields mature, new pockets

"We spend about \$400 million a year just to upgrade and maintain wellheads."

Randy Howard, Unocal Thailand

need to be explored, requiring new wells to be dug routinely. Some pockets are difficult to access, and require specific angles of drilling. This tends to mean expensive wellheads. Yet many reservoirs are believed to hold substantial reserves. Marginal recovery costs therefore provide somewhat of a dilemma.

While the overall situation is not dramatic, it is certainly costly. One can argue that, second to sound geological assessment, new technologies are the single most important variable for the profitability of these mature fields. Necessity



Michael Cvetanovic, chief executive of independent Pacific Tiger, says, "We like to tell our story on results. Each well we have drilled has produced, sometimes marginally, but it has produced."

being the mother of invention, new technologies have benefited greatly from this cost-conscious state of affairs.

A good example is found in Brunei, where Brunei Shell Petroleum (BSP) was the first company to build a "snake-head" well. This special well is five kilometers long, and literally "snakes" its way through the numerous pockets of a large field. This project was a veritable engineering feat, and while presumably rather costly, it is certainly cheaper than drilling five new wells.

Moreover, this new design allows excellent operational freedom—each pocket can be operated individually or together in any combination.

Unocal has gone so far as to create its own joint venture to secure new, cost-efficient technology. Enter CUEL, the new generation of service provider that is likely to cause profound changes in this segment of the industry.

CUEL calls itself a "new breed of professional service provider." This new company was created in an effort to address the thorny issue of cost-efficient marginal recovery. Its raison d'être is low development cost per barrel of oil equivalent (BOE) and that will be good news to most operators in the region and beyond.

Created in 2000 by Unocal and Unithai, a Thai conglomerate which owns and operates Thailand's largest shipyard, CUEL has unique experience in designing platforms that are aimed at marginal recoveries. But its edge comes from strategic alliances with suppliers and subcontractors, and these enable it to keep costs low. Aligning the strategic overlaps and interests of designers, suppliers and subcontractors, CUEL boasts total control of supply-chain management.

This is a more targeted approach: it reduces the ambiguous



Combining large and small wells, Canada-based Pacific Tiger Energy Inc. has 49 million barrels of reserves in Thailand.

pricing methods dear to suppliers and subcontractors, and any unnecessary outsourcing, which can frequently result in delays and a lack of flexibility.

CUEL's approach is expected to yield enormous benefits to customers, and potentially to their host government, insofar as low development costs will enable operators to commercialize oil and gas fields that would previously have been considered unprofitable.

Effectively, from an operator's point of view, this approach can also help to diversify a portfolio, thus diversifying the risk approach. Yet beyond its technical and visionary qualities, CUEL's local solution may be brought to a global issue, enabling Southeast Asia to potentially export its know-how, and in time, to enrich Western counterparts by applying the lessons learned.

The access to low-cost development is also key in ensuring that independents continue to drill where others do not and that majors stick around when reserves diminish beyond what would

have been deemed too little some years ago.

The integrated construction and management team of the UCU Alliance has carried out the design, procurement, fabrication and installation of wellhead platforms, submarine pipelines and offshore facilities, for Unocal's fields in the Gulf of Thailand.

Deeper water

As the potential for further significant offshore discoveries diminishes in shallow waters, operators are looking at deeper waters off the coast of Sabah for the next generation of upstream production. Murphy Oil's recent discovery at Kikeh in August 2002 at a depth of 1,400 meters with estimated oil reserves of 400- to 700 million barrels has provided added incentive.

Its significance is huge, boosting Malaysia's estimated reserves by 7% to 4.54 billion barrels. Murphy Oil has since signed further production-sharing contracts (PSCs) in neighboring blocks

L and M where it hopes to replicate its success.

Deepwater drilling is a new and challenging development for the region, but brings opportunities that may rejuvenate the entire area.

That Murphy Oil made a significant discovery in many ways confirmed what many geologists had been suspecting for some time: that the deep waters of the South China Sea present appealing E&P prospects.

Deepwater drilling, however, presents many challenges, not least of which is the climate in this particular region. Tropical storms, monsoons and scorching heat take turns to punish the intrepid. Commercial ships dare not pass these routes for several months of the year. But the Kikeh Field is proof that the risks are well worth the trouble.

Geophysical appraisals and seismic surveys are being carried out with renewed fervor, both onshore and offshore. As we shall see, a number of independents have stepped up their activities during the past few years in an effort to focus on previously disregarded basins. Many of these companies are made up primarily of geologists with vast experience, who are united in their belief that this region offers very real prospects.

Another indication of the high hopes for new discoveries is the recent acquisition (2002) of a license for E&P offshore Brunei by Total, in conjunction with BHP Billiton and Amerada Hess. The lease concerns Block J, which is immediately adjacent to the Kikeh Field.

But the hottest basins are also the most contested: parts of Kikeh Field could well be in Brunei's waters, ostensibly included in what is known as the Brunei Exclusive Economic Zone (EEZ), which stretches 200 nautical miles from the coast of Brunei.

Unfortunately, Total was forced to stop its activities in 2003 after Malaysia sent warships to dislodge them. Malaysia and Brunei are currently involved in high-level negotiations to resolve the matter, both parties being acutely aware that political skirmishes tend to be extremely costly when it comes to oil.

Students of recent economic history will point out that Association of Southeast Asian Nations (ASEAN) members have a good track record for settling territorial disputes and working in tandem to resolve matters equitably.

A case in point is the joint develop-

ment area (JDA) between Malaysia and Thailand. Placed under a special joint authority in 1991, the site (which holds substantial natural gas basins) has become the theater of considerable investments by both Malaysia-owned Petronas and Thailand-owned PTT. Natural gas is expected to be produced as of 2005. Malaysia has hinted that a similar scheme may be desirable to settle the contested offshore area with Brunei.

While it is clear that Malaysia enjoys greater reserves than Brunei, the latter may be more eager to break new ground. Its economy is highly dependent on oil and gas revenues, and new discoveries would certainly bring a welcome extension to the vast annual income Brunei derives from its hydrocarbon exports.

Moreover, the hitherto conspicuous lack of a national oil company is being

dependents are working the entire region, and onshore basins have also attracted renewed scrutiny. In Malaysia, for instance, Talisman and Amerada Hess are challenging the majors.

Talisman Malaysia Ltd. is one of Canada's largest independent oil and gas producers. Talisman began operating in Malaysia through the acquisition of Lundin Malaysia Ltd. and is currently the operator of the PM-3 CAA production-sharing contract and the PM-305 contract offshore the eastern coast of Peninsular Malaysia.

PM-3 CAA is the largest petroleum development undertaken by a Canadian company in Asia, extracting oil and gas from six different offshore fields located throughout a 1,350-square-kilometer area in the overlapping zone between Malaysia and Vietnam.

With the completion of PM-3 CAA development in Malaysia and Vietnam

stance, to drill for 10- to 20 million BOE, while big companies cannot do it, as it doesn't impact their bottom line."

Pacific Tiger

Small independent E&P company Pacific Tiger Energy Inc., a Canadian publicly listed company that is currently headquartered in Singapore, is active in north-central Thailand.

Michael Cvetanovic, chief executive, says, "We like to tell our story on results. Each well we have drilled has produced, sometimes marginally, but it has produced. We think that maybe some of the old maps weren't correct, and each well has provided us with more information."

Apparently that extra information has been correct: independent auditing firm Gaffney, Cline & Associates (Singapore) has recently upgraded Pacific Tiger's audited proved, probable and possible reserves by 25 million barrels. Of that, 4 million were added after the latest drilling round. In less than 10 years of activity, Pacific Tiger has acquired proved reserves of 1.17 million barrels, and has a total audited estimate of 49.1 million barrels of reserves.

While much has been made of offshore potential, Pacific Tiger has good reasons to focus on its SW-1 onshore concession. This acreage is found in a geological province known as the Phatchubun Basin. It is one of the largest petroliferous basins in Thailand, and as Cvetanovic believes it is perhaps the least explored, with a mere well per 800 square kilometers. He says, "We're excited about our work, and excited about the future. This is a great acreage."

Pacific Tiger has recently begun to drill horizontal wells. This approach has confirmed that the basin contains "stacked" reservoirs, and is a further indication that the Pacific Tiger team was correct in its basic assumption—that prior understanding of this dynamic basin was incorrect.

Says Cvetanovic, "We realized that we had to drill differently, and we have really changed our approach to drilling. Now we are drilling horizontal wells."

By changing its approach, Pacific Tiger has intersected a huge amount of oil pay—400 meters and 90 meters on the two most recent wells.

"I think we have a huge competitive advantage in Thailand. We have excellent relationships with local communities, and government support, and we will be applying for further licenses." □

"...We are quite happy...to drill for 10- to 20 million barrels...while big companies cannot do it, as it doesn't impact their bottom line."

Michael Hugues, Amerada Hess

remedied: Sultan Hassan Bolkiah signed a law creating a national oil company in 2001, which signals a certain amount of confidence in the yet-to-be found reserves. And even if the contested Block J area presents the most immediate prospects, one should not rule out other areas.

Mark Carne, BSP managing director, thinks Brunei presents a lot of exploration opportunities. This bodes well for everybody. But most of all, it bodes well for independents and new ventures, for whom a potential discovery need not equal hundreds of millions of barrels to be deemed successful.

Southeast Asia is fertile ground for a new breed of independents. The economic climate is sound and investors are once again looking for overseas opportunities.

This new breed of independent company tends to be headed by geologists and other industry veterans who have spent many years in the region with some of the major companies. They are united in their confidence that the region has yet to bear significant finds. Clearly, the Kikeh discovery has focused attention on deepwater potential and rekindled investor interest. But in-

in 2003, on schedule and on budget, production from the region is expected to quadruple in 2004. Current production in the region is approximately 40,000 BOE.

Amerada Hess

The entry of Amerada Hess into Malaysia occurred in 1998, when new PSCs were signed for two blocks. In partnership with Petronas Carigali, Amerada Hess holds operatorships in blocks SK 306 (80%) and PM 304 (70%). Both blocks contain oil and gas discoveries with established oil reserves. The firm has an initial five-year exploration period for the blocks.

What prompted Amerada Hess to get involved in Malaysia was the company's identification of Southeast Asia as a growth area. The firm already had offices in Bangkok and Jakarta, as well as production in Thailand and Indonesia. What also helped the company decide to enter Malaysia was the depth of information available on both blocks.

Michael Hugues, Amerada Hess general manager, says, "As a new entrant and a medium-size company, we are looking for rewarding opportunities. Actually, we are quite happy, for in-

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NATURAL GAS EXPORTS

Southeast Asia hopes to provide supply to growing demand for liquefied natural gas.

Liquefied natural gas (LNG) has been a rising star in the energy world. Unstable oil prices, rising concerns about the durability of world oil reserves, and environmental issues have encouraged a drive towards energy diversification.

Coal, nuclear power, hydroelectric power and LNG have been tried and tested variously. But LNG has proved far more attractive than other alternatives because it is highly efficient and has wide-ranging applications. It is also believed to be environmentally friendly.

23.9%, followed by Indonesia (11.3%) and Malaysia (9.8%).

Malaysia is the world's third-largest exporter of LNG, after Algeria and Indonesia, with gas reserves estimated to be 89 trillion cubic feet (Tcf), which could last up to 43 years. Three LNG plants are in close proximity at in Bintulu, Sarawak. Natural gas is supplied to the plants from the fields offshore and Malaysia's state-owned Petronas maintains the controlling interest of each. The three plants combined represent the largest integrated LNG capacity in the world with a capacity of 22.7 million metric tonnes per year.



The LNG business keeps ports and shipyards throughout Southeast Asia busy.

Japan has played a pivotal role in the growth of the LNG industry worldwide. Possessing no natural resources of its own and having to cope with massive energy demands, Japan imports the entirety of its energy requirements. Southeast Asia has been its key supplier of LNG for more than 30 years, and has amply proved its worth as a reliable and efficient supplier. The regional LNG industry provides excellent long-term prospects. Bold projects and new infrastructure are the order of the day.

In the Asia-Pacific region, 40% of gas reserves are in Malaysia and Indonesia, followed by 10.2% in China. In terms of production, Indonesia accounted for 23.8%, followed by Malaysia (18.5%) and Australia (11.7%). These countries export natural gas, mainly in the form of LNG. In terms of consumption, Japan ranks first, accounting for

Brunei's LNG industry also provides appealing prospects. Brunei is Southeast Asia's third producer of LNG, behind Indonesia and Malaysia. It is the world's fourth exporter. Reserves are estimated at 13.8 Tcf, with production reaching 366 billion cubic feet in 2002. Brunei is also hoping that new exploration and development will yield significant gas discoveries, potentially as much as 7 Tcf.

Brunei's gas is piped from major producing fields to the Brunei LNG plant, where it is separated and liquefied. This plant, located near the country's border with Malaysia's Sarawak province, has been operating for some three decades. It was the first LNG plant in Southeast Asia.

Plans are currently under way to upgrade much of the facility and to expand train capacity. This is in view of increasing exports to Japan and South Korea. Exports to Japan

Malaysia is the world's third-largest exporter of LNG, after Algeria and Indonesia....

and South Korea operate under 20-year contracts, which were recently renewed. 2003 also saw a few spot sales, notably to the U.S.

If that were not enough, Brunei is planning to use LNG as the key for its diversification strategy. The Brunei economy is highly dependent on hydrocarbon revenues, which make up 40% of its gross domestic product (GDP). Using LNG as its engine, Brunei is seeking to develop a massive industrial infrastructure in a bid to diversify revenues and create jobs.

The Brunei Economic Development Board (BEDB) has instigated a two-pronged strategy to attract investments, both of which are based on the country's LNG industry. The first part is to build industrial capacity that can be powered with LNG. Alcoa, the world's largest aluminum-maker, has already signed a memorandum of understanding with Brunei to build an aluminum smelter.

A British company is pursuing plans to build a massive rubber-recycling plant. In both instances, the availability of LNG is a key requirement for success.

The second part of the strategy aims

to build a port on a small island about a kilometer from Brunei. This island's main appeal is that it enjoys water depths of about 20 meters immediately off its coast. This compares with depths of about 14 meters in Singapore.

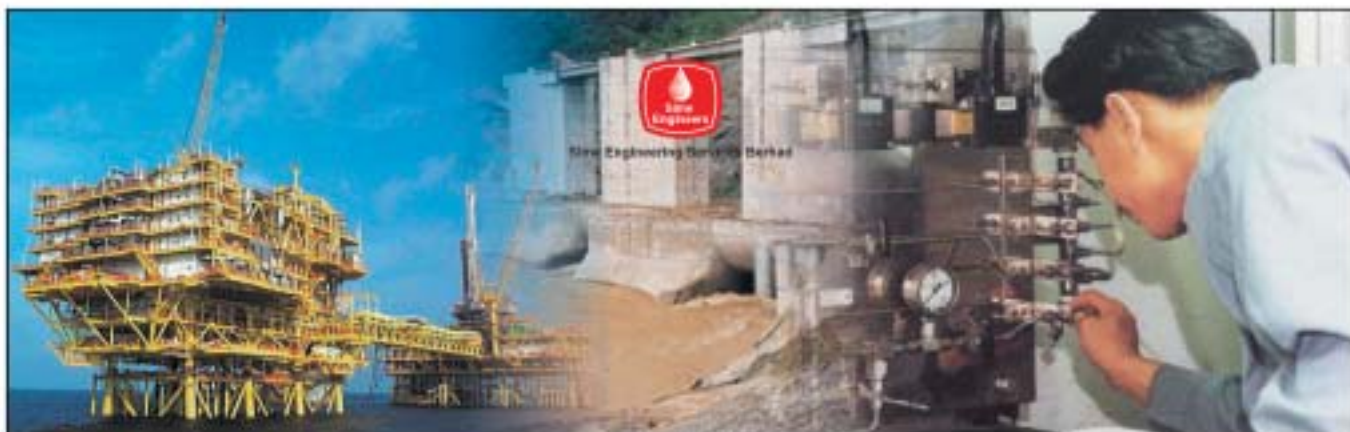
The planned increase in LNG capacity and the consequent rise in exports amount to good rationale for building a specialized LNG port. Add to that a new generation of LNG carriers, larger and heavier, and an increase in global LNG exports. Pending sufficient investment, this new port could well become the new major servicing point for the entire LNG-carrier fleet in the Asia-Pacific region.

Thailand also enjoys considerable gas reserves, estimated at around 13.3 Tcf, with an additional 9 Tcf classified as probable. LNG is not used commercially in Thailand. The country has adopted a massive energy-diversification program to cope with rising energy demands, chiefly due to strong economic growth.

Until the authorities decide otherwise, Thailand-owned PTT will be the sole buyer of natural gas, and it will sell it only to generate power for the country's 60 million inhabitants. □



Gas produced from Bongkot Field offshore Thailand is not converted into LNG; instead, it is brought ashore and used to generate electricity.



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Sime Engineering Sdn Bhd, an ISO 9001 accredited engineering design company, is involved in project management services to the upstream sector and engineering, procurement, construction and commissioning (EPC) for downstream sectors of the petroleum, petrochemical and power industries. Sime Engineering is leading a consortium of companies responsible for the construction of the RM1.75 billion CW2 Package (Main Civil Works) for the Bakun Hydroelectric Project in Sarawak.

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THE NEW SERVICES

Southeast Asia's homegrown oil-service sector is evolving into international markets.



Tan Sri Hamdan, chief executive officer of Ranhill Berhad Malaysia, presides over a firm whose engineering and related services qualify it as an "engineering supermarket."

Malaysia's service industry has risen to the challenge of providing world-class service to the sizable domestic market. It has matured and may now be looking to expand in the entire region.

From the outset, the development of the Malaysian oil and gas support service companies has been linked to the expansion of state-owned Petronas. Continuing its drive to increase local participation in the oil and gas sector, the company was dedicated to building a strong support base to help it in its role in assuring the country's energy supply. The success of Petronas, now a worldwide player, has thus been mirrored by the world-class development of Malaysian service companies.

The oil and gas sector is set to emerge as the new key driver of the Malaysian economy this decade. The sector is the largest taxpayer and the biggest hard-currency earner. By 2007, contributions are expected to reach 21.7% of federal revenue.

Moreover, the sector is the largest recipient of direct investment. In 2002, approved investments by the Malaysian Industrial Development Authority (MIDA) in the electrical and electronics (E&E) sector and petroleum products totaled 4.9 billion Malaysian ringgits and 5.7 billion, respectively. Including exploration and production (E&P) investments, the oil and gas sector has outshined E&E as the country's largest recipient of direct investments.

According to Thong & Kay Hian Securities, in the next few years, spending on oil and gas will exceed that on infrastructure. E&P spending alone reached more than 10 billion ringgits in 2003. Based on the Eighth Malaysia Plan, the government only has 6 billion ringgits a year to spend on infrastructure projects. The oil and gas sector is set to replace

construction as the epicenter of large contracts.

Finally, the value-add of the mining and quarrying sector (mostly oil and gas) is more than six times that of E&E, even though its contribution to gross domestic product (GDP) is only 9.4%. Every additional 2.5-billion-ringgit investment in the oil and gas sector can potentially add 0.5% to GDP growth.

Undoubtedly, Petronas has played a key strategic role in fueling the development of a solid supply chain to the offshore oil industry.

Petronas has endeavored to get as many local companies as possible to assist in the development of the country's oil and gas resources. The strategy is certainly an old formula. The plan, which consisted of insisting that foreign operators put local content in their production activities associated to the "revenue over cost" concept (R/C production-sharing contract), smacks of protectionism, but has ensured that local companies benefit from predictable and viable streams of orders and are favored partners in joint ventures.

To favor effective local participation in the oil and gas industry, Petronas has adopted an integrated approach. This involves favoring indigenous companies when awarding contracts and licenses and implementing a vendor-development program (VDP), which is an affirmative action program for the Bumiputra (the indigenous race of Malaysia, as opposed to citizens of Chinese and Indian origin).

To encourage foreign investment and technology transfer, the Malaysian government offered tax-incentives and other financial motivations.

Herein lays a paradox. Sorraya Denney, managing director

"We are constantly chasing acquisition opportunities in order to complete our range of services."
Kamarulzaman Omar, Ranhill

of Amsito Oilwell Services, a medium-size Bumiputra service company, says, "If Petronas wants to go on moving up the value chain, which in our case means improving the quality of services, there is a real need for further competition on the local market, as well as on the international level. International competition is the best way to benchmark ourselves."

Local companies are asking for independence as a way to improve their competitiveness. This suggests that the industry has matured to a point where it is now willing and able to stand on its own feet, and is ready to emerge from the shadow of Petronas.

Besides Petronas' national strategy, another initiative is the Cost Reduction Alliance (Coral) which was imple-

mented by the Malaysian petroleum industry in 1994 to meet the challenges of low oil prices and rising operating costs. Together, Petronas, E&P companies and local services companies decided to work together in the definition of best practices and established a forum and guidelines to ensure that they are met across the board.

Petronas and its production-sharing contractors (PCSB, Shell and EPMI) embarked on the first phase, identifying three main cost centers: fabrication, drilling, and procurement and contracting.

Coral managed to cut costs in the industry by an estimated \$342 million (1.3 billion ringgits) over a period of five years. The latest string of achievements by Coral was the recent announcement of the on-schedule completion of a drilling and riser platform for the ANGLI-A project. A 27% savings from the original estimated cost was achieved with 65% of the work undertaken by local contractors.

Coral's success during the First Wave was built around major issues affecting the production-sharing contractors, focusing mainly on cost-reduction efforts. Now in the Next Wave (2001-05), Coral aims to ride on this success and strives to bring the service industry further into the fold.

The ambition for the industry is to attain competitiveness, "everywhere and anywhere." The Next Wave intends to promote business opportunities through value creation by reducing finding-to-production costs, increasing production/recovery of identified oil fields, accelerating cost-recovery times and enhancing service-sector competitiveness.

Today, Malaysia-based service operators range from engineering firms to fully integrated service companies. 2003 was marked by significant merger and acquisition activity among key players, mainly because Petronas' VDP helped small and mid-sized enterprises (SMEs), consequently fragmenting the market.

The consolidation movement will allow the players the critical mass to expand regionally and internationally, which is the aim of many of the larger companies.

Petronas has again played a key role. First, local operators, as subcontractors, have been able to build strong domestic positions. Second, by venturing into numerous overseas contracts, Petronas has set the example and led the way.



Singapore-based Keppel Fels has built some 60% of the jack-up rigs on order in the last decade.

Moreover, Petronas actually started to benchmark Malaysian service companies by including them in its overseas activity. This gave them the opportunity not only to build a reputation but also to demonstrate their competitiveness on an international level.

As an engineering contractor, the Ranhill Group services a multitude of industries. Originally, it provided only mechanical and electrical engineering design services as an engineering partnership formed by the Australian engineering concern, Rankine & Hill. Malaysian operations were established in July 1981 and rapidly a complete range of engineering capabilities were attained and ownership became fully Malaysian.

"Ranhill stands for excellence not just as engineers and constructors with a growing international presence, but also as the owners and developers of oil and gas facilities," says Tan Sri Hamdan, Ranhill Berhad Malaysia chief executive.

The initial development of a broad engineering base had allowed Ranhill to offer a comprehensive range of services so as to be regarded an "engineering supermarket." Full turnkey capability was achieved in 1985.

Kamarulzaman Omar, Ranhill executive director, says, "The oil and gas industry has become an important contributor to Ranhill's earnings. This sector covers both upstream and downstream activities. We are constantly chasing acquisition opportunities in order to complete our range of services. Moreover, we are competing and bidding for jobs not only here but also in Pakistan and the Middle East."

Another company now entering the

global arena is Crest Petroleum, already one of the largest local oil and gas well drilling and marine construction contractors in Malaysia. Crest Petroleum is involved in marine installation and construction, offshore drilling and marine services. Thanks to its latest acquisition, the Sapura Group, Crest Petroleum's services now include not only oil and gas rig management, but also offshore platforms and pipelines installation.

Datuk Shahril Shamsuddin, the firm's executive vice chairman, adds, "Where previously we had a division of resources and a duplication of efforts, we now have better economies of scale, increased flexibility and focus on resource allocation as well as the ability to provide our clients with a greater degree of integrated services."

With an impressive 40% market share in Southeast Asia, Crest, the only Malaysian-owned company with offshore drilling assets, offers excellent options for investors looking for exposure in companies involved in deep-sea oil and gas exploration and production.

Following in Crest's wake, Malaysian platform fabricators have evolved to a point where they are also touting their services to foreign markets. Nick Walker, general manager of Talisman Energy, stresses, "Local fabricators have the yards, the facilities and the design capabilities that we require. Malaysia offers very highly skilled workers in the oil and gas industry and price-wise, the region is very attractive. As a consequence, we outsource most of our platform fabrication jobs locally."

One company that should not be missed by investors is Malaysia's Dialog group. As the name makes clear, this company's trademark is its client focus. The numbers almost speak for themselves: Dialog has achieved an average ROE of 32% during the past six years, and an annual compounded profitability rate of 27% in the same period. Clearly they have been doing something right.

Dialog was created in 1984, focusing on oil and gas and petrochemicals. This full-service engineering firm has since then expanded its capabilities to engineering, procurement, commission and construction (EPCC), offshore construction, plant maintenance and tankage facility, among other services. It has offices in Singapore, Thailand and Indonesia, and it is headquartered in Kuala Lumpur.

Ngau Boon Keat, co-founder and chairman of Dialog, says, "When



Vessels are converted into floating production, storage and offloading (FPSO) facilities in Singapore.

someone is sick, he can go to the hospital to find the right specialist. It is the same at the Dialog group. Here you will find the right specialized department for each of your needs.”

The concept may sound benign, but Keat’s track record makes it credible. Dialog has the full confidence of Malaysia’s investor community, being a component of the Kuala Lumpur stock exchange composite index. Under Keat’s new management and service principles, the Dialog group aims to increase its capabilities, either through acquisitions or organic growth.

Singapore

Malaysia’s service industry provides an interesting contrast with Singapore’s. Singapore has been the traditional service destination of choice for the oil industry in the South China Sea. Strong engineering, offshore know-how, and famed efficiency have contributed towards building a vibrant service industry.

But things are not what they once were.

The 1997-98 financial crisis has had a severe impact on Singapore’s economy, particularly on engineering firms and shipyards. The crisis caused a general downturn in the oil and gas industry, to which Singapore was particularly sensitive. Moreover, the market was already showing signs of saturation by 1997, with several firms working similar niches, such as offshore engineering and shipyard repairs and upgrades.

Competition became intense for the few lucrative contracts for a market marked by efficient, though high-cost, services. The effects have been clear: declining revenues and rising costs have meant that few firms have managed to stay truly competitive.

Competition from neighboring Malaysia has been hurting Singapore’s service industry. Though its port and shipyards are still a qualitative advantage, Malaysian labor is far cheaper, and where once stood a wide gap in engineering know-how, now only a marginal difference exists.

Engineering and service firms now face a simple, yet brutal, dilemma: expand or die. This is especially true for midsize companies, whose revenue base is not diverse enough to withstand expansion. Consortiums have been formed in an effort to export services more successfully, but have shown little success so far.

Every generalization must come with exceptions. In this case, the exception is a big one. Keppel Fels, a Singaporean service company is a global powerhouse. The world leader in the building and designing of jack-up rigs, it has built about 60% of the jack-up rigs on order in the last decade. The company is also the world leader in the conversion of FPSOs (floating production, storage and offloading vessels) and FSOs, being capable of the widest range of repairs and conversions imaginable.

In addition to its technical expertise, Keppel is one of only a few Singaporean companies with a truly global reach. C.B. Choo, Keppel chief executive, says, “Our market is not Singapore, our market is international. We want to be where our customers are, where our customers need us to be. We believe in a near-market/near-customer approach.”

Offices can be found in the U.S., Brazil, the Netherlands, Norway, Bulgaria, Azerbaijan, China, Vietnam and Australia. Altogether, 16 yards and 10 representative offices supplement an enormous headquarters and shipyard in Singapore.

Keppel has invested a considerable share of its profits into research and development (R&D), ensuring that it maintains a cutting edge of technology and design. “I think improving your R&D and improving your execution is very important. With new technologies, we can reduce the number of steps, cutting both costs and man hours. This saves a lot of time and a lot of money, and helps our workers to be more productive,” Choo says.

Keppel further expanded the scope of its activities in 2000 by acquiring a majority stake in the country’s largest refinery, Singapore Petroleum. Choo says, “You have to maximize your earning potential from the core. When the core is unstable, you go to adjacencies.”

He adds, “Getting to know your customers’ business is very important.” □

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SINGAPORE

The Port of Singapore is key to the transportation of oil and LNG through Southeast Asia.

Singapore's location near the Malacca Straits has made it the most important shipping hub in Asia, alongside Hong Kong. The Malacca Straits link the Indian Ocean and the Pacific Ocean. Otherwise put, it links major oil-producing countries from the Middle East with the major oil-consuming markets of the Far East.

Southeast Asia's rapid industrialization and economic development during the past 20 years have resulted in vast increases in energy consumption. Singapore has therefore been a key transit point for global oil trade.

The Port of Singapore is the world's busiest in terms of tonnage, and constitutes the heart of the country's economic well being. The country has, until now, managed to leverage economic advantages inherent in its geography with great success. Industries such as electronic components and biotechnology have flourished, and contributed to the diversification of the economy.

Singapore has also become an important financial center. More pertinently, Singapore has developed a massive refining capacity to accommodate crude oil imports. It enjoys one of the largest refining capacities in the world—around 1.4 million barrels per day.

These two factors—location and large refining capacity—have until now provided Singapore with virtually assured revenue. Shipping is not likely to diminish, energy demands are set to grow, and refining capacity is being used to power the growth of a large petrochemical industry. By all accounts, Singapore has sunny days ahead. Or does it?

Dire straits

The Malacca Straits is one of the world's great "choke points" for oil transit. It is the shortest sea route between three of the world's most populated countries: India, China and Indonesia. More than 50,000 ships transit through the straits each year, and China's ever-growing energy needs are likely to make that number grow. Currently, the straits see more than 15 million barrels of crude oil transit every day. Liquefied natural gas (LNG) carriers also use this route daily.

At its narrowest point, near Singapore, the Malacca Straits are only 1.5 miles wide. This creates a natural bottleneck with good potential for collisions or spills. Piracy is also a concern, being far from uncommon in the Singapore Straits. Should any of these lesser problems occur, grounding of tankers would be the most likely result—a costly affair, but



Singapore hosts a world-class marine construction industry.

not insurmountable.

Closure of the straits, however, would have far more wide-reaching consequences, such as huge worldwide increases in the cost of freights and energy shortages in much of Asia.

An ever-growing concern is international terrorism. The Bali bombing in 2002 put Indonesia on the map of "high security-risk" countries. Insurance costs have increased accordingly for tankers docking in Indonesia. Various scenarios are being considered, under which terrorists could hijack an oil tanker or an LNG carrier and use it as a giant bomb to be launched at nearby Singapore, or anywhere else within reach for that matter.

While this represents the most alarmist scenario, countries surrounding the straits are taking no chances. Malaysia and Singapore have stepped up naval patrols, and have reportedly begun to escort some tankers. But ultimately, if the Malacca Straits are to sustain increased traffic, more far-reaching measures will have to be found.

The rising traffic and security concerns make Singapore's economy, which is so vitally dependent on maritime trade, quite vulnerable in the long term.

Part of the solution

Thailand possesses two strategic assets that could radically

alter the global supply equation. The first of these is location: Thailand's western coasts are passing points for all tankers from the Middle East en route to Singapore. The second is its infrastructure: Thailand benefits from a good basic infrastructure, from refining to pipelines, which could be expanded to accommodate larger volumes.

Consider also that Thailand links Indochina and China. It is a central point between Indonesia and southern China, and its ports are closer to China than either Singapore's or Malaysia's. In short, Thailand has the potential to fundamentally alter energy dynamics in the region and beyond.

Thailand's energy minister Prommin Lertsudeji, is spearheading the government's efforts to market an ambitious plan to turn the country into a regional processing and transportation hub for the oil industry. The plan includes several projects: a marine maintenance and repair facility on the western coast, complete with docking facilities; increased refining capacity (a new refinery was inaugurated in January 2004); the establishment of a tax-free zone; and several new pipelines, the most important of which would link western and eastern Thailand, and by exten-

...If Thailand can become a regional stockpiling center, it will also become Southern China's immediate "oil basket."

sion, the entire Mekong area and Southern China. By building adequate infrastructure, Thailand could also become a regional stockpiling center for crude oil.

The potential benefits of the project are enormous. Once the marine facilities and refining capacity have been prepared, Thailand will provide an immediate alternative to the Malacca Straits. That, by itself, will already be a considerable achievement.

Another huge benefit will be the opportunity to further develop the downstream and petrochemical businesses. This will increase domestic demand for oil, create jobs and strengthen the

economy.

Another potential benefit could be Thailand's development into a regional oil stockpiling center. This would bring added energy security to the region. But the chief benefit of this ambitious project is undoubtedly access to China.

China on a silver plate

China is the world's fastest-growing economy. It is now second only to the United States in terms of energy consumption. But the gap is narrowing inexorably. If Thailand manages to implement its energy plans, it could well take over Singapore as the destination of choice for transit of crude oil supplies.

Moreover, if Thailand can become a regional stockpiling center, it will also become Southern China's immediate "oil basket." The Association of Southeast Asian Nations (ASEAN) region already enjoys considerable pipeline infrastructure, from Indonesia to Singapore, from Singapore to Malaysia, from Malaysia to Thailand.

Future pipelines linking China with Thailand will therefore also provide a stable and cost-efficient export route for Indonesia's abundant oil and gas resources. □

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