Petroleum review November 2001

Asia-Pacific

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ABBREVIATIONS

The following are used throughout Petroleum Review:

- $mn = million (10^6)$
- bn = billion (10^9) tn = trillion (10^{12})
- cf = cubic feet
- cm = cubic metres
- boe = barrels of oil
- equivalent
- t/y = tonnes/year
- km = kilometre sq km = square kilometres b/d = barrels/day t/d = tonnes/day

kW = kilowatts (103)

MW = megawatts (106)

GW = gigawatts (109)

kWh = kilowatt hour

No single letter abbreviations are used.

Abbreviations go together eg. 100mn cf/y = 100 million cubic feet per year.

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Front cover: The 120,000 b/d Melaka, Malaysia, refinery is the anchor for Conoco's downstream operations in Southeast Asia. Photo courtesy Conoco









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inside...

ROUNFrom the Editor

The challenge is weakening demand

The oil industry is well used to rising to the challenge – whether it be technical, financial or organisational. But, as noted before in this column, oil and politics don't mix well and political challenges by their very nature are outside the industry's direct control.

The present crisis (war is an unhelpfully melodramatic term) contains many threats to the international oil and gas industry. Immediate impacts have been negative. Demand has fallen sharply and, after an initial surge, crude prices have also weakened.

Already the oil analysts are calculating the likely size of the reduction in 4Q2001 profits. This of course assumes that any conflict has little or no direct impact on crude production and loadings in the Middle East.

It is to be hoped that this relatively benign situation continues, but if the terrorists' desire is to harm western interests in general and US interests in particular, then some form of assault on oil fields, loading jetties or tankers is a realistic threat. If realised, we have a real oil crisis with soaring prices, warzone shipping insurance costs and significant security of supply concerns.

Extreme events are by their very nature unpredictable and unplannable. All companies can do is make contingency plans as to how damage to their business and their customers can be minimised.

In fact, even before 11 September oil demand was weakening as the US economy slowed to the very brink of recession. The aftermath of the terrorist attacks was a truly massive fall off in flights and airline passenger numbers. Airlines have announced mass redundancies and cut flights by between 10% and 30%; jet kerosene demand has slumped by up to 400,000 b/d. This in turn has depressed crude demand, pushing prices out of the bottom end of Opec's target range.

Opec, already overproducing against its reduced quota targets by 1.26mn b/d (September), is caught between the rock of trying to cut supply in the face of a major crisis and the abyss of falling prices and slumping demand. Little wonder it has put off its next formal meeting until mid-November.

Just weeks ago analysts were fretting about low oil stocks and the apparent failure to build up stocks ahead of the northern hemisphere winter. Stocks are now rapidly building, while weakening demand means forward stock cover is positively soaring. Improbable as it may seem, we may soon be worrying about high stocks and where to put them.

For the immediate future the fortunes of the oil industry will largely be determined by the way economic activity changes and by how much oil demand declines. For the oil producers the principle threat is that oil prices will once again plunge into the mid or even low teens.

Anyone who doubts the speed of the turnaround being suggested should look at US gas markets where prices have moved from a record high of \$10/mn Btu last December to under \$2 now. Early in the year all sorts of elaborate plans for pipelines from Alaska and new LNG import terminals looked to be certain development projects. Now they don't even add up, never mind achieve a hurdle return.

The oil and gas industry has learned to operate in the face of large and rapid price swings – even if they don't like them very much. Governments and government planners find it much harder to look after the 'national interest' in these circumstances. Expect to hear of plans to stabilise prices, promote mutual interest etc, etc. Don't expect any to come to fruition.

What is not yet clear is whether risk profiles have actually changed in the aftermath of 11 September. Will companies come to regard Middle Eastern or Central Asian investments as more risky than they did before the terrorist attacks? Will western governments regard dependence on Middle Eastern or Caspian supplies as more dangerous, more risky than they did before? Will they take any concrete steps to reduce this dependence? Clearly there will be much talk – but how much action? How the current conflict develops and concludes will give some clues, but that might be some time off.

Agonising dilemma

No one seems to have asked if there's actually enough carbon for global warming to be a significant problem. All the models of climate change use a doubling of CO₂ as their basis of concern. The possibility of resources constraints are effectively ignored. For the concerned environmentalist, the dilemma is acute: to believe in the horrors of global warming you need to believe hydrocarbon resources are fabulous. But if hydrocarbon resources are limited the global warming effects are fairly trivial. Tough thing this science. *Chris Skrebowksi*



A website enabling workers to gain rapid access to essential information about their health and safety rights and responsibilities has been launched by the UK Health & Safety Executive (HSE). The 'Workers Web Page' – www.hse.gov.uk/workers – includes links to the TUC website and to HSE's InfoLine contact centre, both of which are important sources of workplace safety information.

The Society of British Gas Industries (SBGI) reports that it is planning to introduce a website version of its new 'Directory of Energy Saving Gas Equipment' (currently being compiled) at www.energysavinggas.org.uk The directory's scope is to be extended to cover domestic as well as industrial and commercial sectors and services as well as equipment. Those wishing to have their company details included in the directory can fill in forms online at www.energysavingsgas.org.uk Further information is also available from the SBGI, who can be contacted at e: energysavinggas@sbgi.org.uk

UKPIA (the UK Petroleum Industry Association) recently launched its new website at www.ukpia.com According to Malcolm Webb, Director General, the website 'marks the start of a more proactive approach to communication at UKPIA. The site will be an important tool in establishing UKPIA as an authoritative source of opinion and information on noncompetitive issues relating to refining, distribution and marketing of oil products.'

A new Internet-based training system for Nymex Access is available at www.nymex.com/markets/index.htm The tutorial covers navigation and trading on the new web-based application, and is available to all interested parties.

Leading Edge Advantage (LEA) of Aberdeen is introducing a series of online best practice manuals on advanced drilling techniques (ADT) to help the oil and gas industry improve its understanding of these new technologies and enhance its performance. The first manual - Underbalanced Drilling - has been produced for the Japanese National Oil Corporation (JNOC). Other manuals currently being finalised cover coiled tubing drilling and through tubing rotary drilling. LEA also offers client-customisation and manuals to support LEA training courses for use by students on distance and open learning programmes.

Visit the revamped IP website @ www.petroleum.co.uk

In Brief

NEW_{pstream}

Algerian licensing round awards

BP is understood to have submitted an 'environmental statement' to the UK Department of Trade and Industry that details plans to develop eight new wells (three producers, five water injectors) on the West of Shetland Schiehallion field. Work on the proposed Phase III development of the field is slated to begin in May 2002.

UK

Kerr-McGee is reported to have found oil with a recent sidetrack well drilled on its North Sea Tullich prospect in block 9/23a. Additional appraisal drilling is planned and, if sufficient reserves are found, the field is likely to be developed as a satellite tie-back to the nearby Gryphon FPSO.

Start-up of Phillips Petroleum's North Sea Jade field is reported to have been delayed from 1 October 2001 to later in the fourth quarter.

Conoco (50%, operator) and BP (50%) are seeking UK Government consent for the fast-track development of their recent natural gas discovery in block 49/16 off the coast of Lincolnshire. The Vanguard Extensions (VE) prospect is expected onstream in 3/4Q2002 and is going to be produced through the Lincolnshire Offshore Gas Gathering System (LOGGS).

Europe

Ramco Energy reports that the 48/24-5A appraisal well on the Seven Heads field offshore Ireland has tested 13.7mn cf/d of gas. The well is to be suspended and will be incorporated in future development planning as a potential producer.

Statoil has awarded \$42.85mn worth of contracts relating to the development of the Sigyn gas field in the North Sea. ABB is to carry out modification work on the Sleipner A platform, which is to be connected to the wellstream from Sigyn. Coflexip Stena Offshore is to install the seabed template, flowlines and control cable.

Statoil is reported to have awarded European Marine Contractors (EMC) the NKr80mn contract to lay a 40-km pipeline between the North Sea Mikkel field and a subsea template on Midgard.

Statoil is understood to have awarded NKr400mn worth of contracts for its Repsol YPF has been been awarded exploration block 401D in Algeria's Berkine Basin in the country's latest licensing round. The contract provides for two terms of exploration – one lasting three years, the other for two years – and calls for a 700 km 2D seismic programme and the drilling of three exploration wells.

TotalFinaElf was awarded an exploration permit covering blocks 432, 444 South and 403 North in the Basin. The

Foinaven satellite onstream

The West of Shetland East Foinaven satellite oil field has come onstream at an initial flow rate of 20,000 b/d, exceeding the expected plateau of 15,000 b/d. East Foinaven reserves are put at 36mn barrels of oil. The field is expected to produce for up to 10 years.

Gas export is due to commence early next year through jointly-owned infrastructure. It will be sold to the Magnus field owners as part of the Magnus enhanced oil recovery scheme.

Parters in the East Foinaven project are: BP (43%, operator), Marathon (47%) and Enterprise Oil (10%).

Hoton topsides lift



UK heavy crane specialist Baldwins Industrial Services recently utilised its 1,200-tonne Liebherr LR1800 crawler crane to install the 350-tonne topsides module onto BP's Hoton offshore jacket currently being fabricated by SLP Engineering at Lowestoft.

First gas from Hoton, located in North Sea block 48/7b, is expected before the end of 2001. work commitment on the permit includes a 500-km 2D seismic programme and the drilling of two wells.

In addition, the US independents Burlington Resources and Anadarko were awarded block 402D and block 406B respectively, and Canadian company FCP block 405B.

Over 7bn barrels of oil reserves have been found in the Berkine Basin over the past decade.

Abu Dhabi project

Kellogg Brown & Root has been awarded a two-and-a-half-year, \$47mn production services contract by Abu Dhabi Marine Operating Company for engineering, procurement and construction management work on the West Super Complex located offshore Abu Dhabi.

The project workscope comprises a tie-in to the existing Umm Shaif Super Complex via an existing 18-inch diameter pipeline, the installation of a new compressor on the Zakum West Super Complex, and a 14-inch pipeline between the complex and a remote wellhead tower. In addition, the complex will be fitted with a new flare system and new equipment, that includes slug catchers, cooler and pig launchers/receivers.

Rising Danish reserves

The Danish Energy Agency is reported to have raised its estimates for oil reserves in the Danish sector of the North Sea by 43.6mn to 1.9bn barrels.

The bulk of the rise is thought to come from better than expected recovery rates from the Dan field – Denmark's largest field, which is currently producing 122,000 b/d. Dan's reserves figure has been raised by 41mn barrels from its 1998 reserves estimation of 436mn barrels.

Faroese drilling

The Faroese Ministry of Petroleum has reported that BP's 6004/12/-1 wildcat well is to be plugged and abandoned after failing to find commercial quantities of hydrocarbons.

However, the Svinoy well was said to have demonstrated the presence of both oil and gas, which Minister of Petroleum Eyoun Elttor stated 'considerably improves our expectations of finding oil in commercial quantities in the future.'

3



Snøhvit gas field gets the green light

Statoil and partners are reported to have given the green light for the NKr46bn development of the Snøhvit gas field in the Barents Sea. The project had been put on hold earlier this year following a dispute with the Norwegian

Government over the tax regime to be applied to the development. However, recent proposals put forward by the Norwegian Finance Ministry are reported to meet the partners' aims for return on capital and, subject to approval from the Norwegian Parliament, the field is due onstream in 2006.

The field is to be developed via a subsea tie-back to a new LNG terminal to be built near Hammerfest in northern Norway. Estimated reserves are 320bn cm of gas. Project partners are: Statoil (22.29%, operator), Petoro – which controls the Norwegian Government's directly-held interests (30%), TotalFinaElf (18.4%), Gaz de France (12%), Norsk Hydro (10%), Amerada Hess (3.26%), RWE-DEA (2.81%) and Svenska Petroleum (1.24%).

Echo-Yodel project plans

Woodside Energy reports that the North West Shelf Venture partners have been awarded production licences WA-23-L and WA-24-L for the Echo-Yodel gas condensate field offshore Western Australia. Probable field reserves are put at 37mn barrels of condensate and 0.4tn cf of gas over a four to five-year period.

The Echo-Yodel field is to be developed via two subsea production wells tied back to the Goodwyn platform via a 30-cm diameter pipeline. Production will be commingled with existing production on the Goodwyn platform, processed and exported to shore via the existing trunkline system. Start-up is slated for mid-2002. Output from Echo-Yodel is expected to help compensate for the natural decline in condensate production from the much larger Goodwyn field.

The six equal partners in the North West Shelf Venture are: Woodside Energy (operator), BHP Petroleum, BP Developments Australia, Chevron Australia, Japan Australia LNG and Shell Development (Australia).

Kizomba A development

ABB has been awarded a contract by ExxonMobil for the engineering, fabrication, integration, installation and commissioning of the surface wellhead platform for the Kizomba A project offshore Angola. The platform is scheduled for completion in 3Q2003.

ABB will execute the project from its Houston office via a 50:50 partnership with Heerema's Grootint. The project will also require extensive activities in Africa, the US, Europe and Asia, with key components fabricated in Angola.

According to ABB, the project – based around a next generation, four-legged tension leg platform concept – will be the first dry completion unit to be installed in West Africa's deepwater region.

Asia-Pacific expansion

Amerada Hess has successfully bid for the Tanjung Aru block in the prospective Kutei Basin offshore East Kalimantan, Indonesia. It is to act as operator, holding a 50% stake, with Malaysia's Petronas Carigali holding the remaining interest.

The company now has interests in six Indonesian blocks, having first entered the arena in 1997 by farming in to the Lematang PSC containing the Singa gas field. Earlier this year it signed a gas supply contract with its partners for supply of gas from the Jabung PSC in South Sumatra to Singapore.

Discussions are currently under way for the potential sale of gas from Jambi Merang in which Amerada Hess holds a 25% stake.

In East Java, the company has added to its 36% stake in the Ujung Pangkah field with the purchase of Premier Oil's 40% interest; field reserves are put at 500bn cf. Amerada Hess also holds a 30% interest in the Blora PSC where an exploration well is planned later in 2001.

Quiriquire onstream

Repsol YPF has commenced production from its Quiriquire gas and condensate field in the state of Monagas in western Venezuela. The field was already producing 13,000 b/d of oil and proved reserves are put at 145mn boe of liquids and gas.

The first development phase for gas and condensate reserves comprised the repairing and upgrading of existing wells, the revamping of the separation and compression plant, and the construction of a 26-km gas pipeline to the PdVSA facilities in Orocual. Gas production has begun at an initial rate of 2.1mn cm/d and is scheduled to reach a sustained production level of 7.6mn cm/d by 2002 when development is completed.

In Brief

Kvitebjørn field in the North Sea, where development drilling is due to begin in autumn 2003.

The Italian authorities are reported to have signed an agreement for a proposed \$2bn, 1,000-km Algeria– Sardinia–France natural gas pipeline. The pipeline, still at the planning stage, will have a 8bn cm/d capacity.

Statoil's SCA-7 appraisal well on the Siri field in the Danish sector of the North Sea is reported to have discovered oil east of the currently producing part of the field. The well tested at 23,000 b/d.

Repsol-YPF has made two oil discoveries – Necora and Bocarte – in the Mediterranean Sea that it reports could produce up to a combined 10,000 b/d. The fields will be tied back to the nearby Casablanca platform.

North America

Conoco is understood to be selling a package of non-strategic oil and gas assets in the Gulf of Mexico to Stone Energy for \$300mn.

CGG is reported to have begun a high resolution 3D seismic survey over BP's Crazy Horse field in the Mississippi Canyon region of the deepwater Gulf of Mexico. The survey is to target the field's large subsalt reservoirs and associated geology.

US independent ATP Oil and Gas is reported to have brought onstream the Ladybug field on Garden Banks block 409 in the Gulf of Mexico. The field is currently producing 8,000 b/d of oil and 6mn cf/d of gas.

Shell is reported to have confirmed plans to develop its \$80mn Manatee project in the deep waters of the Gulf of Mexico. FMC Technologies is to supply two subsea wellheads for the project located in Green Canyon block 155. Manatee is to be developed via a tie-back to the Shell-operated Angus manifold and its Bullwinkle platform. Recoverable oil reserves are put at 12mn barrels and the field is due onstream in 3Q2002.



Pakistan's Federal Minister for Petroleum & Natural Resources Usman Amenuddin has announced a gas discovery near Sukkar by a joint venture

In Brief

of Petronas of Malaysia, Lasmo and Government Holdings, reports Stella Zenkovich. The discovery well flowed 25.6mn cf/d of gas.

Hyundai Heavy Industries is understood to have been awarded a \$300mn contract from Maersk for the construction of ten platforms and four compression modules for an oil field offshore Qatar. Delivery is slated for mid-2003.

Russia & Central Asia

Gazprom's 3.2tn cm Zapolyarnoye gas field is reported to have come onstream. The company expects field output to compensate for the natural decline in its other giant fields – Yamburg and Medvezh'e.

Sinopec has joined PetroChina in the proposed construction of the eastwest gas pipeline between Xingiang and Shanghai, reports UFG. Gazprom is one of the companies bidding to construct the pipeline and may join with Shell if its bid is successful, comments the analyst.

China National Petroleum Company (CNPC) subsidiary, Daqing Oil Field Corporation, and Yukos of Russia are understood to have formed an alliance to develop oil deposits in the Irkutsk and Sakha regions of Siberia, Russia.

Gazprom is understood to be in discussions with Rusia Petroleum concerning the joint development of the Kovykta gas field in eastern Siberia.

Wintershall has pulled out from Russia's Prirazlomnoye oil field development project due to a failure to agree on the proposed production sharing agreement terms with the Russian Government and Gazprom, holder of the production licence for the field, reports UFG. The field has estimated oil reserves of 400mn barrels and is forecast to cost \$1bn to develop.

Asia-Pacific

Matrix Oil of Australia is reported to have produced 4,200 b/d of oil and 2.9mn cf/d of gas from the L-1 re-entry well at its Langsa offshore contract area in Indonesia.

PetroChina is understood to be opening 18 blocks – located in China's Ordos, Songliao, Qaidam and Junggar Basins – to foreign participation.

NEW_{Stream}

UKCS output remains below last year's levels

July 2001 saw a 2% increase in monthly oil from the UK Continental Shelf to bring output back above 2mn b/d, according to the latest (September 2001) Royal Bank of Scotland *Oil and Gas Index.* However, output was down 14.7% on the year. Gas production was up on both the month and year. Monthly oil production for July was 2,033,323 b/d and gas production was 8,841mn cf/d.

Tony Wood, Senior Economist with the Royal Bank, commented: 'This month we have seen a slight increase in UKCS oil production. However, output continues to be significantly below last year's levels. Despite this, we continue to expect a recovery in oil production towards the end of this year and into next year. The story on gas is more positive, with production up on both the month and the year.' Turning to the terrorist attacks in the US, he said: 'Oil markets have been eclipsed by recent events in New York and it is too early to assess the implications of this. However, following an immediate rally to \$31/b, oil prices have fallen to below \$22/b. In the absence of supply difficulties from the Middle East and/or over-reaction on the demand side, both of which could result in sharp price rises, we anticipate continued weakness in the market in coming weeks. The actions of Opec will be key to achieving market stability in these uncertain times.'

Monthly oil revenues for July were down 9.4% on the month and 22.2% on the year to stand at £35.5mn/d. Combined oil and gas revenues were down 6.8% on the month and 14.9% on the year to stand at £47.6mn/d.

Year Month	Oil production (av. b/d)	Gas production (av. mn cf/d)	Av. oil price (\$/b)
Jul 2000	2,383,944	7,531	28.9
Aug	2,339,363	7,464	31.6
Sep	2,281,516	8,080	33.7
Oct	2,247,307	10,172	30.9
Nov	2,322,296	11,621	32.8
Dec	2,399,038	11,439	26.3
Jan 2001	2,274,671	13,061	25.8
Feb	2,206,542	12,293	27.5
Mar	2,301,409	12,465	24.5
Apr	2,223,924	11,918	26.0
May	2,170,520	9,155	28.3
Jun	1,993,483	8,639	27.6
Jul	2,033,323	8,841	24.7

Source: The Royal Bank of Scotland Oil and Gas Index

North Sea oil and gas production

Sibneft reports large hike in output

Sibneft claims that it has 'achieved the fastest rate of organic production growth of any major Russian oil company in the first 3Q2001,' according to official figures released by the Russian Energy Ministry. Sibneft's production jumped by 18.7% to 393,000 b/d in the period compared with the first nine months of 2000.

The large hike in output is reported to have resulted from a combination of improving productivity at existing fields, combined with intensive investment in developing new fields. The company this year launched an ambitious twoyear horizontal drilling programme covering some 60 wells. Horizontal wells drilled in 1H2001 yielded average production of 1,853 b/d, against 454 b/d for new wells in general.

Sibneft is targeting total production in 2001 of 405,000 b/d, up from 338,000 b/d in 2000. Investment in exploration and production is forecast to total \$595mn.

NEW_{Upstream}

Gulf of Mexico drilling programme

BHP Billiton has announced the results from recent appraisal and exploratory drilling in the Gulf of Mexico. The Atlantis-3 appraisal well and a lateral sidetrack drilled on the Atlantis field in Green Canyon block 743 encountered hydrocarbon-bearing reservoirs and the results will be used to further define the reserve level for the field, currently estimated at between 400mn and 800mn boe. Atlantis is on a fast-track development schedule and project sanctioning is expected during 1H2002. BP holds a 56% stake in the field and acts as operator, BHP Billition owns 44%.

Results from the Mad Dog-4 appraisal well in Green Canyon block 782 are reported to have verified the reservoir continuity on the west flank of the accumulation, and are said to indicate reserves in the region of between 200mn and 450mn boe. Project sanction is expected by the end of 2001. Mad Dog partners are BP (operator, 60.5%), BHP Billiton (23.9%) and Unocal (15.6%).

The Boris exploration well in Green Canyon block 282 encountered hydrocarbon-bearing sands. The well is to be evaluated for development via a tieback to the Typhoon field facilities on Green Canyon block 237. BHP Billiton holds a 50% stake in Boris and is operator. Partners are Chevron and Noble Affiliates' Samedan Oil Corporation, each holding 25%.

The Frampton-1 exploration well on Green Canyon block 872 in the Western Atwater Foldbelt play fairway – which includes BHP Billiton's discoveries at Neptune, Mad Dog and Atlantis – also encountered hydrocarbon-bearing sands. However, the resource is currently deemed to be non-commercial and the well was plugged and abandoned.

Russia and Central Asia news update

Stella Zenkovich reports on recent upstream developments in Russia and Central Asia.

- The OKIOC consortium that is developing the large Kashagan field in the northern Caspian has taken out a record high insurance policy of \$500mn cover. The field is located in shallow waters of just 3.3 metres depth which are prone to winter ice packs that make operations treacherous. In addition, the changing level of the Caspian Sea lengthens the rig-to-shore distance unpredictably. The area is home for endangered sturgeon and seals, and oil companies operating in the region have been taking great care in their precautions against spills and releases of drilling wastes.
- The decision whether to drill a second exploration well in the Azeri Absheron offshore gas field - which at one stage had been hoped to yield 700bn cm of gas - has been postponed by the consortium of Socar (50%), Chevron (30%) and TotalFinaElf (20%). The first well, drilled at a cost of \$78mn, failed to produce commercially viable reserves. The PSA agreement comprises a twowell obligation; as yet no discussions are reported to have taken place regarding paying compensation to Baku. However, there is ample time as the rig needed to drill the second well is not expected to become available.

until 2004.

- The Russio-Kazakh Caspian sector's oil and gas reserves have been put at between 8bn and 10bn tonnes on the basis of recent findings by Ivan Glumov, Russian Deputy Minister for Natural Resources. He stated that the view to date had been that the Azeri and Turkmen southern Caspian Basin was the main depository of hydrocarbon resources, the basis on which the Baku-Ceyhan oil pipeline was agreed. However, no prospecting has taken place in the central Caspian, although studies by both Russian and Kazakh geologists have indicated up to 15 oil and gas structures and three fields in the region. According to Glumov, these could ensure the full capacity operation of CPC's Tengiz-Novorossiysk oil pipeline in the coming years.
- President Mohammed Katami and his Turkmen counterpart Saparmurat Niyazov have signed a joint declaration calling for 'an immediate stop to the exploitation of contested areas of the Caspian' and on the other three littoral states to ensure that the region does not become 'an area of tension and confrontation'. They are also calling for talks on sharing oil and gas resources to include all five of the Caspian states. Both Turkmenistan and Iran contest some deposits with Azerbaijan.

In Brief

PetroChina is reported to have made a 'major' oil discovery in China's Tarim Basin with its Lungu-15 field that tested 443 cm/d (2,800 b/d) of heavy crude oil. Probable reserves are put at 68mn tonnes.

Platform C on CNOOC's Suizhong 36-1 oil field has entered production with oil output to gradually rise to 9,000 b/d. Platforms D, E and F came onstream at the end of 2000, with the two remaining field platforms, G and H, slated to come onstream by the end of 2001. Production is expected to peak at 69,000 b/d once all the platforms are commissioned.

Sinopec of China is reported to have discovered a self-contained oil field beneath the Anpeng oil field that has been producing for the past 15 years. Reserves are put at between 10mn and 12mn tonnes of oil.

Santos is reported to be planning to bring its Wellington gas field in Queensland's Cooper Basin onstream in November 2001. The field will be tiedin to the Ballera gas processing plant.

Latin America Wintershall Energia of Germany is

vuntershall Energia of Germany is understood to be planning to invest \$300mn by 2005 on gas exploration offshore southern Argentina.



Ocean Energy's East Zeit A-21 wildcat well in the Gulf of Suez offshore Egypt has encountered 745 ft of oil pay and should enter production before the end of October 2001. The discovery is expected to yield between 40mn and 80mn barrels of oil, in addition to the 87mn barrels of oil produced to date from the East Zeit field.

TotalFinaElf's \$2.7bn deepwater Girassol field in block 17 offshore Angola is reported to be on schedule for first oil by the end of the year. Production is forecast to reach 200,000 bld within the first six months. Other Girassol partners are ExxonMobil (20%), BP (16.37%), Statoil (13.33%) and Norsk Hydro (10%).

Canadian company Antrim Resources is reported to have been given the green light by the Zanzibar Government to explore for oil in the country.

In Brief

NEW_{industry}

UK

UK indigenous production of primary fuels was 3.5% lower in 2Q2001 compared to 2Q2000. The drop is largely attributed to a 6.6% fall in petroleum production. Inland consumption on a primary fuel basis was 235.1mn toe in 2Q2001. Oil consumption fell by 2.6%; gas consumption fell by 1%.

BP is planning to move to new corporate headquarters at No 1 St James's Square in London next spring.



Norsk Hydro has posted a 3Q2001 net income of NKr1,333mn, a decline of NKr2,563mn compared with the same period a year earlier and weaker than the first two quarters of 2001.

Kvaerner is reported to have appointed Finn Berg Jacobsen as its new Acting Chief Financial Officer, replacing the current CFO, John M Charlton, who is retiring for personal reasons.

North America

Houston-based Burlington Resources is understood to be planning to sell off \$500mn worth of non-core assets following its \$2.1bn acquisition of Canadian Hunter Exploration.

The Texas Eastern Products Pipeline Company (TEPPCO) has announced plans to acquire Jonah Gas Gathering Company, a subsidiary of Canada's Alberta Energy, for approximately \$360mn, reports Monica Dobie.

Lukoil is reported to have completed its acquisition of 97.2% of the shares of Canadian company Bitech Petroleum.

TransCanada PipeLines is understood to be selling part of its gas marketing business to Calgary-based BP Gas and Power for an undisclosed sum.

US company Duke Energy is understood to be planning to acquire Westcoast Energy of Canada for \$8.5bn in cash, stock and the assumption of nearly \$5bn in debt.



UK inquiry in to energy policy and security of supply

The UK Trade and Industry Committee has announced the terms of reference for its inquiry into 'Energy Policy - the Security of Supply'. All four of the chief sources of energy in the UK (coal, gas, oil and nuclear power) are likely to present difficulties within the next ten years - for both environmental and cost reasons: there has been a move away from coal-fired electricity generation; the UK is already a net importer of gas and dependence on gas imports is likely to increase sharply over the next five years; the UK will probably become a net importer of oil in the same period; and the UK's existing nuclear power stations are being progressively decommissioned. It is not yet clear how much renewable sources of energy (many of which raise their own environmental problems) and energy conservation will be able to contribute to meeting/ reducing energy demand.

The inquiry will focus on the question of how the UK should adapt its energy policies to provide secure and diverse energy supplies over the next 50 years, while fully respecting its environmental commitments and its social goals. The Committee wishes to learn the views of interested parties about the following issues:

- Given the imminent dependence of the UK on energy imports, how can the UK maintain a secure energy supply? What mix of fuels would maximise security?
- Is there a conflict between achieving security of supply and environmental policy? What is the role for renewables, and combined heat and power schemes?
- What scope is there for further energy conservation?
- What impact would any changes have on industrial competitiveness and on efforts to tackle fuel poverty?
- Is any change of government policy necessary? How could/should government influence commercial decisions in order to achieve a secure and diverse supply of energy?

Latest developments in Africa

Stella Zenkovich rounds up some of the latest developments in the African oil and gas sector:

- The Egyptian Oil Ministry has formally established a new company, Egyptian Holding Company for Natural Gas, that is to develop and manage gas projects in the country. The company will also be responsible for coordinating the flow of Egyptian gas to Libya in exchange for crude from there – a deal originally mooted in the mid-1990s by Egyptian Oil Minister Samah Fahmy and now revived with the Minister announcing the creation of a \$100mn, 50:50 joint venture known as Arab Company for Oil and Gas Lines.
- Having pulled out of oil exploration in western Uganda in 2000 due to a drastic fall in crude prices, Hardman Petroleum of Australia is seeking a comeback and is at an advanced stage of negotiations with the Ugandan Government.
- Three bids have been posted for development of \$200mn worth of oil and gas reserves in Algeria's Menzel Ledjmat North (MLN) field, jointly managed in block 405 in the Berkine Basin by state-owned Sonatrach and Burlington Resources of the US. The bids have been placed by US local Brown & Root Condor, Entrepos of

France, and Petrofac of the US.

- Chevron and the Nigerian National Petroleum Corporation have signed a 75%:25% joint venture supply agreement, and Chevron and South Africa's Sasol a 50%:50% technology partnership, for the front-end engineering design (FEED) phase of the Escravos gas-to-liquids (GTL) project. Due for completion in 2005, the 33,000 b/d plant will use 3.1bn cm/y of gas.
- Egypt's petroleum sector produced \$500mn surplus between 1 July 2000 and 30 June 2001, compared with \$233mn in the previous fiscal year and a deficit in 1998/1999.
- A new company Petrodar has been set up by Gulf Company, Chinese National Petroleum Company (CPPC), Al-Thani Corporation of the United Arab Emirates and Sudan's national oil company Sudapet to develop the Adariel oil field in southern Sudan.
- The Nigerian National Petroleum Corporation has issued new crude export guidelines, restricting them to companies with Nigerian export refineries and who have a net worth in excess of \$40mn and an annual turnover of \$100mn. The dual aim is to strengthen the country's economic base and to reform its oil sector.

NEW_{industry}

Shell forecasts 3% growth to 2005

Shell's growth in upstream production is forecast to average 3% a year up to 2005, reports Walter van de Vijver, Chief Executive Officer of Shell's Exploration and Production business. 'This forecast has been lowered from our earlier targets partly as a result of slower access than anticipated to major sources of reserves,' he commented. 'In addition, some projects are taking longer to realise than first predicted, and some of our more mature fields, in the UK and US particularly, are declining faster than before.'

Production in 2001 is expected to

meet the target of 3.8mn boe/d at \$14/b Brent, benefiting from the recent startup of projects in the Gulf of Mexico and the Phillipines. Output in 2002 is expected to be similar to this level.

'Growth in value is to be achieved through a combination of portfolio developments, efficient use of capital investment and focused exploration,' van de Vijver stated. 'We are currently developing projects from which we expect to produce by the end of 2005 over 1.2mn new boe/d. Capital investment in the upstream business will be in the range of \$7bn to \$8bn a year.'

Monitoring greenhouse gas emissions

Chevron reports that it is using a new system to manage its energy usage more effectively and to monitor greenhouse gas emissions from all of its worldwide operations.

Developed with consulting firm Arthur D Little, the Chevron Energy and Greenhouse Gas Inventory System (CEGIS) is an automated, electronic data management information system that is designed to gather monthly energy and greenhouse gas emissions data from the company's activities in the exploration and production, refining and marketing, petrochemicals, transportation and coal sectors around the globe.

In addition, the system will assist the company in setting goals for energy and emissions reduction, helping identify potential improvement areas, evaluating capital projects and generating corporate energy and environmental reports.

Two-fold division of Norsk Hydro operations

Norsk Hydro has unveiled plans to intensify its focus on the Norwegian Continental Shelf by dividing its administrative management into two separate divisions.

Operations and Production Norway will be responsible for the safe and efficient operation of the fields where Norsk Hydro is operator, as well as for the development of these fields, their infrastructure and their installations. It will be located in Bergen.

Exploration and Development

Norway will be responsible for exploration and field development in new areas on the Shelf, plus the commercial management of Norsk Hydro's total involvement in the Norwegian oil and gas sector. It will be headquartered at Kjørbo, Sandvika, near Oslo.

The two divisions form part of Norsk Hydro's Oil and Energy business area, which also includes divisions in Energy, Exploration and Production International, and Oil Marketing.

Changes to Chinese import laws

China is to abolish its laws requiring international oil companies to channel their crude and processed oil through state importers, reports *Keith Nuthall*. The promise has been accepted as part of Beijing's price for membership of the World Trade Organisation (WTO) which was approved by the WTO's China accession working party in September 2001.

Under the deal, the growth of volumes open for private imports will be steadily increased, 'allowing China's own industry to adjust gradually to liberalisation,' said an EU briefing paper. China has also promised to lift restrictions on the number of foreign petroleum retail outlets in a particular chain that can be opened in China. It has also committed to lowering tariffs on a range of machinery, including construction gear, that oil companies looking to work in China would need to import in to the country. General levels will now range from between 5% and 10%, down from levels of up to 35%. The commitments should come into force in March 2002, when formal procedures sparked by the working party decision are completed.

In Brief

Council, Kuwait Oil Company is to offer a public tender for a \$655mn project to boost oil/fuel export capacity to 3mn b/d, writes Stella Zenkovich.



Technip-Coflexip and Kazakh oil and gas transportation company TOG are reported to have agreed to establish a 50:50 engineering and construction joint venture that will be headquartered in Almaty. Technip Kazakhstan will focus on bidding for work related to development of the Tengiz, Karachaganak and Kashagan fields, as well as cross-country pipeline projects.

Yukos of Russia is reported to have acquired a 10% stake in Kvaerner.

Hurricane Hydrocarbons of Canada is reported to be planning to invest \$280mn in Kazakhstan's oil and gas sector by the end of 2002. The company currently operates the Kumkol oil field and owns an 88% stake in the Chimkent refinery.

The Russian Government has implemented the export duty changes that it had previously discussed – halving the natural gas export duty from 10% to 5%, decreasing the export duty on gasoline and gasoil from euro 39/t to euro 32/t, and increasing the export duty on fuel oil from euro 20/t to euro 39/t, reports UFG.

Russian gas exports fell by 5.9% in the first eight months of 2001, according to UFG. Exports to western Europe were down 7.5%, while those to eastern Europe were down 2.3%.



Indonesian Energy Minister Purnomo Yusgiantoro, speaking at an energy conference in Houston, is reported to have stated that the government plans to keep a controlling 51% stake in state-owned Pertamina after it becomes a private limited company.



Rilwanu Lukman, a Special Advisor on Petroleum Affairs to the Nigerian President, is reported to have been named the new Opec President. He will take over from Chakib Khelil – Algeria's Oil Minister – on 1 January 2002.

In Brief

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UK

The International Petroleum Exchange (IPE) reports that Brent crude futures have set a new daily record on 24 September, trading 145,825 lots – the equivalent of over 145mn barrels of crude, twice daily world production.

Venture capitalist company Alchemy Partners is reported to be planning to sell UK independent Petrol Express' 200-strong service station network for £30mn.

Europe

Saipem, a business unit of Italian oil and gas group Eni, is reported to have acquired from Halliburton Brown & Root the remaining 50% of European Marine Contractors for \$115mn.

Foster Wheeler's French subsidiary has been awarded a contract by Esso Raffinage for the front-end engineering design of the major part of the \$200mn PJ21 project at its Port-Jerome Gravenchon refinery in Normandy, France.

Eni is planning to sell a further 261 of its service stations operating in Italy under the Agip and IP brands to Italian distributor Tamoil for \$73mn. The company is understood to be wanting to sell or swap over 4,000 of its 9,000strong Italian forecourt network by 2003 – reducing its market share to 30%. The company currently holds some 43% of Italy's retail market.

The Irish authorities are reported to have given Bord Gais and Questar the green light for the development of a multi-million pound gas network that will link Southern and Northern Ireland's networks and integrate them into the European gas pipeline system. Due for completion in 2004, a new pipeline will link Gormanstown in County Meath to Antrim where it will connect with a pipeline running from Belfast to Londonderry. In addition, a new gas-fired electricity power station is to be constructed at Coolkeeragh, near Londonderry.

North America

US energy company Enbridge is understood to be expanding its US operations with the \$50mn acquisition of Williams Cos' Texas natural gas pipeline and processing operations.

Shareholders approve ChevronTexaco

Chevron and Texaco shareholders have approved the merger of the two companies at a special stockholders' meeting. The companies received US Federal Trade Commission approval, subject to a number of conditions being met, in September 2001 (see Petroleum Review, October 2001). Some of these conditions are to be met as the result of a deal between Shell and Texaco under which Shell Oil Company is to acquire Texaco's 44% interest in Equilon Enterprises, making Shell the 100% owner. The Memorandum of Understanding also provides that Shell and Saudi Refining will acquire Texaco's stake in Motiva Enterprises whereby each company will become a 50% interest holder in Motiva.

Shell expects to generate savings of \$400mn/y by 2004 as a result of the agreement. There will also be one-off restructuring costs of \$100mn and rebranding costs of \$500mn associated with the Shell and Texaco networks over the next four years, it reports.

The new ChevronTexaco company ranks third in the world in oil reserves and fourth in oil and natural gas production. Its downstream business will operate 25,000 service stations located on six continents, and will have a refining capacity of 2.2mn b/d. It is to be headquartered in San Francisco until 2H2002; it will then relocate to San Ramon in California. More information about the new company can be found at www.chevrontexaco.com

Fall in US monthly gas spot prices

Platts reports that average US monthly natural gas spot prices for October 2001 were \$1.68/mn Btu, down 24.3% from September 2001 and 67% from October 2000, resulting in the lowest monthly average in more than two and a half years. A number of factors are reported to be responsible for the price fall – demand is said to be 'way off' due to the economic slump, the seasonally moderate weather and the fact that natural gas storage capacity is over 86% full with nearly five weeks to go in the injection season.

'Add to that a year-over-year increase in production and an increase in imports of Canadian gas, and it begins to look like the market doesn't have much upside at least through next winter,' commented Kelley Doolan, a natural gas market specialist for Platts.

These and other Platts energy prices can be charted, free of charge, at www.platts.com

European call to cut fuel duty

European fleet and fuel management company Arval PHH, which also operates the AllStar fuel card, has urged the UK Government to 'reconsider its fuel taxation policy' following the European Commission's call for harmonised petrol and diesel taxes (from the EC White Paper published on 12 September 2001). The company believes that 'British firms are competing at a disadvantage in comparison with businesses in other member states because pump prices are so high.'

'It is proving increasingly difficult for the government to justify the current high taxation levels when the economy is struggling and alternative forms of transport are inadequate,' stated Martin Hender, Arval PHH Director of Fuel. 'Petrol prices have fallen recently by around 2 p/l, but this was the result of fluctuations on the international oil market and there's no guarantee that this downward trend will continue. The threat of recession means that businesses need all the help they can get to remain competitive and the government should use this opportunity to review their fuel taxation levels as a matter of some urgency.'

Currently, for every £1 a British driver spends on unleaded fuel, 75 pence goes to the UK Government in tax and 23 pence goes to the oil company, with the retailer receiving the remaining 2 pence. This compares to an average tax rate across the other 14 EU countries of 63%, states Arval PHH.

Commenting on the potential impact on the UK oil and gas industry of the recent terrorist attacks in the US, Hender stated: The price of crude oil is particularly susceptible to speculation following a Middle-East related crisis. That was a major factor in the recent leap in prices, although forecourt petrol prices remain fairly steady at the moment [mid-September]. That aside, we will have to wait and see what the long-term effects are for the price of crude. The current weakness of the dollar actually helps the UK as we buy oil in dollars. However, if the current crisis continues, and the price of oil stays high, we could see the effects filtering through to what we pay at the pumps."

NEVSwnstream

Phillips invests in Nigerian power project

Phillips Petroleum is to invest \$85mn for a 20% stake in a new independent power project to be built near Kwale, Nigeria, in oil mining lease OML 60.

'The power project is part of Phillips' development strategy for Nigeria and will utilise 600bn cf of gas produced by the joint venture,' stated Henry McGee, President of Phillips' Europe–Africa division. 'Phillips will book approximately 20mn boe of proved reserves this year as a result of the approval of this power project investment. The project also will help eliminate gas flaring by 2004, ahead of all other oil companies operating in Nigeria.'

The power plant will be tied into the Onitsha substation located approximately 50 km from OML 60, and will help bring electricity to people in 14 of the 36 Nigerian states. Currently, some 60% of Nigeria's population has no access to electricity.

The Kwale plant will cost \$425mn and is expected to start up in 2004. The Nigerian Government is reported to have provided 'significant' tax and other incentives to the project.

energy studies will be given a greater

priority following the recent US ter-

rorist attacks and recent estimates of

future increases in European energy

dependency on the volatile Middle

East. These concerns have fuelled

Europe's oil trade with Russia, which

has grown so fast that the EU's trade

deficit with Russia rose to euro 25bn

Meanwhile, the Commission is just

launching a research project into the

clean and efficient use of solid fuels in

power plants; studies could focus on oil

shale consumption by the Estonian

electricity industry, said the report.

last year, said Eurostat.

EU call to increase use of bio-fuels

Franz Fischler, the EU Agriculture Commissioner recently stated that European Union countries will have to ensure that at least 2% of their transport fuel supplies are in the form of bio-fuels – made from sugar beet, cereals, maize and rape-seed – by 2005 under a European Commission Directive to be proposed very shortly, report *Keith Nuthall* and *Alan Osborn*. The share taken by bio-fuels will rise steadily to 20% by 2020 if the plan is approved by Ministers and the European Parliament.

EU Research Commissioner Philippe Busquin has added that renewable

'Firm but fair' price control on Transco

UK gas and electricity industry watchdog, Ofgem, has unveiled its final 'firm but fair' proposals for the forthcoming fiveyear price control on UK gas pipeline operator Transco. The proposals include:

- A reduction of Transco's revenues of 4% in the first year, and 2% in the subsequent years.
- New quality of service targets and output measures.
- Sufficient funding to ensure that Transco, operating efficiently, can

replace the mains pipeline network.

A significant development in RPI-X regulation to create a stable and forward looking regulatory environment for Transco, combined with new incentives and guaranteed outputs for customers.

According to Ofgem, its proposals – which will come into effect on 1 April 2002 – will mean a real reduction of £5 off domestic gas customers' bills, guarantee certain standards in quality of service, and strengthen security of supply.

In Brief

The company also recently acquired Midcoast Energy Resources for \$350mn, which operates 6,000 km of pipeline in Canada and the US.

Imperial Oil and ExxonMobil have reached an agreement under which Imperial will become the exclusive marketer of Mobil branded lubricant oil products in Canada, writes Monica Dobie.

The US Federal Trade Commission (FTC) is understood to have given its approval for the \$9bn merger of Phillips and Tosco. No asset divestitures are reported to be required. The merger is claimed to create the US's second largest refiner after ExxonMobil, with the new venture holding 10 refineries with 1.7mn b/d of capacity and a 12,400-strong service station network.



Atofina, the chemicals branch of TotalFinaElf, and Qatar Petrochemical Company, in which the Group owns a 10% interest, have signed an agreement covering the construction of an ethane cracker train in Ras Laffan, Qatar. The cracker is due onstream in 2H2006, with an initial capacity of 1mn tly.

Sasol and Qatar Petroleum have awarded Foster Wheeler Energy Ltd (FWEL) a front-end engineering and design (FEED) contract for an \$800mn gas-to-liquids (GTL) plant to be based in Ras Laffan Industrial City, Qatar. The plant will provide 24,000 bld of fuel, 9,000 bld of naphtha and 1,000 bld of LPG for domestic consumption.

Alon Israel Oil, operator of a 219-strong service station network in Israel, is seeking to acquire the remaining 11% of shares in Dor Energy at 18% above the market price, having acquired 89% of the company for \$70mn in 1999, reports Stella Zenkovich.

Russia & Central Asia

Tyumen Oil Company (TNK) has confirmed plans to participate in the privatisation of a 63% stake in Czech refining and petrochemical company Unipetrol, reports UFG. TNK is expected to face competition from Mol of Hungary, Russian company Sibur and at least 20 other bidders.

Gazprom is reported to have agreed to join a consortium of Ruhrgas, Gaz de

Forecourt operators connecting online

Conoco reports that it is encouraging staff at its UK network of around 600 Jet service stations to sign up for Connect2U, the WH Smith Groupowned online marketplace for retailers and newsagents. The company believes that the efficiencies delivered through the web-based ordering facility can help its employees improve cashflow by up to 20% a week and at the same time improve service to customers.

Steve Walton, who is News Category

Manager at Conoco explains that, because the service is available 24 hours a day, 'Connect2U... leaves our staff free to concentrate on customers during shop hours, but manage their supplies online much more efficiently at a time when it suits them, keeping disruption to a minimum.' The service also keeps forecourt operators up to date with new launches, promotions and news, and there are plans to expand the range of product categories available online.

In Brief

France and Snam to bid in the privatisation of the Czech Republic's gas pipeline operator.

Lukoil, which owns and operates Bulgaria's Neftochim refinery, is planning to invest \$100mn over four years to renovate Petrol AD's 400-strong service station network in the country, according to UFG. Petrol has tied its network to Lukoil's 22 outlets for a 15year period.

Transneft, the Russian state-owned oil pipeline operator, is reported to have secured a \$150mn loan from a syndicate of foreign banks. The funding will help finance the Baltic export project that is to carry oil from the Timan Pechora Basin in northwest Russia to new terminals at Primorsk on the Gulf of Finland. The pipeline will have an initial 12mn t/y capacity and is due to be commissioned by the end of 2001.

Asia-Pacific

Shell is reported to have acquired the LPG business of Pakistan's state-owned Sui Northern Gas Pipeline for \$2.29mn.

Latin America

Shell is reported to be buying Sunoco's 77,000 bld oil refinery at Yabucoa in Puerto Rico for an undisclosed sum.

Foster Wheeler's Fired Heater Division has secured a multi-million dollar contract from Grupo Alvica – a joint venture between Fluor Daniel and Inelectra – for the supply of two delayed coker furnaces to the Petrolero Amerivan Hamaca crude upgrader project in Venezuela.

NEVSwnstream

BP unveils road-to-rail oil programme

BP has introduced a new oil tanker train service from Grangemouth to Fort William. The service – managed by rail freight operator EWS, running two trains a week over the next year – will take 11,000 tonnes of fuel from BP's refinery on the Firth of Forth to an oil distribution depot on the west coast. The transfer from road to rail will save 400 lorry trips across the Scottish Highlands annually, states the company, the equivalent of more than 93,000 lorry transit miles.

Additional road-to-rail transfers are planned. Oil trains from Grangemouth to Lairg are to be introduced in November, with services to Dumfries and Kilmarnock following in April 2002. Finally, Grangemouth-manufactured aviation fuel will be despatched by rail to a brand new depot at Aberdeen Airport, due to be completed by the end of 2002.

BP's renewed commitment to rail has been made possible following a £10mn Freight Facilities Grant from the Scottish Executive. The grant covers upgrading of the Grangemouth refinery's train loading gantries and upgrading at the Fort William, Lairg, Dumfries and Kilmarnock depots plus construction of the new airport depot. Also covered by the grant are improvements to BP's railcar fleet, including the fitting of self-sealing valve couplings to eliminate the risk of spillage whilst offloading.

When all the new services are in place, more than 112,000 t/y of oil products will have transferred from roads to rail, reports BP. This will remove more than 3,000 lorry movements a year from Scotland's lorry transit roads.

Hat-trick of deals for Phillips' refining process

Phillips Petroleum has signed a licensing agreement with a Houston-based refinery for the use of the company's S Zorb Sulfur Removal Technology (SRT) for gasoline. The refinery has a crude oil processing capacity of more than 200,000 b/d. The licensing agreement allows for the processing of in excess of 50,000 b/d of gasoline blendstocks into very low sulfur fuels.

This latest agreement is the third major licence of the SRT for gasoline. Marathon Ashland Petroleum signed the first in 2000 to use SRT at any of its seven US refineries with a total combined crude oil processing capacity of 935,000 b/d. Crown Central Petroleum has also licensed the technology for use at its two Texas refineries with a combined crude oil processing capacity of 152,000 b/d.

The SRT process was developed to help companies comply with the EPA's Tier II sulfur regulatory levels. Beginning in 2004, gasoline sold in the US will have sulfur content phased down to a level no higher than 30 ppm on average. The current average is 340 ppm. A 6,000 b/d S Zorb SRT plant at Phillips' Borger refinery is reported to have demonstrated the process's ability to reduce gasoline sulfur content to levels below 10 ppm.

Visit the IP website @ www.petroleum.co.uk

UK Deliveries into Consumption (tonnes)

Products	†Aug 2000	Aug 2001	tJan-Aug 2000	Jan-Aug 2001	% Change
Naphtha/LDF	157,468	188,296	1,443,098	1,188,947	-18
ATF – Kerosene	986,505	1,073,028	6,716,329	7,440,461	11
Petrol	1,815,198	1,781,904	13,957,861	13,824,404	-1
of which unleaded	1,682,304	1,697,934	12,835,448	12,608,548	-2
of which Super unleaded	34,370	31,168	265,670	281,991	6
of which Premium unleaded	1,647,934	553,154	12,569,778	6,077,533	-52
ULSP (ultra low sulfur petrol)	100 C	1,113,612		6,688,599	-
Lead Replacement Petrol (LRP)	132,894	83,970	1,122,413	706,396	-37
Burning Oil	218,324	213,175	2,390,874	2,626,098	10
Automotive Diesel	1,295,368	1,344,658	10,221,685	10,664,341	4.3
Gas/Diesel Oil	556,453	480,160	4,582,367	4,133,423	-10
Fuel Oil	110,975	104,004	1,024,118	1,272,928	24
Lubricating Oil	65,005	72,807	538,613	568,313	6
Other Products	701,326	624,839	5,479,753	5,387,151	-2
Total above	5,906,622	5,882,871	46,354,698	47,106,066	2
Refinery Consumption	470,555	533,064	3,505,598	3,060,190	-13
Total all products	6,377,177	6,415,935	49,860,296	50,166,256	1
† Revised with adjustments			All figures provided by the	UK Department of Trade a	nd Industry (DTI)

NEVSwnstream

ExxonMobil and climate change – the facts

In the September issue (p10) *Petroleum Review* interviewed the coordinators of the 'StopEsso' campaign. This month *Gordon Sawyer*, Manager UK Public Affairs, ExxonMobil, has provided a clear statement of the company's approach to climate change concerns.

'Never let the facts get in the way of a good story' – that seems to be Greenpeace's philosophy in the quest for support for the 'StopEsso' campaign. Conceived in the wake of President Bush's announcement on Kyoto in March, StopEsso is, at best, intellectually dishonest, at worst, plain vindictive.

The StopEsso campaign is based on the premise that ExxonMobil is environmentally irresponsible, denies climate change and caused President Bush to reject Kyoto. Wrong! Let's look at the facts.

ExxonMobil's commitment to excellence in environmental performance is clear in our words and our actions. Our performance is among the best in our industry and we are dedicated to continuous improvement. The company's **Operations Integrity Management** Systems (OIMS), introduced in the early 1990s, was re-attested in July this year to meet the requirements of ISO 14001 worldwide. Lloyds Register Quality Assurance, who conducted the assessment said: 'We believe ExxonMobil to be among the industry leaders in the extent to which environmental management considerations have been integrated into its ongoing business processes.' In the UK, our leadership over the years in widening availability of cleaner fuels to customers will be recognised by many readers of Petroleum Review.

With similar commitment we speak our mind in an honest, open and constructive way on environmental policy issues – climate change is no exception.

Like everyone else in our industry, we take the issue of climate change seriously. Responsible action is needed. We know enough about the science to tell us that, but to ignore the acknowledged uncertainties – clearly brought out in the recent US National Academy of Science's review of the IPCC scientific reports – is intellectually dishonest, misleading and will do good policy making no service.

Whilst ExxonMobil supports international action, we – along with many others, largely outside Europe – have expressed concerns at the costs and impracticalities of the Kyoto Protocol and its limited impact on global emissions. We have argued for a different, and we think a better, approach that encourages economic near-term reductions in greenhouse gas emissions; promotes carbon storage (recently addressed in Bonn); supports new technologies to offer meaningful future options; and that undertakes to better understand climate systems. We believe such an approach could be developed under the United Nations Framework Convention on Climate Change (UNFCCC) which all nations have endorsed. We deplore the charge that expressing a legitimate view equates to 'derailing international action'.

The UK is one of the few countries expected to meet its Kyoto targets without much economic pain. The targets for many countries are not attainable without significant economic cost. Many in the US, for example, including politicians, industry, commerce, farmers, trade unions, have shared that view since 1997. This may also be true of the more ambitious domestic targets being undertaken by the UK Government.

Greenpeace's claim that donations from ExxonMobil to the Bush election campaign influenced administration policy on Kyoto is just nonsense and plays on the lack of understanding by many outside the US of that country's political processes. ExxonMobil did not even contribute to the \$194mn Bush election campaign (our employees donated \$5,285) and despite being the largest company in the US, our total political contribution in 1999-2000 was not even sufficient for the company to rank among the top 150 contributors to the \$1.6bn donated from all sources to all parties and candidates.

But whatever one's view on Kyoto – and governments in the end will determine future strategy – action is needed.

Everyone in our industry is clear that continued growth in oil and gas production is vital in the next few decades if global aspirations for economic growth are to be met. At ExxonMobil our priority is to respond to that need, but to do so responsibly. We have always tried to be the most efficient competitor and that's why we're one of the industry leaders on energy efficiency throughout our operations. We have redoubled our efforts with the launch of our Global Energy Management System in 1998. A rededication on energy efficiency by individuals, by companies, by everyone makes sense - it saves money, makes wise use of resources and reduces CO₂ emissions. But that's not enough. We've got to get smarter in the longer term through a commitment to technology step-outs that make economic sense as well as delivering significant energy savAfrica AES is reported to have stated that it has completed \$250mn in financing from the International Development Association and the European Investment Bank for the Songo Songo gas-to-electricity project in Tanzania. The project includes the construction of 70,000 cf/d processing facilities, pipelines from Songo Songo Island to the capital city Dar es Salaam, and the conversion of the existing 112 MW Ubungo power plant to gas. Songo Songo field reserves are put at between 600bn cf and 1tn cf of gas.

In Brief

Bechtel of the US is reported to have secured the front-end engineering and design contract for the liquefaction plant, storage tanks and marine facilities to be developed under the \$900mn Egyptian LNG export project proposed by BG Group, Edison International and the Egyptian General Petroleum Corporation. The plant will be located a Idku, 50 km east of Alexandria and is slated to be commissioned in 2005.

Commercial operation is expected to

start in October 2003.

ings. ExxonMobil's commitment to inhouse R&D is a core strategy.

Indeed, that is why we enthusiastically accepted the opportunity to sponsor this year's IP Award for Innovation. Energy efficiency features strongly in much of our technology work. None more so than in our research into cleaner fuels/cleaner engines for road vehicles. Our partnership with General Motors is a case in point. Fuel cells represent a promising technology, but cracking the problem of how to make the hydrogen feed is the tough nut. ExxonMobil is working with its partner to develop the world's first onboard petrol reformer to produce hydrogen. General Motors showed it in their S-10 pick-up truck at last month's Fuel Cell Conference in London; road tests start next year.

We all have a part to play in responding to the challenge of climate change and we at ExxonMobil intend to play our part in a manner that builds on our strengths in technology, responsible environmental management and a commitment to honest debate. We deplore Greenpeace's efforts to smear Esso's name in an effort to undermine that intent.



<u>AH, THE THRILL OF YET ANOTHER</u> TERRITORY TO EXPLORE.

(AND OTHER BENEFITS OF OIL & GAS E-BUSINESS.)

Some thought the pioneering days of the oil & gas industry were over. Just then, along came the internet. And with it, one of the most promising claims ever: Perfectly streamlined collaboration all along your extended supply chain, upstream and downstream, from source to service station. Distilled from one of the most comprehensive and powerful e-business solutions, mySAPTM Oil & Gas offers you everything you need to scoop out the full potential of this unique find: One integrated platform from exploration to production, from E-Procurement to Customer Relationship Management, tailored to the specific needs of your industry. Our Education services and tools will help you quickly acquire and develop SAP knowledge, improve the quality of implementation and optimise your return on investment. Time to go exploring again: www.sap.com/oilgas or call 020 8917 6224 quoting reference G3.



Asia-Pacific overview

Gas driving Asia-Pacific developments

In the first of a two-part review,* *Kim Jackson* looks at recent oil and gas developments in the Asia-Pacific, one of the fastest growing energy markets in the world. Much E&P attention continues to focus on gas – which is rapidly becoming the fuel of choice for power generation in the region

Above: The Belida field is one of the original developments in the Conoco-operated Block B in Indonesia's West Natuna Sea.

The Asia-Pacific is an important region for exploration and production in the world market – particularly for countries seeking to reduce their reliance on energy supply from Opec countries. (Indonesia is the only country in this region currently a member of Opec.) Many of the Asia-Pacific countries have, or are in the process of changing their fiscal and regulatory regimes in a bid to attract foreign operators, while a number of pipeline projects are planned to improve and expand the supply infrastructure in the region (see p28).

There is also a strengthening trend for the larger multinational companies to focus on gas exploration - to meet increasing demand for what is fast becoming the fuel of choice for power generation in the region - leaving the way clear for smaller and mediumsized niche players to recover oil from fields now past their peak and entering decline. Continued technological development has helped drive this trend to more effective exploitation of mature assets, with new technologies available to optimise production, including the use of underbalanced drilling (see p24), acidisation and downhole mini-fracturing.

The region is currently experiencing some repercussions from the terrorist

attacks on the World Trade Centre in New York and Washington's Pentagon on 11 September. Pakistan – which neighbours Afghanistan, the target of recent strategic US bombing attacks – has been particularly hard hit, with the resulting political instability leading to the postponement of its upstream oil and gas privatisation programme, as well as the privatisation of marketing and refining group Pakistan State Oil and the sale of 95% of the Oil and Gas Development Corporation.

India, which imports 70% of its crude requirements, has been prompted to assess a proposal for establishing strategic reserves of crude oil and petroleum products. Although the country already has two months' inventories of oil and products, it has yet to implement a plan to create a strategic reserve such as that in the US. Both India and Pakistan are also reported to have stepped up security at oil and gas producing installations. Japan too is reported to be looking to increase its domestic oil stocks following the terrorist attacks.

Bangladesh

Earlier this year, Tullow Oil signed a production sharing contract (PSC) for block 9 as part of Bangladesh's second petroleum licensing round. Tullow will act as operator, with a 30% stake. Partners include Chevron (30%), Texaco (30%) and Bangladesh Petroleum Exploration and Production (Bapex) (10%). In the event of any commercial discovery, the operatorship of any development will fall to Chevron. To date, six significant oil fields – including Bakhrabad – have been found in the block, the existing infrastructure providing for the fast-track development of any new discovery.

Shell (45%), Cairn (45%) and Bapex (10%) signed in July 2001 PSCs covering blocks 5 and 10. A 6,500 sq km aerial magnetic survey is planned over block 5, but will have no detrimental environmental impact on the Sundarbans reserved forest.

Now that a new government is in power, the proposed Bangladesh–India pipeline may be put back on the agenda. Bangladesh has significant domestic gas reserves, but a small local market. Although it makes economic sense to export the gas to India which has an ever-growing energy demand, the Bangladeshi's have seen their reserves as a 'birthright' and so far have been reluctant to go down the export route.

Brunei

Brunei is a mature oil and gas province and is a significant oil and LNG exporter in the Asia-Pacific region. Levels of exploration drilling have declined in recent years, and no major discoveries having been made, but liquids production has increased with the continued success of Brunei Shell Petroleum's (BSP) liquids output optimisation programme and the coming onstream of TotalFinaElf's Maharaja Lela Jamajulalem field in offshore block B in early 1999.

BSP also embarked last year on a \$290mn rationalisation project to extend the production life of its Ampa and Fairley fields. The project included the construction of a new onshore gas compression plant at the Lumut LNG facility, the installation of new offshore pipelines and modifications to existing platforms. Production from the Lumut LNG plant in 2000 rose to 6.7mn tonnes of LNG, with the supply of an additional 14 'B' class cargoes to Japan. Brunei LNG is also planning to participate in the LNG spot sales market from 2002, which will lead to increased sales of LNG.

According to Wood Mackenzie, Brunei has proven and probable liquids reserves of 1.4bn barrels (as of 1 January 2001), produced 206,000 b/d of liquids in 2000, and has an estimated liquids reserves production ratio of 18 years. Gas reserves are put at 9.9tn cf, with production reaching 1.2bn cf/d in 2000. It has some 24 years of gas reserves production currently in place.

A new deepwater licensing round was launched at the end of 2000, with awards expected at the end of this year/early 2002. Interested players are understood to include Shell, TotalFinaElf and Unocal. Keen to encourage more western entrants to the market, the Government of Brunei has over the past few years relaxed its energy resource conservation policy.

Future projects include BSP's Egret oil and gas field, due onstream in 2003. Field reserves are put at 500bn cf of gas and 50mn barrels of crude. Egret gas is expected to be sold to Brunei LNG, which is reported to be planning to expand production from 6.7mn t/y with the installation of a new 4mn t/y train at its Lumut LNG facility by 2008. Other projects in the offing are the Mampak oil and gas, and Merpati gas discoveries.

Cambodia

Oil and gas exploration and development activity in Cambodia remains quiet, with the ongoing boundary dispute between Thailand and Cambodia continuing to hamper interest in the region. However, the signing of a Memorandum of Understanding by Thailand and Cambodia in June 2001, addressing the hydrocarbon potential in the area currently under dispute, may open acreage for exploration in a region considered highly prospective.

Woodside Petroleum completed its 18,000 sq km geological and geophysical study over blocks 1, 2, 3, 4 and 7 in the Gulf of Thailand in mid-2000.

Licensing activity has been confined to the offshore area and onshore the south of the country. Last year, Harrods Energy signed exploration rights to the onshore Tonle Sap acreage in blocks 11, 12, 13 and 16.

China

See p32.



A view from the Belida field in the West Natuna Sea.

India

Following the global mergers and acquisitions trend, the Indian authorities have been reported to be discussing a proposal to merge four state-owned oil and petrochemical companies – Indian Oil, Oil and Natural Gas Corporation (ONGC), the Gas Authority of India Ltd (GAIL), and Indian Petrochemicals – into a 'mega-corporation.' The new integrated company would have interests ranging from E&P to refining and marketing of oil and petrochemicals. The Indian Government, however, has denied that any such plans are currently being considered.

Discoveries over the past year include 1tn cf of gas reserves by Cairn Energy and ONGC in the Krishna Godavari Basin offshore east India. A new oil and gas bearing structure has also been discovered offshore western India, estimated to hold 36mn tonnes of in-place reserves. ONGC is understood to be planning to bring the field, located near the South Bassien field, onstream within the next three years.

Cairn Energy reports that results from its R-2 appraisal well on block KG-DWN-98-2 offshore eastern India, located 100 metres downdip of the Annapurna gas field, indicate that the field is compartmentalised. Reserves potential has therefore been reduced to between 400bn and 800bn cf of gas. A further three exploration wells are to be drilled on KG-DWN-98-2 as part of Cairn's 2001/2002 drilling programme.

The fast-track development of the Lakshmi gas field in block CB/OS-2 offshore western India is now currently underway, with first production slated for 3Q2002. Two conditional gas sales contracts have been signed by the coventurers for the sale of Lakshmi gas to the industrialised Gujarat market. In addition, the development of the nonassociated (dry gas) satellite gas fields at the Cairn-operated Ravva project are also underway. The development plan envisages 86bn cf of sales gas, commencing in September 2001, reaching a plateau delivery of 332mn cf/d in early 2002.

Other recent developments in the region include BG's reported acquisition of Enron's offshore India oil and gas assets – including its 30% stake in the Tapti gas field and Panna Mukta oil and gas fields – for \$288mn, making it

							From						
То	US	Trinidad & Tobago	Oman	Qatar	UAE	Algeria	Libya	Nigeria	Australia	Brunei	Indo- nesia	Malaysia	Total Imports
Japan	1.65	-	0.08	7.87	6.30		-		9.81	7.71	24.25	14,79	72.46
South Korea Taiwan	1	1	2.15	4.41	0.33	-	12	2	0.07	1.08	8.35	3.29	19.68
Total Exports	s 1.65	3.51	2.47	14.04	6.93	26.32	0.80	5.61	10.11	8.79	35.70	21.03	136.96
Table 1: Asia-P	acific t	rade moveme	ents 2000	- LNG, b	n cm				Sou	rce: BP Stati	stical Revie	ew of World Ene	ergy, June 2001

Asia-Pacific overview

the largest foreign investor in the country's upstream sector. The deal would add 19,000 boe/d to BG's production portfolio, 5% of its total Indian output (of which 60% is gas). The deal is not proceeding smoothly. BG agreed the deal on the understanding that it would assume operatorship of the assets. However, ONGC wishes to take over as operator and proceedings are reported to be currently at a standstill.

BG is also understood to have acquired the Pipavav LNG port venture on the coast of Gujarat, through its purchase of Sea King Infrastructure's 100% equity for \$79.8mn. The Pipavav LNG project was originally planned with a 3.5mn tonne handling capacity; BG is reported to be planning to invest some \$770mn to increase this to 10mn tonnes.

It is not yet known whether concerns over events following the US bombing will effect the planned opening of India's third round of its New Exploration Licensing Policy (NELP) before the close of the 2001 fiscal year, which runs from April to March. (The government approved the award of licenses on 23 out of 25 blocks on offer in its NELP II round in May 2001. Awards comprised eight deepwater, eight shallow water and nine onshore blocks.)

Keen to reduce its reliance on imports, the country is looking to overseas ventures. It was recently reported to have agreed a deal with China under which the two countries will jointly acquire equity in oil and gas projects abroad as well as to undertake E&P in both China and India. In addition, ONGC Videsh (ONGC's overseas operation) is understood to have recently acquired a 20% stake in Russia's Sakhalin-1 field due to come onstream in 2005, as well as a 45% interest in a Vietnamese gas field.

ONGC is also understood to be planning to increase its domestic production by 20% over the next five to seven years. In July 2001 it was reported to have identified for development as many as 107 small oil and gas fields (including 60 offshore projects) in which hydrocarbon reserves are put at between 200mn and 250mn tonnes. Development may be via joint ventures. More recently, the company was reported to have outlined a 'twopronged' strategy to boost production from existing fields using a variety of improved/enhanced oil recovery techniques. A total of 19 projects in 15 fields have so far been identified, of which 13 have been approved and are expected to yield more than 61mn toe over 20 years. The projects include the redevelopment of the Mumbai High, Neelam, Heera and Gandhar fields.

In July 2001, the Indian authorities launched a study to mark and expand the country's sea boundary by an additional 1mn sq km (400,000 sq miles) beyond its existing exclusive economic zone. A seismic survey is being carried out by the National Institute of Oceanography, with a view to staking a claim by 2005 for extended maritime borders on the east and west coast of India. The key is establishing the extent of the Indian Ocean continental shelf from its shoreline.

Indonesia

Indonesia is the world's largest exporter of LNG. It is the only Asia-Pacific country to be a member of Opec and is an

important crude oil source for Japan. However, the country has been reported to be struggling to meet its Opec production quota of 1.3mn b/d - including problems experienced by Caltex resulting from regional disturbances and pilfering onshore Sumatra - and some analysts predict that it may lose its Opec membership within the next decade unless its deepwater drilling programme produces the very significant results hoped for. That said, liquids production is forecast to rise over the next five years with output from Conoco's Timor Sea facilities and anticipated production from ExxonMobil's Banyu Urip field in its TAC (technical assistance contract) onshore East Java which has



Located in the shallow, oil-prone waters of the Cuu Long Basin, block 15-2 includes the large Rang Dong field currently producing around 50,000 b/d of oil.

Country	Oil res (bn b)	Change (99/00)	R/P ratio (years)	Oil prodn (,000 b/d)	Growth 99/00 (%)	Oil consmpt (,000 b/d)	Growth 99/00 (%)	Gas res (tn cm)	Change 99/00	R/P ratio (years)
Australia	2.9	n/c	10.4	815	45.1	870	1.9	1.26	n/c	40.6
Bangladesh	-	-			-	65	3	0.3	n/c	29.1
Brunei	1.4	n/c	19.5	195	6.5	-		0.39	n/c	33.5
China	24	n/c	20.2	3.245	1.3	4,840	9.5	1.37	n/c	49.3
India	4.7	0.1	17.3	785	-0.7	2,070	2.5	0.65	n/c	24.8
Indonesia	5	n/c	9.8	1,430	2.5	1,065	9.1	2.05	n/c	32
lapan	-		-		÷	5,525	-1.5	*	-	-
Malaysia	3.9	n/c	14.1	805	1.2	445	0.8	2.31	n/c	52.3
Myanmar	-	-	-		-	1		*	-	÷
New Zealand	-	-	1.00	-	-	135	0.7	*	-	
Pakistan	-	-			-	385	7.5	0.61	n/c	32.3
Papua New Guinea	0.3	n/c	14	70	-20.2	-		0.22	0.06	**
Philippines	-	-	-	-	-	350	-6.8	*	-	
Singapore		-		-	-	560	2.9	*	-	-
South Korea	-	-	-	-	-	2,200	2.1	*	-	
Taiwan	-	1 m		÷.		815	-0.3	*	-	
Thailand		0.1	-	-	-	715	-3.6	0.33	-0.2	18.7
Vietnam	0.6	n/c	5.2	320	11			0.19	n/c	**
Othera	1.2	n/c	16.7	305	0.1	625	8.7	0.65	n/c	54.2
Total Asia-Pacific (A	-P) 44	n/c	15.6	7,970	4.9	20,665	2.9	10.33	0.05	38.9
Total World	1,046.4	12.4	39.9	74,510	4	73,905	1.0	150.19	3.76	61.0
A-P as % of World	4.20	-	-	10.70		27.96	-	6.88		

Table 2: Asia-Pacific production, consumption and refinery capacity, 1999–2000 Source: BP Statistical Review 2000, interpreted by Petroleum Review; *Totals for countries not individually itemised; *included in 'other Asia-Pacific'; ** over 100 years

16

reserves in excess of 250mn barrels.

The Banyu Urip find in particular has excited the Indonesian oil fraternity as it is a new play in a well explored province and indicates the potential for more discoveries along its trend. It is due onstream in 2003, with forecast production of 100,000 b/d.

Gulf Indonesia has also had considerable success during 2000/1H2001 offshore East Java on its Ketapang PSC. Significant discoveries include Bukit Tua and Jenggolo. An appraisal programme is planned with possible development in 2003/2004.

Some operators have also embarked on enhanced oil recovery projects in a bid to boost production and prolong life of field. Such programmes include Caltex's steam injection project at the Duri heavy oil field.

The Indonesian authorities have commenced a liberalisation programme aimed at ending Pertamina's monopoly and to encourage foreign operators to the country. Plans include the eventual abolition of domestic subsidies and the freeing of foreign companies from many regulatory approval requirements that, in the past, have been blamed for hindering the efficiency of oil and gas exploration and development programmes.

A total of 17 offshore blocks are reported to remain available under Indonesia's latest licensing round in September 2001, development contracts having already been signed for six of the original 23 blocks on offer. The awards made to date include the award of the Bawean block in east Java to BP, the Nila block in the Natuna Sea to Conoco, and the Tanjung Aru block in the Makassar Strait to Amerada Hess, while Zodan and Zudavi of Malaysia are understood to have secured the Makassar Strait's Popodi and Papalang blocks, respectively. The government is reported to be hoping to secure \$250mn investment for each of the remaining 17 blocks.

country is Conoco, active for the past 33 years. The company recently doubled its Southeast Asia proved reserves and more than tripled its 2000's total net production from the region with its acquisition of Gulf Canada and its majority interest in Gulf Indonesia Resources. The com-

One major foreign operator in the

Gas use continues to soar

or the Asia-Pacific region as a whole, gas consumption growth for 1999–2000, at 7.4%, was two and a half times the region's oil demand growth of 2.9%. Unlike previous years, oil production growth at 4.9% was well ahead of regional demand and world growth, but still only accounts for a little over onethird of regional oil consumption. In contrast, regional gas production accounted for 92%. However, regional gas production growth at 4.9% was rather below the consumption growth of 7.4%.

Regional refinery throughputs have increased by 6% in 1999–2000, although regional refinery capacity was effectively unchanged.

For oil, notable production growth was seen in Australia – although reserves cover remains limited with a reserves/production (R/P) of 10.4 years. Other countries with limited reserves are Indonesia, with an R/P of 9.8 years, and Vietnam, with one of just 5.2 years. In the case of Australia and Indonesia the low R/Ps probably do represent a threat to future production levels. However, Vietnam's very low R/P probably reflects the fact that recent discoveries have not been fully evaluated and so are not included in the total. In general, however, the region is characterised by limited reserves, with the region having an R/P ration of 15.6 years compared with a world average of 39.9.

The Asia-Pacific has just 4.2% of global oil reserves and accounts for 10.7% of global production, but accounts for 27.9% of global oil consumption. Clearly, the region is going to become increasingly dependent on the Middle East for its oil supplies.

For gas, the position is very much healthier. The region accounts for just under 7% of global reserves, around 11% of production and 12% of consumption. It is notable, however, that R/P ratios for gas reserves throughout the region are below the global average. This may well reflect the fact that significant recent discoveries have not been fully appraised.

In contrast to oil and gas, regional refining capacity, at 25.4% of the global total, is closely aligned with regional refinery throughput that accounted for 26% of the global total in 2000.

Country	Gas prodn (bn cm)	Growth 99/00 (%)	Gas consmpt (bn cm)	Growth 99/00 (%)	Refinery cap (,000 b/d)	Growth 99/00 (%)	Refinery t'pt (,000 b/d)	Growth 99/00 (%)
Australia	31.1	1.8	21.3	7.5	920	1.9	880	1.8
Bangladesh	10.3	24.7	10.3	24.7	-	-	1.1	-
Brunei	11.6	3.8	-		-	-	-	-
China	27.7	14.1	24.8	16	5.425	0.5	4.220	-3
India	26.1	4.7	25.0	5.2	2.220	1.3		-
Indonesia	63.9	-4.4	27.8	0.8	930	0	-	-
Japan		-	76.2	2.2	5,030	-1.6	4.145	-1.5
Malaysia	44.2	7.6	21.7	14		12		
Myanmar	-	-	_	-		-	-	-
New Zealand	-	-	5.4	4.6	-	-	-	-
Papua New Guinea	-	-		-	-	-		_
Pakistan	19.0	9.5	19	9.5	-		-	-
Philippines	-	-	0.1	50.0	-	-	-	-
Singapore	-	-	1.5	0	1.255	0	1.2	-
South Korea	-	-	21.0	12.3	2.315	0.7	14	-
Taiwan	-	-	6.9	10.6		-	-	-
Thailand	17.8	5.2	20.9	20.5	-		-	-
Vietnam	-	-	-	_	-	-		-
Othera	13.7	17.5	7.4	1.4	2,745	-	8.840	6.0
Total Asia-Pacific (A	-P) 265.4	4.9	289.3	7.8	20,840	-0.1	18.085	9.9
Total World	2,422.3	4.3	2,404.6	4.8	81,975	0.4	69.510	2.0
A-P as % of world	10.96	-	12.03	-	25.42	1961	26.02	0

Asia-Pacific production, consumption and refinery capacity

Asia-Pacific overview

pany reports that it is currently 'moving aggressively' to develop the natural resources needed to fulfill its long-term natural gas sales agreements with Singapore and Malaysia under which it is committed to the delivery of nearly 2.5tn cf of gas from its block B in the West Natuna Sea over the next 20 years. (See p26 for more information on Natuna Sea developments.)

The 180mn barrel West Seno oil field, being developed by the operator Unocal via a mini tension leg platform (TLP) and floating production unit (FPU), is due onstream in 2003. South Korea's Hyundai Heavy Industries recently secured a \$265mn contract to supply the 12,000-tonne FPU and 6,000-tonne TLP. Clough Engineering of Australia was awarded the \$80mn contract for two 62-km pipelines to take field oil and gas to the Santan onshore terminal on Kalimantan. The 52mn barrel Merah Besah field is to be developed as a satellite field to West Seno in 2004.

The other development prospects include the Ujung Pangkah gas field with recently confirmed recoverable reserves of over 450bn cf. A significant oil accumulation has also been detected underlying the Ujung Pangkah gas. The Pangkah PSC partners, including Amerda Hess and Dana Petroleum, are planning to soon submit an application for the joint development of Ujung Pangkah fields and nearby Sidayu oil field, with first production targetted in 2002.

Conoco's \$1.6bn Belanak offshore oil and gas project is expected to serve as a central gathering hub for at least six other nearby fields that are forecast to produce 1.4tn cf of gas and 150mn barrels of oil, condenate and LPG through the Belanak facilities. First production via its FPSO is expected in 2004.

Recent discoveries include Unocal's Ranggas discovery offshore eastern Kalimantan, reported to hold potential oil and gas reserves between 190mn and 650mn boe.

Mitsubishi of Japan has recently

acquired for \$480mn a 16.3% stake in Indonesia's Tangguh LNG project on Irian Jaya, making it the second largest partner after BP which holds a 40% interest. The project, which is due to come onstream in 2006, is reported to be the largest LNG facility in the world with an annual production of between 7mn and 10mn tonnes. LNG produced will be exported to Japan, South Korea and China, as well as elsewhere. Feedstock gas would be sourced from BP's nearby Wiriagar and Muturi fields that hold 14tn cf of reserves.

Japan

Japan has virtually no indigenous oil and gas resources and is heavily reliant on imports to meet almost all its energy needs. In 2000 its primary energy consumption stood at 505.3mn toe. Despite major efforts to reduce the country's dependence on crude oil, 51.4% of the country's energy requirements was met by crude oil in 2000. Coal accounted for a further 18.6%, nuclear power 13.0%, natural gas 13.2% and hydroelectricity 3.6%.

Japan has continued to diversify its energy balance in recent years, with LNG imports having increased significantly. However, plans to further expand nuclear production may not be welcomed by the general public following the country's serious nuclear accident in September 1999 when high levels of radiation leaked from a uranium processing plant near Tokyo.

Japan National Oil Corporation (JNOC) assists Japanese oil companies in various oil and gas exploration projects around the world in a bid to help increase the level of Japanese produced crude oil imports. In the fiscal year 2000, 579,000 b/d of imported crude was produced by Japanese companies, accounting for 13.2% of total crude imports.

JNOC had assisted around 300 companies by end-March 2001, at which



Rang Dong field, Vietnam

time 74 of the companies were still actively involved in the oil and gas sector. Of these 74 companies, 46 were producing, or about to produce, crude oil and natural gas in over 30 countries, while 29 were conducting oil and gas exploration and development work. **Table 3** summarises those E&P projects in which Japanese companies became involved in 2000/2001.

Not surprisingly, E&P attention has focused on Asia region to date, with 38% of JNOC-assisted companies (28) working on projects located in this region in March 2001. A further 14% of companies (10) were working on projects in Oceania and 11% (eight) in the Middle East. JNOC was also involved in nine projects in North and South America, six in Europe, four in China, seven in Africa and five in the FSU.

It has been reported that under the latest Japanese Government plans JNOC is to be wound up. At the time of writing there were no details of how this would be achieved or whether the assets would be sold or vested in a new body.

Malaysia

With an upstream sector dominated by a small number of major players, particularly national state oil company Petronas, and a lack of available prospective exploration acreage, it would appear that opportunities for foreign players in the Malaysian upstream sector are limited. However, recent exploration success coupled with moves by Petronas to contract significant gas volumes to the Peninsular Malaysian gas market, show that the country's oil and gas sector is far from stagnant.

The country is becoming an increasingly important gas producer and LNG exporter. When the third LNG train at Bintulu is completed in 2003 Malaysia will become the world's largest LNG facility with a capacity of 23mn t/y. Total gas production in 2000 was 4,274mn c/d. The country has proven reserves of 3.9mn barrels of oil and in recent years has managed to sustain production of 700,000 b/d despite a profile of falling reserves. Half of its oil production is exported.

Alongside an upturn in exploration drilling in Malaysia, as new entrants begin to fulfill their contract exploration drilling commitments, there has been an upturn in exploration success with a number of new discoveries made. In 1Q2001, discoveries offshore Sarawak include Murphy Oil's West Patricia-2, SK309 PSC, that flowed over 2,900 b/d of oil and 25mnn cf/d of gas, and Carigali's F38-1 which tested over 50mn cf/d of gas. Offshore Peninsular Malaysia, Amerada Hess made an oil discovery with Cendor-1 on the PM304 PSC, testing over 2,800 b/d of oil. More recently, Lundin Oil was successful with East Bunga Raya on the PM3 PSC that flowed 5,500 b/d of oil.

However, despite the increasing success of Malaysian exploration on a boe/wildcat basis, Wood Mackenzie notes that the majority of discoveries are relatively small on an international scale, with most of the new discoveries estimated to be smaller than 50mn boe on a proven plus probable basis.

Some prospective unlicensed acreage remains, albeit limited, and there are potential farm-in opportunities available to encourage foreign players to become involved in the exploration and development of smaller, more marginal fields. Deepwater Malaysia is also offering potential opportunities. Exploration activity in the deep waters offshore Sabah and Sarawak has historically been limited and the recent upturn in exploration has not been reflected in an increase in deepwater activity as yet. With the abundance of gas reserves in shallow water Sarawak there is little incentive to explore for further gas reserves with inherently low commercial value in deepwater areas, comments Wood Mackenzie. The high costs of deepwater exploration and Malaysian deepwater terms that remain relatively unattractive on an international basis have also precluded significant deepwater activity.

The only deepwater discovery of significance to date is Shell's Kamunsu East field in block G offshore Sabah that is reported to contain 'significant' oil reserves. Following the discovery, Conoco re-entered the Malaysian market, farming in to Shell's block G and J with a commitment to drill four exploration wells. Murphy Oil holds interests in the adjacent blocks H and K and plans an exploration programme in 2002. Further deepwater potential lies in the Sarawak block B, recently relinquished by ExxonMobil.

Aside from opportunities presented for marginal field development and deepwater exploration, the focus for a number of players within the Malaysian sector and surrounding countries, in particular Indonesia, is the Malaysian gas market – both in the form of the domestic market supply and LNG supply projects.

Future projects include ExxonMobil's Larut satellite and Angsi field, the latter with reserves of 1,000 bn cf of gas and 95mn barrels of oil, which is due onstream in 2002. Nippon Oil Exploration's Helang gas field is due onsteam 4Q2003 and has reserves put at 1,200 bn cf of gas. The Shell-operated Jitan field (2,800 bn cf) is also due onstream in 2003. Both Helang and Jitan will supply the MLNG Tiga plant, which is also to be supplied by the SK8 and SK10 PSCs (with 7tn cf of proven plus probable reserves) that are currently progressing with production start-up scheduled for 2003.

Looking downstream, the 120,000 b/d Melaka refinery (see front cover photo) is the anchor for Conoco's refining and marketing operations in the Asia-Pacific, helping to position the company's retail marketing operations for profitable growth as regional demand increases. Claimed to be the first foreign company allowed to invest in Malaysia's retail petroleum industry in over 30 years, the company launched the ProJET brand earlier this year as part of a joint venture with leading Malaysian conglomerate Sime Darby. Combining service stations with 24-hour convenience store operations. ProJET currently operates 12 retail sites in the Kuala Lumpur area, with a total of 20 sites expected to be in operation before the close of 2001.

Malaysia/Thailand Joint Development Area (JDA)

In October 1999, Petronas and PTT of Thailand signed a landmark agreement that paved the way for first production from the JDA. The two jointly contracted to take around 2.9tn cf of gas from block A-18, on a 50:50 basis with production slated to begin in 2003 and forecast to plateau at 390mn cf/d.

Petronas will be responsible for the preliminary stage of the gas sales agreement, with the gas initially exported to Malaysia. PTT of Thailand will take its 50% share of the JDA gas reserves at a later date. The contract includes a take-or-pay provision specifying that the buyer must take at least 90% of the daily contract quantity. According to Wood Mackenzie, the deal was significant in that the agreed gas sales price of JDA gas will be significantly higher than that of gas currently supplied from offshore Malaysia.

In April 2001, the Thai Prime Minister, Thaksin Shinawatra, stated that the government was to go ahead with plans for a joint gas pipeline project with Malaysia in southern Thailand, despite objections from local residents. He did comment, however, that environmental impact assessment approval was still needed. The agreement between Petronas of Malaysia and the PTT was signed in 1999 to build a \$789mn pipeline to carry gas from the offshore JDA in southern Thailand. Petronas had promised to deliver gas by July 2002; work was supposed to have begun in March 2001 but was delayed due to the environmental report. Gas is not expected to transit the pipeline until 2003 at the earliest, even if work on the pipeline commences soon.

More recently, Amerada Hess added the JDA to its Asia-Pacific portfolio with its acquisition of Triton Energy in August 2001.

Myanmar

Licensing activity in Myanmar has picked up over the past 18 months. Awards include three contracts signed between TG World Energy and MOGE covering blocks RSF-2, RSF-3 and IOR-3. Prime Resource Management Cyprus of Canada signed EP4, covering an area in the western Prome region.

Liquids production in 2000 was boosted to 13,000 b/d by the coming onstream of the Yetagun gas/condensate field in the Andaman Sea. Premier Oil recently awarded a \$30mn EPC contract to Kvaerner Oil & Gas to upgrade the Yetagun platform that will enable it to supply 300mn cf/d of gas from

Country/Region	Japanese company (% interest)	Area	Licensees (% interest)
2001			
Brazil	Japex Brasil (20%)	Campos Basin, offshore block BC-9	Petrobras (35%), Unocal (35%), Repsol (10%)
Australia	IB Resources Pty Ltd (33.33%)	North West Continental Shelf, block WA-292-P	Agip (33.33%), OMV (33.33%)
2000			
Brazil	Inpex Offshore North Campos (12.75%)	Campos Basin, offshore Frade block, block BC-4	Texaco (42.5%), Petrobras (42.5%), Odebrecht (2.25%)
Algeria	Japan Ohanet Oil & Gas Co. Ltd (30%)	Ohanet gas field	BHP (60%), Petrofac (10%)

Asia-Pacific overview

October 2002 as part of the project's Phase 2 development.

Total 2000 gas sales for the year reached 330mn cf/d.

Pakistan

Pakistan neighbours Afghanistan, the target of recent strategic US bombing campaigns in response to the terrorist attacks on the World Trade Centre and Pentagon in September. The resulting political instability has led to the postponement of its upstream oil and gas privatisation programme, in which nine producing oil and gas holdings were put on offer to international and domestic companies in phase one of the programme. Assets include the government's 40% interest in the Badin oil and gas field, six fields in the northern Potwar Basin, and a number of gas assets in southern Pakistan.

The Pakistani authorities have also postponed the privatisation of marketing and refining group Pakistan State Oil (PSO) and the sale of 95% of the Oil and Gas Development Corporation.

In addition, the mooted Iran–India pipeline, planned to carry production from Iran's South Pars field to India's HPJ pipeline network, is unlikely to go ahead under the current politically unstable climate. The pipeline was to have passed through the Balchistan Province in Pakistan, close to the Afghanistan border.

Earlier in the year, the Pakistan Government unveiled a package of new incentives aimed at encouraging exploration and development onshore Pakistan and reducing the country's dependence on imported oil. The focus is on gas – over the past five years some 6tn of gas reserves have been discovered in the country. Under the new policy, gas producers will be able to directly enter into agreements with gas distributors, power plants and industrial consumers. In addition, the income tax rate for oil and gas companies has been reduced from 50% to 40%, and the term for exploration licences extended from two to five years.

More recently PSO is reported to have announced plans to invest \$15.62mn in the White Oil Pipeline linking Karachi to Mehmoodkot. The company holds a 12% stake in the \$480mn project through its equity in Pak-Arab Pipeline Company (PAPCO). The underground pipeline will be capable of carrying 12mn t/y of products, primarily diesel.

Future E&P projects include the fullscale development of the 1tn cf Lasmooperated Bhit gas field. The first phase of development is expected to cost \$260mn, with first gas slated for end-2002, building to a plateau production rate of 235mn cf/d by early 2003. A gas sales agreement was signed in early 2001 with the Sui Southern Gas Company. The Sawan field is due onstream in 1H2003, with reserves put at 2tn cf of gas. Phase one development is expected to produce 170mn cf/d; phase two, involving the development of additional infrastructure, will add a further 170mn cf of production.

Papua New Guinea

Development of Papua New Guinea's (PNG) huge gas reserves will take off with the commissioning of a gas export pipeline between PNG and Queensland, Australia, in 2004. Itochu Corporation of Japan was recently reported to have announced plans to form a \$3.5bn, 50:50 gas joint venture with the PNG Government that will hold equity in a project intended to produce 500,000 tonnes of LPG from ExxonMobil's Hides field as part of the PNG-Australia gas project.

Looking downstream, earlier this year Interoil and Shell agreed a strategic alliance under which Interoil will acquire Shell's retail and distribution assets in PNG for \$18mn. Shell will take a 9% in Interoil, which will lease the assets back to the oil company who will remain operator. Shell is also to purchase 100% of its domestic PNG refined products from the Interoil refinery.

Philippines

Fuel oil currently acts as the feedstock for 38% of power generation in the Philippines. However, as is being seen across the Asia-Pacific region, future attention is expected to increasingly focus on gas. Driving this oil to gas conversion is Shell's Malampaya-Camago project (see *Petroleum Review*, May 2001) offshore Palawan Island, that is to supply more than 20% of the electricity demand of the Philippine's main island – Luzon. The field came onstream as *Petroleum Review* went to press. Commercial gas sales are slated to begin on 1 January 2002.

In August 2001, the Philippines Department of Energy was reported to have indicated that it is to offer 'incentive packages' to both local and foreign companies in a bid to encourage exploration programmes in Palawan.

Singapore

Fuel oil makes up 87% of Singapore's power generation capacity, with gas accounting for just 13%, according to a recent report by Credit Suisse First Boston (CSFB) in Hong Kong. However, analysts predict that the country will rely more heavily on gas in the future as new gas-fired power plants are built and older plants are converted from oil to gas.

South Korea

The South Korean Energy Minister Chang Che-shik was recently reported to have unveiled government plans to reduce the country's dependence on oil from 52.2% in 2000, to 50% by 2010 and 46% by 2020 by expanding its direct overseas E&P activities. The government also plans to import gas from a field in eastern Siberia between 2008 and 2010. (See also *Petroleum Review*, April 2001.)



The first foreign company allowed to invest in Malaysia's retail petroleum industry in over 30 years, Conoco launched its ProJET brand earlier this year as part of a joint venture with leading Malaysian conglomerate, Sime Darby.

Taiwan

Taiwan's energy demand is forecast to grow by an average of 5.8%/y according to recent estimates from the Taiwanese Ministry of Economic Affairs. Indigenous reserves are virtually non-existent, with just over 97% of demand met by imports.

The country's energy policy is expected to increasingly focus on improving the efficiency of energy use and the development of new types of energy. The authorities plan to continue to encourage the construction of gas-fired power generation plants (see *Petroleum Review*, August 2000) and perhaps to expand existing nuclear power facilities.

Thailand

Thailand's 18th licensing round was launched in July 2000. A total of 87 blocks located onshore, in the Gulf of Thailand and the Anadaman Sea were offered. Under the terms of the licensing invitation, unawarded blocks will remain open for the next three years and applications for open blocks will be received each month by the Department of Mineral Resources. Only a limited number of applications have been made to date, possibly because the Thai market is currently oversupplied with gas which meets over 72% of the country's power generation requirements.

In August, US company Unocal brought its Plamuk field onstream – its first oil field in Thailand – at 2,500 b/d through an early production system. The company is understood to have leased the *Sibea* FSO vessel; production is expected to reach 18,000 b/d by 1Q2002 once a new platform has been installed.

Future projects include Chevron's Jarmjuree and Tantawan fields in block B8/32, located close to the producing Benchamas field. Recoverable reserves on the B8/32 concession are in excess of 1tn cf of gas and 200mn barrels of oil. State-owned PTT Exploration and Production's exploration campaign on blocks B14A, B15A and B16A (Arthit field) has also proved successful in 2000/1H2001, with over 3tn cf of gas discoveries made and some production liquids. Development, however, will be determined by the vagaries of the Thai gas market, and is not expected before 2005.

Unocal is also looking at the development of the Yala field in the Pattani Basin. Believed to consist of three accumulations, gas reserves are put at 120bn cf. However, with the Thai



Rang Dong field, block 15-2, Vietnam

market currently oversupplied with gas, the company is reported to be evaluating the possibilities of commercialising the oil leg of the Yala discoveries. The field lies close to Chevron's producing Tantawan field on block B8/32, which currently outputs 10,000 b/d of oil and 85mn cf/d of gas using an FPSO. Development of Unocal's Dara (100bn cf of gas and 3mn barrels of condensate) and West Dara field (150bn cf of gas, 13mn barrels of liquids) in B10/32B also seems unlikely before 2005 due to the domestic gas supply situation.

Importantly, in June 2001 Thailand and Cambodia signed a Memorandum of Understanding which addresses the hydrocarbon potential in the boundary area currently under dispute that may open acreage for exploration in a region considered highly prospective.

Timor Gap Zone of Cooperation (ZOC)

See p26

Vietnam

Vietnam is the fourth largest oil producer in Southeast Asia after China, Indonesia and Malaysia. The country is reported to have exported 8.5mn tonnes of crude in 1H2001, representing a 15% rise in output. Plans are to export a total of 16mn tonnes of oil by the end of the year and 1.65bn cm of gas. Some 85% of Vietnamese crude oil is produced form the Bach Ho (White Tiger) fields, operated by Vietsovpetro.

Gas production from Vietnam is expected slow down over the next couple of year's as output from the Bach Ho fields - the country's sole gas producer - reaches plateau at 150mn cf/d. However, start-up of BP's Lan Tay/Lan Do field, in 2003 at the earliest. is likely to more than double current levels of gas production by the end of the decade. Development of the field will underpin a wider Nam Con Son Basin gas utilisation scheme under which a 400-km pipeline will be built to Phu My, close to Ho Chi Minh City. This will provide sufficient spare capacity to transport gas from other nearby sources

Future projects include the development of Petrovietnam's Black Lion (Su Tu Den) discovery in Cuu Long Basin block 15. Recoverable reserves are in excess of 250mn barrels of oil, with first production targetted for 2004. Part of the field will produce from the basement and it seems likely that it will be brought onstream via an early production scheme in order to gain reservoir experience prior to full field development. Other potential field developments are Kim Long as well as Ca Voi offshore southwest Vietnam. Recoverable gas reserves are put in excess of 1tn cf, although with significant upside forecast by Unocal. PetroVietnam has stated that production is expected in 2005 at a rate of 200mn cf/d. However, ultimate development will depend on the evolution of gas demand in southwest Vietnam which may take a while to materialise.

Recent discoveries include a new offshore oil field, discovered by Petronas of Malaysia with its Topaz North-1X exploration well in blocks 1 and 2. The Topaz North field is located near the Ruby field that is currently producing 23,000 b/d of oil.

Looking downstream, in May 2001, the Vietnamese authorities gave BP the green light to go ahead with the \$359mn, Phu My 3 gas-fired power plant in Ba Ria-Vung Tau Province in the south of the country.

Petroleum Review would like to thank Edinburgh-based consultancy Wood Mackenzie for its help in putting together this review. Thanks also go to Conoco for supplying the photos.

*The December 2001 issue will review the latest E&P developments relating to Australia and New Zealand.

Country/Field	Operator	Oil or gas output	Start-up date	Oil res. (mn b)	Gas res. (bn cf)	(Smn)	system
BANGLADESH	1	and and an	2017		1.05	270	and and
Bibiyana (block 12)	Unocal	gas/cond	2004		2,802	279	onshore
Moulavi Bazar (block 14)	Unocal	gas	2000		150	27	onshore
Semutang	Cairn	gas	2000		333	255	onshore
Sub Total	Unical	gas	200112.	0	3,285	571	
BRUNEI	e33	1			25		and any contains with Decay
Asam Paya*	BSP	oil	2000	50	25	80	onshore, unitise with Rasau
Bugan discovery	BSP	gas			140		
Bungam Foret	BSP	oil/gas	2003	50	500		3 platforms
Mampak	BSP	oil/gas					evaluation
Merpati	BSP	gas					evaluation
Sub Total				100	665	80	Address of the second
CHINA	Davies	oil	2003	60			, floating production system
Bootes	Phillins Petroleum	oil	2003	700			platform
CED 11-1(Bobai bay)	CNOOC/Kerr-McGee	oil	2003	130			floating production system
Changbei (Ordos Basin)	Shell	gas	2004		2,500		onshore
Dongfang1-1	Nanhai West Oil Corp	gas	2001	240	2,000	553	platform
Futai (Shengli area)	Sinopec	oil	2001	160			subsea to Huizbou 26 plat
Huizhou 26-1 N	CACI	oll baroil	2001	500			onshore
Lungu (discovery in Tarim) Mosuowan	PetroChina	gas/oil		150			THEFT
Nanbao 35-2	CNOOC	oil	2004	100			platform
Panyu	Devon	oil		-			FPSO (70kb/d)
Peng Lai 19-3(Bohai)Ph1	Phillips/CNOOC	oil	late 2001	750			FPSO +24 slot platform
Peng Lai 19-3(Bohai)Ph2	Phillips/CNOOC	oil	2004	750	0		Boxi area development
Qikou 17-2	CNOOC/Texaco/BB	oil/gas	2000 Oct-01	200	9	800	FPSO (80 kb/d) + 2 plats
Qinnuangoao 32-6 Shuliga (Ordos basin)	PetroChina	gas	occor	200	17,500		to be the construction of the second
Suizhong 36-1 (Ph 2)	CNOOC	oil	end-2001	337.6		1,300	6 platforms, peak 69kb/d
Ursa	Devon	oil	mid-2002	50			FPSO + platform
Wenchang 13-1, 13-2	CNOOC/Husky Oil	oil	1H2002	100	250	300	platforms and FPSO
Yaha (Xinjiang Province)	PetroChina	gas/cond	Nov-00	250	250	777	onshore farim Basin
Zhao Dong Sub Total	Apache	011	2000	4,323.6	22,259	3,190	plation
INDIA	Sec. 1	1.0	- Cara -			100	
Annapurna	Cairn Energy	gas	2003		600	400	
CB-OS/2 Gulf of Khambat	Cairn Energy	oil/gas	2003		200	90	platform
PY-1	Mosbacher	gas	1999/00		200	00	onshore
Dholasan	UNGC	oil					
Lakshmi	Cairn Energy	oil/gas	3Q2002				2 platforms offshore
North Balol	ONGC	oil/gas					onshore
North Kathana	ONGC	oil					onshore
Kanawara	ONGC	oil					onshore
Sub Total	ONGC	011		0	880	488	- Annalis
INDONESIA	1	0.10	our Li	32.00			11 A 11
Banyu Urip (Cepu block)	ExxonMobil	lio	2003	250+	ACT	210	onshore
BD (Madura)	ExxonMobil	gas/oil	2005+	100	465	310	FPSO (100kb/d)
Belanak (block B)	Conoco	gasion	2002+	100	35		nr Asamera-Duri pipeline
Block A. North Sumatra	Gulf Indonesia	gas	2002		476	240	onshore to fertiliser plt
East Natuna	ExxonMobil	gas	2013		140,000		
Langsa	Matrix Oil	oil	end-2001	33.5			FPSO
Merah Besar	Unocal	oil/gas	2004	52	160		mini TLP to West Seno
Natuna D Alpha	ExxonMobil	gas	2010+	40	46,000	200	nlat joint dev
Nubi/Sisi	Kufper	gas	2001	40	2,700	200	onshore
Pase B	ExxonMobil	gas	2000	80			
Ranggas (off Kalimantan)	Unocal	oil				190-650	evaluation
Sidayu	Amerada Hess	oil	2002		400		aashara
Singa in Sth Sumatra	Amerada Hess	gas	2002		400	500	subsea via Pagerungam
Sirasun/Terang	BP, IN Java Sea	gas	2005+	50	14.400	1.750	onshore, platform
Ujung Pangkah	Amerada Hess	gas/oil	2002		450+	4.54	
West Natuna Gas Project	Conoco/Premier/Gulf	gas	2001	8	2,500	1,100	platform, pipe to Singapor
West Seno	Unocal	oil/gas	2004	250 915.5	180 218,876	4,290-4,7	FPU + TLP 50
KOREA (SOUTH)					A.4.18.24	1.120.00	
KOREA (SOUTH)		as.	lun-02		200-300		
Gorea-V							

and the second s	and a line						
Country/Field	Operator	Oil or gas output	Start-up date	Oil res. (mn b)	Gas res. (bn cf)	Capex (Smn)	Production
MALAYSIA		and the second	1000		(encert	round	system
Angsi/Larut area	ExxonMobil	aas/oil	2002	OF	1.000	1 500	1.10
Asam Paya*	BSP	oil	2002	20	1,000	1,500	platform
B11, off Sarawak	Sabah Shell?	gas	2000	20	1.400	00	platform
B12, off Sarawak	Sabah Shell?	gas	2006		500		platform
E6, off Sarawak	Sabah Shell Carigali	gas	2002				plation
E8, off Sarawak	Shell/Petronas Carigali	gas	2005		2,100		platform + compression
F13, Off Sarawak	Shell/Petronas Carigali	gas	2009		3,700		platform + compression
F28 off Sarawak	Shell/Petronas Carigali	gas	2004				platform
F29. off Sarawak	Shell Malaysia	gas	2009		100		platform
G7, off Sarawak	Shell Malaysia	gas	2010		100		platform
M4, off Sarawak	Shell Malaysia	gas	2010		100		a last a second
Belumut	EPMI	oil	2002	40	800	200	platform
Beryl	Petronas Carigali	gas	2010	40	400	200	platform
Bintang	Esso Malaysia	gas/oil	2009	25	1.500	800	platform
Blocks PM 5,8,9,10	Esso Malaysia	gas	1998		1,500	000	Peninsular das project
Bunga Orkid	Lundin Oil (ex IPC)	gas/oil	2015	7	420		platform
East Bunga Raya	Lundin Oil (ex IPC)	oil/gas	2002?				test 5.500 b/d. via Pase 2
*Helang (blk SK 10)	Nippon Oil Exploration	gas	2005		1,200		platforms?
-Jitan (DIK SK 8)	Shell	cond/gas	2003	75 (cond)	2,800		2 platforms
Lalla	Petronas Carigali	gas	2010		300		platform
Resak Beranang	Esso Ivialaysia	01	2002	30	1 1 1 1 1	200	platform
*SK8 other fields	Occidental	cond/gas	Jan-00	50	1,500	650	3 bridge-linked platforms
*SK10 other fields	Ninnon Oil	gas	2003	80	5,200	700	platform
Serudon/South Rava	Esso Malaysia	yas cond/aac	2005	50 12 (liquida)	1,300	4//	central platform, subsea
West Patricia (off Sarawak)	Murphy Oil	oil/gas	2001	12 (ilquids)			tie-backs to Yong/Raya
Sub Total	maiping an	ongus		524	24,245	4,607	
MALAYSIA-THAILAND JD	A			-			
Cakerawala	CTOC	das	2002	17	2 100	800	platform
A18 fields	CTOC/BP	gas/oil	2003	120	7 700	1 750	Cakenvala is phase1
B17 fields	Petronas	gas	2008	120	1,500	1,750	Muda plat + pipeline link
Sub Total		3	1222	137	11,300	2,550	widda plat + pipeline link
MYANMAR							
Yetagun phase 2	Premier	cond/gas	Oct-02	50	1,800	635	2 platforms 8 subsea
Sub Total			1000	50	1,800	635	2 plationis, a subsea
PAKISTAN							
Bhadra	Lasmo	oas			500		onchore
Bhit	Lasmo	gas	end-2002		1.000	363	onshore
Charchar	Tullow Oil	gas	end-2002		1,000	505	onshore
Mazarani/Larkana	Pakistan Petroleum	gas	Sep-02				10–12mn cf/d onshore
Miano (Sind Province)	British Borneo	gas	1Q2001		374	105	onshore
Sawan (Sind Province)	OMV	gas	1H2003		800	210	onshore
Sawan (Sind Province)	OMV	gas	end-2003		1,200		onshore
Zamzama	BHP	gas	Jun-01		1,000		onshore
SUD TOTAL				0	4,874	678	
PHILIPPINES							
Sub Total	RD/Shell	gas	2001	120 (liquids)	3,400	1,800	385kb plat, floater, subsea
THAN AND				120	3,400	1,000	
Arthit	DTTED	and to an	2005	10			
Ronakat radaualan 20	PTTEP	cond/gas	2005	12	300		all and a second se
Chabatother B8/32	Chowron	oil/gas		250	3,700		plat + gas processing
Dara	Unocal	on/gas	2005	350	2,500		discovery
Dara West	Unocal	gasion	2005	3	100		
Jarmiuree/Tantawan B8/32	Chevron	oil/gas	2005	13	150		ab et al.
Maliwan B8/32	Chevron	oil/gas	Nov-01	200	7,000		platform
Nang Nuan redevelopment	Shell	oil	end-2002	23.0	201		platform
Pailin phase2	Unocal	gas	mid-2002	55	2 040	1 700	control plat + 25 wellboad
Plamuk/ Platong/ Surat/		300	1110-2002	55	2,040	1,700	central plat +25 wellhead
Kaphong	Unocal	oil	end-2001				
Yala Sub Total	Unocal	oil/gas		100	A.A.A.		FPSO (50kb/d)
300 10(8)				662.6	9,991	1,700	7 0.000 00
VIETNAM	DD/Charles II				2036		
Red Piver province	BP/Statoil	gas	2003	10	2,000	1,300	platform
Su Tu Den (block 15.1)	Conoco	gas	2004	130	3.75bn cm		ACTIVATION OF A COMPANY
Block 15-1 discovery	Conoco	oil	2004	250+			FPSO (70kb/d)
Swan discovery	Samedan	das					17,800 b/d on test
Topaz and Emerald	Petronas	gas		50			tested 20mn ct/d
Sub Total	110000	340		440		1,300	
GRAND TOTAL			-	7 272 7	301 775	21 990	
and a state of the				1,6/2.1	301,775	21,009	

Key: *to Tiga LNG project

Current and planned field developments in the Asia-Pacific region

Source: Petroleum Review

Technology drilling

New drilling techniques raise hopes of big gains

Three drilling techniques – underbalanced drilling (UBD), through tubing rotary drilling (TTRD), and through tubing drilling (TTD) – all originally used on land, have been adapted and are growing in popularity for use on offshore developments. *Brian Warshaw* looks at some recent North Sea applications of these drilling techniques.

Inderbalanced drilling (UBD) was initially developed in Texas during the late 1970s, and became an accepted procedure a decade later in the US and Canada. Generally used in low-pressure structures, the bottomhole pressure is deliberately maintained at below the reservoir pressure to allow gas and liquids to flow out in a controlled manner during the drilling process.

UBD benefits

The benefits of UBD are that pore damage is reduced, drilling performance is improved with higher rates of penetration and less bit wear, and the geologist has real-time information on which to base decisions. It has been reported that during the recent drilling of one wellbore, the planned length had been reduced by onethird, as the real-time results allowed the geologist to judge that the target production rate had been achieved.

Instead of the kill-weight chemical mud used for conventional drilling, in UBD the drilling fluid is lightened by the injection of a gas. In the North Sea, nitrogen or methane is typically used. However, foam, gas/mist, and even light oils can also be used, depending upon the static pressure of the reservoir. Because the wellbore is drilled live, extra safety devices are included in the blowout preventer (BOP) stack. These include the use of a rotating diverter also known as a rotary blowout preventer - or pressure while drilling unit, which is installed above the standard BOP, with a snubbing unit at the very top. These units are designed to allow the drillstring to move in and out of the wellbore as drilling proceeds or when the bottomhole assembly (BHA), comprising the drillbit, drillcollars and stabilisers, needs to be changed.

Additional equipment includes a nitrogen generator or cryogenic storage tanks, a flow valve manifold to regulate the pressure of the returning fluid, and a separator system for the gas, hydro-carbon liquids, drilling mud and well chippings – all of which make demand on rig

floor space. Unless the gas and liquids can be transferred to nearby process systems, a gas flare and storage is also needed.

Shell was the first company to use the UBD technique offshore, when it drilled and completed well A27-52 on the North Sea Leman field during 1997, using a reduced-head procedure. Reduced-head drilling operations use a chemical mud that has a density above the pressure exerted by the reservoir, but below the overbalanced density used during conventional drilling. Shell has subsequently used full UBD on several of the 14 wells it has recently drilled in the field.

In the last few months, BP and Conoco have announced a joint venture to develop UBD operations in the gas bearing reservoirs of the southern North Sea. Starting with a four-well programme in summer 2002, budgeted to cost around £60mn, a number of provisional wells have already been identified and a contract will soon be placed for a rig.

TTRD and TTD

Other techniques gaining credence are through tubing rotary drilling (TTRD) and through tubing drilling (TTD). In effect, these both relate to the method of entry, which is through the BOP and completion tube, with the packer also remaining in place. The benefits of these procedures is their proven speed and financial economy. The BP Arco Shared Services Drilling Group, which pioneered TTRD in Prudhoe Bay, Alaska, claims that up to \$1mn could be saved on each well drilled; while Shell Expro reported that two TTRD wells drilled on the North Sea North Cormorant field cost £1mn and £1.5mn, around half the price of a typical coiled tube drilling (CTD) well.

Coiled tubing

Where the platform drilling rig has been removed or a jack-up rig was used for the original wells, coiled tubing (CT) is likely to be the only available method for drilling sidetrack wells. A CTD unit will be necessary to implement the TTD, but a major consideration is whether the platform can accommodate its size and weight, which can be 20 tonnes for the reel alone, without accounting for the pumps, cab and flow lines. A benefit of CTD is the ability to include wireline inside the coil, which provides fast data transmission during drilling, and control of downhole tool using electrical signals.

of downhole tool using electrical signals. Typically 2³/₈-inch or 2⁷/₈-inch outside diameter (OD) CT is used and, because it cannot rotate, a small BHA that includes a mud motor driven drillbit is used. The lack of rotation throughout the wellbore reduces the cleanliness of the hole and frictional resistance limits the depth to which the BHA can reach.

When a drilling rig is available, TTRD can be adopted using slim drillpipe. The drillpipe can be as large as 3½ inches in OD, although 2½-inch is more common – this having sufficient strength, bore capacity for fluid flow, and adequate clearance to enable fishing in the event that elements are lost in the wellbore. Modifications to the rig may be necessary. The slim pipe can bow on the rig pipe rack, and consideration must be given to limiting the torque generated by the top drive system on the smaller diameter tool joints.

BP recently confirmed that excellent results had been achieved on the Magnus field using TTRD, which had surpassed its expectations. In early April of this year, a wellbore came in at 12,000 b/d of oil, with the output subsequently expected to reach 20,000 b/d. Originally BP had only anticipated achieving a production rate of 5,000 b/d.

Statoil too, is delighted with the results of its TTD operations. It reported in early September 2001 that well A-23B – the third that had been drilled on the Statfjord field using the technique – had taken just 19 days from start to oil flow. Producing at an initial 5,000 b/d of oil, the well recovered the cost of its development within just 14 days.

Øystein Arvid Håland, the Resource Manager for the Statfjord field said: 'For a mature field such as Statfjord it is important to penetrate the reservoir in many places in order to retrieve as much of the residual oil as possible. That's why it's crucial to reduce the costs per well.'

Håland said that on average, each year Statoil drilled 16 sidetrack wells in the Statfjord field, and that one-third of the current production was coming from wells that were completed last year. It was planned to keep the field operating profitably until 2020, he said, and to achieve that, they intended to identify a minimum rolling programme of at least 50 potential drilling targets.

Capturing the 'on-the-go' consumer

Following on from an article in the October 2001 issue of *Petroleum Review* that summarised the pros and cons of introducing the Internet to the forecourt, *Michael Phillips*, Oil Analyst at Datamonitor, explains how fuel retailers are planning to also promote a plethora of in-car Internet and WAP-based services aimed at attracting a modern breed of cash rich, time poor consumers.

n-car Internet platforms are expected to become a common feature over the next five years, with GM, Ford, PSA, Mercedes-Benz, BMW and Volkswagen all in the process of developing in-car access systems. In addition, MobileAria has unveiled plans to launch a system that allows Personal Digital Assistant (PDA) owners to access Internet services on the move and that can be installed on any vehicle dashboard.

This platform promises to unlock a lucrative new revenue stream for fuel retailers with a strong in-house web content, as the bulk of revenue will come from driver services such as navigation assistance, route planning and traffic information.

Targeted marketing

However, it is marketing as opposed to information provision that presents the greatest opportunity for fuel retailers. The majority of future in-car services will be integrated into multi-access portals, suitable for PCs, WAP phones and PDAs. Users will have their own personalised pages that they will use to manipulate and customise the in-car services to best meet their own needs. The data generated from telematics systems can then be channelled into individual, highly targeted marketing delivered through these personalised pages.

Most refuellings are conducted at service stations that customers pass regularly. Therefore, the ability to market particular stations to appropriate customers will be at least as important as the ability to direct passing traffic to unknown stations. Telematics data will enable fuel retailers to inform customers of the range of services and special offers available at their local stations and alert them to further promotions based on their individual profiles. Location-based 'push' marketing is also a significant possibility, but could be limited by audio-based incar interfaces that will feature in some offerings.

WAP-based information services

Datamonitor is also predicts that advances in 3G wireless networks will provide the speed and functionality to transform the beleaguered WAP platform into a user friendly and popular way of accessing the web when on the move. As 3G-enabled WAP proliferates, forecourt retailers will increasingly use WAP to interact with their customers.

Some companies, such as Shell, have already identified WAP's potential and are tentatively using it as a medium through which to market their sites. As the take-up of this service escalates, the possibilities for forecourt retailers are myriad. Station locators will form the basis for travel-related WAP service packages. For consumers on the move, location and direction information that is instantly available will be of primary importance.

Using the GPS technology that will accompany the advent of 3G networks, forecourt operators will be able to send short messaging service (SMS) messages to customers when they are nearing one of their service stations, to inform them of in-store promotions. Having gained permission from the customer to supply them with such information, retailers will then be in a better position to use 'push' promotions to boost sales of non-fuel items by encouraging impromptu forecourt visits, promoting special offers and increasing awareness of the product range. Obtaining prior permission will both improve response rates and reduce costs. This customer consent can be achieved via the WAP service offering or from dedicated agencies such as SMSaffari and The Mobile Channel.

Adding real value

The Internet is now being used for adding real value to customer service, expanding the forecourt offering in an innovative and differentiating manner. As mobile Internet usage takes off, it will open important new channels for targeted marketing and will present a new source of revenue for companies prepared to take advantage of the emerging automotive technologies.

Business-to-consumer (B2C) e-business in fuel retailing is not just about futuristic brand image, it is going to transform the way in which retailers interact with consumers, both on and off the forecourt.

Asia-Pacific Timor Sea

Doubt surrounds Timor gas projects

The prospect of Darwin becoming Australia's second liquefied natural gas (LNG) export terminal suffered a serious set-back in July 2001 when Phillips Petroleum and its partners shelved plans for a major gas pipeline. *Jeff Crook* reports.

This 500-km pipeline would have conveyed gas from the second phase of Bayu-Undan and from the Woodside Petroleum-operated Greater Sunrise fields. It was expected that the projects would bring a long-term stream of tax revenues, jobs and training opportunities to both the Australian Government, the Northern Territory and to the emergent nation of East Timor. The field partners are now looking at an alternate Shell proposal involving the world's first floating LNG facility.

Timor Sea gas reserves are currently estimated to exceed 22tn cf, with Greater Sunrise volumes of 9.16tn cf similar in scale to the reserves available at the time that the North West Shelf LNG project was committed in 1985. This latter complex is sited on the Burrup Peninsula in Western Australia and is, itself, undergoing an expansion programme to meet increased demand.

The three existing processing trains on the Burrup Peninsula were uprated in the mid-1990s to give a combined output of around 7.5mn t/y. Then in April 2001, Woodside announced the approval for a fourth train, which is now being built on behalf of the North West Shelf Venture partners. With capacity of 4.2mn t/y, it will be the largest train in the world. It is possible that further trains will be added in the future to cater for other discoveries.

Start-up of the fourth Burrup processing train in mid-2004 will coincide with the first LNG shipment to the Americas under a 3.7mn t/y purchase contract placed by Shell International Gas during May 2001. This is just one of many recent contracts that illustrate the healthy state of the LNG market – a fact that is largely explained by the product's 'clean-fuel' status. Shell predicts that an extra 54mn t/y will be needed by 2010 to meet rising demand in Japan, Korea, China and Taiwan.

The Timor Sea has adequate reserves to cater for increased LNG demand and these fields would also provide an alternate source for domestic consumption, replacing the maturing and declining gas fields in the Bass Strait. Sales of Timor Sea gas have got off to a promising start. A Letter of Intent has been signed for the delivery of 4.8mn tonnes of LNG per year to a terminal close to the US/Mexico border. Other Letters of Intent have been signed for supply of gas to Methanex's proposed syngas/methanol plant near Darwin, to other Darwinbased industrial customers and to a major industrial site in Queensland.

Timor Gas situation

One potential hurdle for the Timor Sea gas projects was overcome in early July 2001 when the Australian Government agreed a new Timor Gap Treaty with the UN Transitional Administration in East Timor (UNTAET) and representatives of the local people. The treaty needed to be re-negotiated after the local people voted for independence and Indonesia relinguished its hold on the territory.

Under the new treaty, initialled in Dili on 5 July 2001, East Timor would receive 90% of the revenue stream from a 'Joint Petroleum Development Area' (JPDA), whilst Australia would receive 10%. This compared to the previous 50:50 split. The new treaty also unitises Greater Sunrise, which straddles the boundary, allocating 20% of the field to the JPDA, and 80% to Australia. But the optimism that initially surrounded the agreement turned sour when Phillips Petroleum and its partners announced at the end of July that it was to 'defer indefinitely' a decision on the gas pipeline from the Bayu-Undan field to Darwin. The companies stated that they were dissatisfied with the legal and fiscal regime for projects in the JPDA.

Whilst expressing disappointment over Phillips' deferral of the pipeline decision, the Australian Government was also critical of the East Timor authorities. The government statement said that it was 'unfortunate' that just hours after agreeing the Timor Sea Arrangement, UNTAET and representatives of the local people had used its taxation powers to raise an additional \$500mn in tax from the companies. Negotiations are continuing while field partners also consider the alternate Shell proposal for a floating LNG facility.

If the gas projects had gone ahead as planned, East Timor would have received substantially more that A\$7bn in revenue over the 20-year period from 2004 from the projects. Australia would have received A\$1bn during this same period, together with extensive downstream benefits. But despite uncertainty over the gas projects, the Bayu-Undan liquid stripping/gas recycle project continues unaffected.

Bayu-Undan

The Bayu-Undan field is located 500 km northwest of Darwin and 250 km from Suai, on the Island of Timor. It is made up



Shell has proposed a floating facility to develop Bayu-Undan gas. Photo courtesy of Shell.

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of two discoveries – the Bayu field, discovered by Phillips in 1995, which was unitised with BHP's Undan field in 1997. The combined fields have estimated recoverable reserves of 3.4tn cf of natural gas and 400mn barrels of gas liquids.

Phillips Petroleum was appointed operator of the field in July 1999, and the co-venturers approved the first phase of the development in October of the same year. The first phase consists of a \$1.4bn liquid stripping/gas recycle project. TIGA, an alliance formed between Fluor Daniel and Worley, is serving as the engineering and procurement contractor during the detailed design phase, as part of an integrated team with the unit operator's personnel based in Perth, Western Australia.

Full commercial production of 50,000 b/d of liquids is due to begin in 1Q2004. The main components of this development phase are a central production and processing (CPP) complex, an unmanned wellhead platform, and a permanently moored floating, storage and offloading facility (FSO). The modest water depth (262 ft) allows the wells to be drilled by a jack-up rig in cantilever mode, thus eliminating the need for permanent drilling facilities on the platforms.

The CPP consist of two bridge-linked platforms. Liquids will be stripped from the gas on this complex, and the lean gas will then be compressed and injected back into the reservoir through dedicated wells. The gas liquids will be further processed before being transferred to the FSO, from where they will be loaded on to shuttle tankers for distribution on the world market.

Each three-level CPP platform deck is being built as single, integrated unit, and will be installed on to its steel jacket by means of the float-over method. The larger of these decks is expected to weigh 14,000 tonnes, the smaller 11,500 tonnes. The decks are being constructed by Hyundai Heavy Industries in Korea. The two eight-leg jackets, which each weigh around 10,000 tonnes, are being built by McDermott International at the Batam yard near Singapore.

The FSO is being built by Samsung in South Korea. It will have capacity to store 820,000 barrels of condensate (130,000 cm) and will have a pair of tanks each capable of holding 300,000 barrels (47,500 cm) of propane or butane. LPG refrigeration plant will be installed on the vessel's deck, together with a reliquefaction plant to handle boil-off from



The 5mn t/y FLNG scheme, presented by Shell to the Sunrise gas field partners in early August 2001, would involve a 400-metre long barge equipped with LNG production, storage and offloading facilities, connected to a wellhead platform. *Photo courtesy of Shell*.

the propane and butane tanks.

Under the Phillips Petroleum plan the natural gas reserves of Bayu-Undan were to be exploited in the second phase, in conjunction with development of Greater Sunrise. The shared gas export pipeline for these projects might also have been able to handle gas from the Evans Shoal development with 6tn cf of gas reserves (gross), located 150 km to the southeast.

Greater Sunrise

The Greater Sunrise fields (Sunrise, Sunset and Troubadour) lie in the Bonaparte Basin some 500 km northwest of Darwin, with a portion of the reservoirs lying in the JPDA. These fields are currently estimated to contain 9.16tn cf of gas and over 300mn barrels of condensate. Another estimate of the gas reserves will be possible following the analysis of data from a 3,500 sq km 3D seismic survey – Australia's largest single client 3D survey to date.

One development scenario involves a drilling and processing platform, in 160 metres of water, with an FSO to receive 25,000 b/d of condensate. Around a dozen wells would be drilled from this platform, with another dozen subsea wells being tied-back from satellites. Fugro Survey's geo-technical vessel, *MV Mariner*, carried out a 20-day seabed sampling programme towards the end of last year, to permit the engineering design of the offshore facilities to be progressed.

There are two possible scenarios for export of the gas from Greater Sunrise, the first is via a joint gas pipeline running from Bayu-Undan to Darwin; the second involves a floating LNG facility (FLNG) moored close to the production platform, possibly with a smaller gas pipeline to Darwin for the Australian market.

Floating LNG plant

The 5mn t/y FLNG scheme, presented by Shell to the Sunrise gas field partners in early August 2001, would involve a 400metre long barge equipped with LNG production, storage and offloading facilities, connected to a wellhead platform. The barge would be moored by means of a turret on the bow. Shell says that the facility could also be equipped with gas compression for export of gas by pipe to Darwin.

It is understood that the LNG facilities would utilise Shell's 'mixed refrigerant' process. This process is said to offer a compromise between the inherent safety, but poor efficiency, of nitrogen refrigerant, and the higher efficiency, but greater hazard, of propane. Another innovative safety feature would be the use of electric motors, rather than gas turbines, to drive the refrigerant compressors. The LNG would be stored in prismatic tanks, and LNG carriers would berth alongside the facility for loading, with assistance of bow and stern thrusters.

Stop Press!

East Timor's Secretary of State for Natural and Mineral Resources Egidio de Jesus is understood to have been appointed the newly independent nation's Executive Director of the Timor Gas Joint Authority for the Zone of Cooperation. The Joint Authority is the joint East Timor/Australia body responsible for the administration of oil and gas exploration and production in the Timor Sea, working on behalf of the two nations.

Asia-Pacific gas

Cooperation benefits Asian gas prospects

Jeff Crook looks at how improved cross-border cooperation, together with new trunk pipelines, are gradually improving prospects for gas development in South East Asia.

outh East Asia has enormous natural gas reserves, but many fields lie far from potential gas markets and infrastructure projects are hampered by the complex nature of the national boundaries. The heart of the region is the swathe of mainly Indonesian islands that stretches from Sumatra to New Guinea. There are few major gas markets in this region, so Indonesia has been forced to export its gas in liquefied form - it is currently the world's largest exporter of liquefied natural gas (LNG). However, improved crossborder cooperation, together with new trunk pipelines, are gradually improving the prospects for the gas in the region.

A large number of platforms in the Gulf of Thailand supply gas to the Malaysian Peninsular and development activity continues at a high level. Fields in the Thai sector feed a terminal at Rayong, whilst the Malaysian gas comes ashore at a terminal in Kerteh. The onshore transmission system is gradually extending throughout the Peninsula from Thailand to Singapore. A pair of pipelines has also been built across the border from Myanmar to carry gas from the Yadana and Yetagun fields to power projects near Bangkok in Thailand.

A landmark event occurred in October 1999 when the Prime Ministers of Malaysia and Thailand signed bilateral agreements for the purchase of gas and related pipeline projects that will result in the distribution of gas from the Malaysian–Thai Joint Development Area (JDA) in the Gulf of Thailand. Gas is due to start flowing at a rate of 390mn cf/d from mid-2002. It will be piped 250 km from platforms in the Gulf of Thailand to Songkhla, in Thailand, from where it will be distributed both north and south of the border by means of the Trans–Thailand–Malaysia pipeline.

Other major projects have extended the pipeline network further out into the South China Sea. The ultimate prize here is the Natuna gas field, which lies some 220 km northeast of Natuna Island and is operated by ExxonMobil. This field holds 46tn cf of hydrocarbon gas, enough for pipeline export and a world-scale LNG complex, but its remote location and high carbon dioxide (CO_2) content present a major development challenge.

While ExxonMobil studies various development solutions and seeks buyers for LNG from this massive field, Conoco and its partners have completed the West Natuna Transportation System (WNTS). This system is designed to gather gas from 17 fields in West Natuna Sea Block B, Block A and Kakap for delivery to Singapore.

The gas from these Indonesian fields will also be delivered to Malaysia via a new 97-km pipeline connection to the existing Duyong offshore complex, from where it will be landed at the Kerteh terminal. This gas is due to start flowing in August 2002 at a rate of 100mn cf/d. Flow will then ramp up to a plateau rate of 250mn cf/d by 2007. Like much of the gas landed in this region, it will be primarily used to fuel new power generation.

West Natuna pipeline

J Ray McDermott undertook the \$335mn WNTS subsea pipeline project on behalf of the West Natuna Group, which comprises Conoco Indonesia (operator), Premier Oil Natuna Sea and Gulf Indonesia Resources. The influence of Conoco was significantly increased in July 2001 when its wholly owned Canadian subsidiary acquired Gulf Canada Resources.

When fully operational the WNTS system will gather gas by a network of infield pipes from 17 separate fields for transmission by trunkline to Singapore. It currently has the capacity to transport 700mn cf/d of gas, but this could be expanded to 1bn cf/d to meet expected growth in the gas market.

Conoco says that the pipeline system's flexible design will allow natural gas to be introduced from other areas of the Natuna Sea and will facilitate additional delivery points in the future. The network of pipelines has a total length of 670 km, while the longest section of pipeline is the 470-km, 28-inch trunkline that runs from West Natuna to Singapore's Palau Sakra.

West Natuna gas production

West Natuna gas started to flow to Singapore early in 2001, six months ahead of the official contract start date of 26 June 2001. The gas purchase contract was agreed between the Indonesian state oil company Pertamina and SembCorp Gas of Singapore. It covers the supply of 325mn cf/d of gas over a 22-year term. The gas is to be produced by three production sharing contractors (PSCs): Conoco-operated Block B, Premieroperated Block A, as well as the Gulf-operated Kakap block.

First gas was supplied from the existing Premier-operated Anoa oil and gas field, in block A, and the existing facilities in the Kakap block. Gulf said that the four main producing fields in the Kapak block all contain free or gas cap gas. Then, later this summer, Conoco started to produce its share of the gas from an innovative moveable offshore gas production unit called Hang Tuah (see box). Further facilities are to be constructed in the future, many of which will be in Block B.

Close to half (43.1%) of the 2.5tn cf of gas sold to Singapore, and all the 1.5tn cf sold to Malaysia, will come from block B. Conoco says that the 'cornerstone' for gas supply from this block will be the \$1.6bn Belanak development, which is located 200 km from Singapore. This project involves two wellhead platforms, a floating storage and offloading (FPSO) unit and an LPG floating storage and offloading (FSO) unit. But the facilities will also act as a hub for six fields in the surrounding area. Major contracts worth \$744mn have recently been awarded and first gas is expected in mid-2003.

Nam Con Son Basin

The \$1.3bn Nam Con Son development, located 360 km south of Vietnam, is another project involving the construction of a major gas trunkline in the South China Sea. BP and its co-venturers Statoil, PetroVietnam and India's Oil and Natural Gas Corporation gave the go-ahead for this project in February 2001. The project will develop 2tn cf of gas. It will be Vietnam's largest foreign investment to date and its first dedicated gas-to-power project. The

Hang Tuah production facility

hen Conoco began its contract deliveries through the West Natuna Transportation System (WNTS) to Singapore on 26 June 2001, the gas was produced by an innovative moveable offshore gas production unit (MOgPU) called Hang Tuah. The unit was constructed under a \$130mn contract by a consortium formed between PT Citra Panji Manunggal of Indonesia and Hyundai Heavy Industries of Korea. The contract also covered flowline tie-in modifications to the existing Tembang and Belida field facilities. Construction was completed during March 2001, and the unit was subsequently transported to its field location, where it was successfully installed.

The Hang Tuah was named after a legendary 14th century Indonesian warrior known for his adventurism and bravery. The facility contains living quarters, gas compression unit, utilities and other facilities. One major advantage for this innovative solution is that Conoco will be able to relocate the unit at a relatively small cost as older reserves are depleted and new fields are brought onstream.

'The biggest advantage of the MOgPU is mobility,' said John Hopkins, Conoco Vice President for Exploration Production Technology, as construction was getting underway. 'Basically, we can pick it up off the seabed and quite easily move it to another location and ultimately it can be abandoned with minimal effort and cost. The MOgPU can be built onshore where labour and other costs are cheaper than assembling it in water. Then it can be towed offshore and is almost immediately ready to go. In fact, the same vessels that tow it out can be used to position and install the platform.'

The structure of the MOgPU consists of a buoyant deck with four jack-up type legs, extending up from a rectangular steel base. The entire unit was conveyed to the field site on a heavy lift vessel with its four legs raised so that there was little air space between deck and base. On arrival at the field site, the unit was floated off the heavy lift vessel and a set of simple cable strand jacks used to lower the base to the seabed, and to pull the topside up on its legs. Costs were minimised by hiring the jacking system.







Conoco's unique moveable offshore gas production unit (MOgPU) can be moved from field to field as reserves are depleted and new fields brought onstream, providing considerable operational, cost and resource efficiencies. Photos courtesy of Conoco.

Asia-Pacific gas



gas will be used by three generating plants to provide electricity primarily for consumption in the Ho Chi Minh City area. The electricity generated from this gas represents approximately 40% of Vietnam's current demand.

The project initially involves a steel production platform in 125 metres of water over the Lan Tay reservoir, connected by pipeline to an onshore gas processing terminal. Offshore compression facilities will be added during a second phase of the project and tieback of subsea wells over the Lan Do reservoir will be carried out during the third phase of the project. The pipeline is also designed to accommodate future gas supplies from the Nam Con Son Basin, including the Hai Thach field, discovered by BP in 1995.

A \$76mn contract for construction of the Lan Tay platform was placed with Hyundai Heavy Industries in July 2001. The 6,500-tonnes topsides for the platform, which includes accommodation for 34 people, will be installed by a float-over operation. ABB Singapore was awarded a \$1.7mn contract for the integrated control system.

Further afield

The regional master plan for gas transmission is known as the Trans-ASEAN gas pipeline network. The eventual aim is to link Thailand, Malaysia and Singapore, through Indonesia to Borneo and the Philippines. The WNTS and Nam Con Son pipelines are part of this master scheme. Another planned link will be from the Malaysian Peninsula to Sumatra, where there is significant gas production. The Arun field in Aceh, northern Sumatra, feeds the PT Arun LNG complex – the oldest LNG plant in Indonesia, coming onstream in the late 1970s.

The future could see a link from Singapore to the 'Corridor' system that runs 540 km down the centre of Sumatra. This pipeline currently conveys gas from fields in the southern part of Sumatra to a 'steam flood' facility located near Duri, which is used to boost production from the Duri heavy oil field. The next stage would be to extend this system down to the Indonesian capital Jakarta, on the neighbouring island of Java. The long-term future could see the system extended north to the island of Borneo (and possibly Natuna) and then east to the Philippines.

The sea surrounding Borneo holds vast reserves of gas and the island currently exports LNG from three different sites: the Bintulu complex, in the Malaysian state of Sarawak on the northern coast of the island; Lumut in Brunei; and Bontang, in the Indonesian state of East Kalimantan, on the east coast of the island. Work is currently underway to increase the capacity of the Bintulu complex to 23mn t/y of LNG, which will make it the world's largest complex. Two new 3.8mn t/y trains are being constructed by Malaysian LNG Tiga, a subsidiary of Petronas.

There has been some recent speculation about a pipelink from the province of Sabah, in northeast Borneo, to the Philippines. This pipeline could possibly tie-in to the Malampaya gas export pipeline at the shallow water platform off the island of Palawan. There has also been preliminary planning of a pipeline from Papua New Guinea to Australia, although LNG export from New Guinea is more likely in the foreseeable future.

Preliminary design work is progressing on the Tangguh LNG plant at Berau Bay, in the Indonesian province Irian Jaya, on the island of New Guinea. The front-end design contracts were placed during April 2000. Tangguh would follow Arun and Bontang as Indonesia's third LNG facility.

BP reported that marketing of LNG was going 'very well' in July 2001, when it increased its stake in the project to 50% following the acquisition of Cairns. The proved certified reserves of Tangguh are 14.4tn cf spread across three production licenses: BP-operated Berau, BP-operated Wiriagar and BG-operated Muturi.

A problem shared

Over 70 specialists and practitioners from major oil companies to local authorised distributors gathered at the Institute of Petroleum's day-long seminar 'Improving Safety in Petroleum Distribution', held in Wolverhampton in August 2001. Brian Warshaw provides a brief overview of the day's presentations.

Chaired by John Pond of Kuwait Petroleum, the seminar outlined a series of current issues in the UK petroleum distribution sector arising from new regulation, technology, product specification and operational requirements. Fortunately, the speakers were able to present some solutions to these issues that will assist the sector's drive to improve its safety performance.

Prevention of falls

Graham King from the UK Health and Safety Executive (HSE) reviewed the results of the first year of its campaign to eliminate falls from road tankers in the chemical and allied sectors by March 2005. He reported that of the 43 companies contacted by the HSE, only 2% had eliminated the need for high level access to road tankers while 23% had, so far, done nothing. In two cases, companies were found guilty by the courts of breaches of the Health and Safety at Work Act etc, 1974.

Despite these figures, King was optimistic that with the determination of HSE's inspectors, and the goodwill of the industry, the goal would be achieved.

Vapour recovery

Two papers were presented on the subject of recovery of volatile organic compounds (VOCs). David Coker discussed the potential fire hazard from carbon bed vapour recovery units due to the development of hot spots in the beds. Although there had been several cases of overheating reported in the UK and overseas, there had fortunately been no major incidents to date. He suggested that if operators closely monitor the internal temperature of their units during the summer and winter seasons, they could develop control charts that would quickly highlight hot spot development. Little is known about this problem and Coker said that the IP was proposing to sponsor a research project at Bath University to investigate its root causes.

Delegates were surprised by an admission from Alec O'Beirne of PTF Training that most deliveries to service stations had been, technically, in breach of the VOC regulations that came into effect at the end of 1998. The problem was only discovered six months ago, and apparently stems from modifications made to road tankers which allow VOC emissions to be discharged at high level into the atmosphere. Fortunately, however, O'Beirne reported that three solutions have been developed and are to be incorporated into the vehicle 'safe loading pass' scheme at the beginning of 2002.

O'Beirne went on to highlight several other unacceptable situations, including instances of liquid petrol being drawn up the vapour recovery hose where a previous delivery had overfilled the service station tank; diesel compartments filling with petrol vapour; loss of liquid seal in site storage tanks; and liquid in the tanker coaming valve and down pipe.

Terminal induction training

Contract drivers are being increasingly used in the distribution sector and recent research has indicated that each driver collected product from an average of three different terminals each year. The IP is developing a core terminal induction training syllabus which would ensure that each terminal gives the same message to drivers. David Hughes of Texaco outlined the subjects that would be covered as being relevant at all major oil company sites. He stated that site-specific issues would be delivered separately at the individual terminals. In addition, drivers would be required to pass a comprehension test, and it is to be proposed that they would have to take a refresher course every three years.

Electrical static discharge

In low sulfur diesel where the sulfur content is below 50 ppm, the potential risk of an electrical static discharge is an order of magnitude higher (from one in 10mn down to one in 1mn) than for the former specification diesel, according to Tom Ramsey of ExxonMobil. Controls to overcome this safety problem include reducing tanker fill rates, conductivity additives, and a central conductor in the road tanker compartments similar to the dip tube.

Deliveries to non-retail sites

Guidelines are in preparation for drivers of authorised distributors taking loads to commercial and domestic premises, said John Eveson on behalf of the Federation of Petroleum Suppliers. The guidelines to be issued early next year will make extensive use of flow charts to provide the driver with guidance to ensure a delivery is safe and without adverse consequence to the environment. The need is reinforced by the introduction in March 2002 of the oil storage regulations in England, which makes the driver responsible for judging the suitability of the vessel prior to unloading the product.

Looking ahead

In a final session, delegates expressed the view that many experienced road tanker drivers found that the additional legislative and examination requirements for the transport of dangerous goods somewhat disconcerting. It is also thought that eroding premiums for meeting these requirements may lead to a shortage of suitably qualified drivers.

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Shifting the energy balance

China's dramatic economic growth in the last 20 years has coincided with equally dramatic increases in demand for energy, writes *Mojgan Djamarani*. The country is currently a net importer of crude oil, but there is a potential to reduce the import of oil by exploitation of new discoveries of oil and gas. However, the dilemma for China is that these new sources of oil and gas are either located in the west of the country, thousands of kilometres from the main consumers in the east or the new resources are offshore. Decisions need to be taken now so that billions of dollars of sustained investment over the next decade will lead to the optimum energy strategy for more than a fifth of the planet's population.

hina is the one of the world's fastest growing economies and is its most populous nation. It is also the world's second largest energy consuming nation after the US. Until now these energy requirements were met primarily by domestic supplies of coal and to a much lesser extent by domestic supplies of oil. It has been slow in tapping its rich natural gas resources largely because of lack of infrastructure and distorted domestic energy prices. However, to make the country more energy efficient and to combat pollution caused by the use of coal in power generation, the government is fast promoting a shift in the energy balance to natural gas.

Present and recent past

China is the world's largest producer and consumer of coal that, for the foreseeable future, will remain its principal energy source. Coal currently provides 76% of the country's energy balance but its share is expected to begin to fall from 2005.

Although a large oil producer, the country is the third largest oil consumer in the world (see **Table 1**). China has been a net importer of oil since 1993 – as its domestic oil production began to stagnate – when it imported 9.93mn tonnes. Its imports have increased seven-fold in as many years and stood at 70mn tonnes in 2000. The country's oil demand increased by 200,000 b/d between 1997–2000 and is expected to increase by 5% annually.

Most of China's oil production to date has come from onshore fields in the east and northeast of the country. However the focus of the oil industry is shifting to the west, in particular to the Xinjiang Uygur Autonomous Region.

Currently over 50% of oil production comes from two ageing and declining fields. The Daging field in the northeast is the country's biggest field and produces around 1mn b/d, a small portion of which is exported to Japan. Shengli in the Shandong Province produces around 600,000 b/d. Both fields are overdrilled and have high water cuts. Another major field in the northeast is Liaohe, with average production levels of 300,000 b/d. PetroChina (which controls 70% of the proven oil deposits in the north, northeast and west of the country) has enlisted the help of Digital Gas to extend production and enhance the recovery rates at these fields.

Oil demand

According to the Chinese Economic Research and Consulting Centre, demand for oil is expected to reach 296mn tonnes by 2010, but with domestic production of only 170mn tonnes – meaning 43% of its oil demand would have to be met by imports. This prospect worries the Chinese leadership who, until now, has been unaffected by the ups and downs of the world oil market. As a first step the government has decided to set up a strategic oil stockpile of 8mn cm (6mn tonnes) by 2005. This would represent approximately 10 days' consumption. This can be compared with the US Strategic Oil Reserve of more than 200 days' consumption. It also plans to provide preferential financial and taxation policies to its oil majors to encourage them to build up their own reserves.

The implications of China's shift to an oil importer are significant. Its oil demand is forecast by the Energy Information Agency's (EIA) International Energy Outlook (IEO) 2000 report to represent 14% of the world increase in oil demand of 39.8mn b/d by 2020, making China's influence on and vulnerability to international oil markets evident. According to IEO more than two-thirds of the increase in Chinese oil demand is going to occur in the transportation sector. Transportation's share of oil use is expected to increase from one third in 1999 to 55% in 2020. However, even non-transportation oil demand is expected to increase by 2.4% annually, which is a faster growth rate than that of the total for most of the industrialised economies.

The current oil and gas priorities focus on stabilising oil production in the mature oil provinces of the east, increasing oil and gas production from new fields in the west and the development of the infrastructure to deliver the new oil and gas to consumers in the east. This will require massive levels of investment as oil and gas will have to be transported across 4,000 km to the east. Last May, PetroChina announced plans to invest more than \$8.5bn by 2005 in energy projects in the western regions and Sinopec National Star, another of China's oil majors, has plans to invest \$607mn in exploration activities and \$2bn in the development and production of oil and gas by 2005.

According to Dr Phillip Andrews-Speed at the Centre for Energy, Petroleum and Mineral Law and Policy at Dundee University, China's leadership is very likely to the make the huge investment necessary to ensure the maximum degree of oil self sufficiency. This means that even if foreign companies see investment in projects that promote the production of hydrocarbons in the new oil provinces in the west of China or seek to maintain output levels in the eastern regions as not commercially justified, the Chinese Government will ensure that such projects proceed. Furthermore, there are important domestic political reasons for the investment in the economically backward but resource rich western regions of the country.

The Xinjiang Uygur Autonomous Region, a desert region in the west of the country, is planned to become the country's largest oil and gas producing area by 2010. The area accounts for beween 30% and 40% of all onland crude oil and gas resources. Its three giant oil basins – Tarim, Junggar and Tu Ha – hold over 2.5bn tonnes of proven oil reserves and 700bn cm of natural gas reserves. Oil production from Xinjiang is expected to reach 1mn b/d by 2010. Tarim Basin also holds the country's biggest condensate field, Yaha, which went onstream last year. PetroChina is to offer 11 blocks in the Tarim Basin as well as the Ordos Basin, also located in the northwest, to foreign investors.

Foreign participation

China opened its oil and gas sector to foreign participation in the 1970s, however, response by foreign oil operators has not been decisive. Offshore, geology has not been favourable to the discovery of commercial finds and onshore, in addition to unfavourable geology, PetroChina for a long time held a rather hostile attitude to foreign involvement in the upstream oil sector and was less than forthcoming in offering best acreage and information. To date, onshore western participation



China's main oil and gas fields.

has been limited mainly to smaller fields and wildcat exploration (see **Table 3**). Last December, however, regulatory changes were announced which included the foreign ownership of assets so long as the Chinese partner holds a majority interest. So far 47 contracts, worth \$1.29bn, relating to exploration, enhanced oil recovery (EOR), field development and technical services and integration of upstream and downstream operations have been signed with foreign partners.

Offshore oil production, at around 300.000 b/d, represents less than 7% of total oil production. China has benefited from the limited foreign involvement in its offshore industry as most of the increase in production and reserves has come from areas developed by foreign oil companies. Foreign involvement is greatest in the Pearl River Mouth Basin (PRMB), which provides 80% of China's offshore oil output and Bohai Bay. At the end of 1999, 41 offshore blocks were under license: 49% in Pearl River Mouth Basin, 29% in Bohai Bay, 10% in Yinggheai Basin in the South China Sea and 10% in the East China Sea. CNOOC, which controls offshore field development, expects investment in the offshore E&P sector in the 10th FYP (five-year plan) to total more than \$14bn and production to increase at an annual average of 20%. The target is to produce oil and gas equivalent to 40mn tonnes of oil by 2005. Development priority is given to Bohai Bay and the East China Sea.

Leading the way is Phillips Petroleum. The company is set to develop its Peng Lai 19-3 oil field in the Bohai Bay jointly with CNOOC. The field was discovered in 1999 and is expected to produce between 35,000 and 40,000 b/d in 1Q2002, with full production of 100,000 b/d reached in 2005. Phillips is also interested in a second project in the Bohai Bay for which it has exclusive negotiating rights.

Kerr-McGee has reported positive results from two appraisal wells on two of its Caofeidian fields, 11-1 on block 04/36 and in 12-1 on block 05/36. The first is estimated to have recoverable reserves of 100mn barrels. Primeline Energy of Canada and CNOOC have finalised work programmes worth \$10mn to be borne by CNOOC for block 32/32, and a geological and geophysical study of the Lishui 36-1 gas discovery in the East China Sea. Primeline will have a 11.25% stake in any future production and development from the blocks. Devon Energy, previously Santa Fe Snyder, has recently concluded production sharing contracts (PSCs) for block 26/35 in the South China Sea, as well as

Asia–Pacific China

blocks 16/02 and 16/05 and block 27/10 in the Pearl River Mouth Basin. It is to spend at least \$10mn on exploration on block 27/10. The company is already involved with two other fields in the area, Ursa and Bootes.

BP/Texaco's Qinguangdo 32-6 oil field in Bohai Bay, with 1bn barrels of oil in place, is to come onstream this year. It is expected to reach 60,000 b/d in 2002 and peak at 80,000 b/d.

The CACT Operators Group - which consists of CNOOC, Chevron, Texaco and Agip - is the largest foreign investor in offshore field development in China with daily production of 100,000 b/d. It was founded in 1983 and currently operates five fields in the South China Sea: Huizhou 21-1 (onstream 1990), Huizhou 26-2 (1991), Huizhou 32-2 and 32-3 (1995), and Huizhou 32-5 (1999). The Group has recently discovered two more oil fields on block 16/19 next to its existing fields. Both HZ19-3-1 and HZ 19-2-1 have multiple oil-bearing zones. A single zone tested yielded 46° API gravity crude at a rate of 4,700 b/d.

Husky Oil is to begin production at Wenchang 13-1 in 1H2002. The field, with estimated recoverable reserves of 100mn barrels, is expected to have peak production rate of 50,000 b/d.

In the East China Sea, China has confirmed proven gas reserves of 200bn cm. Sinopec (China Petrochemical Corporation, which also participates in the upstream sector) has announced plans to spend \$24.9bn on the development of the resources in the area in the next decade. However, on national security grounds, the East China Sea is banned to foreign participation and Sinopec and CNOOC are to jointly conduct E&P activities in the Sea's promising Xihu Trough.

Oil and gas exploration in the Beibu Gulf is also expected to start as China last year settled differences with Vietnam over their respective sovereignty and economic rights over the resources of the area. The Spratly Islands in the South China Sea are also believed to hold oil and gas resources, but are subject to territorial disputes by several countries. This, however, has not stopped Shell from reaching an agreement with CNOOC covering exploration in the Sea.

A major problem facing the Chinese oil sector is that output in the western regions is still too inadequate to economically justify construction of a west-east pipeline. In 1997 construction of a 491-km pipeline from Korla in the Tarim Basin to Shanshan in Sinkiang was completed, but plans to extend the line further east have not been pursued.

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Year	Production	Consumption	Gap
1995	3.318	3.200	0.118
1996	3.354	3.556	0.202
1997	3.331	3.947	0.616
1998	3.390	3.910	0.520
1999	3.380	4.229	0.849
2000	3.375	4.795	1,420
2001	3.299 Jan-	4.711 Jan-	1.412
	May average	April average	10000
Source: Oil	and Energy Trends, 17 August	2001	

Table 1: Chinese crude oil production and consumption (mn b/d, including NGLs)

Foreign supplies

In an effort to diversify from the domestic oil market the Chinese Government is pursuing two options. One is to alleviate the growing dependence on oil imports by encouraging its oil companies to invest in foreign oil field development. In 2000, CNPC (China National Petroleum Corporation, which is the parastatal for foreign business and pipelines) ended up with 5.05mn tonnes of oil from joint venture activities overseas. It hopes to raise this figure to 15mn tonnes by 2005 as it sets up more bases in Sudan, Iran, Peru and Venezuela.

The other option being pursued is imports of oil from Siberia. Earlier this year, CNPC and Russia's Yukos reached an agreement to carry out a feasibility study for the construction of 1,700-km long pipeline from Angarsk in Irkutsk Oblast to Daqing where it will link up with the Chinese domestic pipeline to Beijing. Estimated to cost \$1.7bn, its start-up date is set for 2005 – although it is not referred to in the directives for the 10th FYP (2001–2005).

China has pledged to import 20mn t/y of Russian oil by 2010 and 30mn t/y thereafter. Currently, the country imports 25,000 b/d (about 1.2mn t/y) from Russia. The suddenness of the decision, according to Dr Andrews-Speed, is partly attributable to the leadership's decision to go ahead with the construction of the West-East gas pipeline and for the time being to put pipeline imports of gas from East Siberia on the backburner. The decision also stems from China's view of oil as a strategic commodity and its desire to limit its dependence on international markets.

One advantage of this option as opposed to imports of oil from Kazakhstan by pipeline is that on the Russian side a pipeline infrastructure already exists and this helps to reduce its cost. Moreover, Russia is seen as a less risky supplier.

Although the transportation costs of imports of Persian Gulf crude by tanker would be cheaper at \$10/t compared to \$30/t by the Russian route, China is constrained by the poor status of its oil processing facilities that cannot refine large quantities of most of the lower quality supplies from the Gulf. By 2005 it is estimated that China will be able to process little more than 1.35mn b/d of the lower quality Gulf oil, although it still can import high quality oil from Oman, Yemen and Abu Dhabi. By importing oil from Russia at a higher price, China is also paying a premium for security as it seeks to avoid dependence on the same sources of supply as the US.

The Chinese Government is also concerned about the geopolitical risks of placing too much reliance on supplies that not only need to navigate the Straits of Hormuz but also the narrow, and easily blockaded approaches to the South China Sea.

Onshore gas supplies

China is rich in natural gas resources with potential reserves of 38.4tn cm. It has ten basins with proven reserves of more than 1tn cm (see **Table 2**), but until recently natural gas was used primarily as feedstock for fertiliser plants and very little for power generation. Currently it accounts for 3% of the total energy consumption. Plans are to raise this figure to 8% by 2010. This is to be achieved through domestic production and imports of LNG as well as piped gas from Russia.

Development of the sector is given priority in the 10th FYP. In the five-year period it is planned to construct a group of natural gas-fired power plants with combined capacity of 7,930 MW in Shanghai as well as in Jiansu, Zhejiang and Henan Provinces. The annual gas consumption will be 4.5bn cm with approximately 40% of the gas supplied by the planned West-East pipeline. Four gas producing provinces are to be developed within the next 15 to 20 years: Sichuan-Chongging; Shaanxi-Gansu-Ningxia; Xinjiang; and Qaidam in southwest China - each with projected annual production rates of between 10bn and 20bn cm.

The government is offering preferential financing and taxation policies and easing of pricing regulations to

Company	Field/Area	Status
Enron	Bajiaochang gas field, Sichuan Province	
Техасо	Yaan block, Sichuan Province	Has drilled two wells: Sanchenan 1 and Qionsui 2.
Genting Oil & Gas	Zhuangxi oil field, North China Basin	Enhanced oil recovery (EOR)
Shell	Changbei block, Ordos Basin	Evaluating gas reserves, study devel- opment and marketing of the field.
	Block 15/12, East China Sea	Exploration
Ivanhoe Energy/Mitsubishi Oil Group	Kongnan, North China Basin, Dagang	EOR
	Zitongxi, Zitongdong and Yudong blocks, Sichuan Province and munici- pality of Chongging	To conduct feasibility before signing PSC. Blocks are estimated to contain 20tncf of gas.
Phillips Petroleum	Peng Lai 19-3 oil field, Bohai Bay	Production
	XJ 24-3 and XJ 30-2, PRMB (Pearl River Mouth Basin)	Reserves of 19mn barrels and 14mn barrels respectively. The fields were commissioned in 1994 and 1995.
Devon Energy (ex Santa Fe Snyder)	Blocks 15/34 and 26/35, South China Sea; blocks 16/02, 16/05 and 27/10, PRMB	Evaluation on B15/34. PSC on B16/02 and 16/05 involves seismic and drilling of three wells. \$10mn to be spent on exploration on block 27/10.
Bligh Oil & Minerals	Block 22/12, Beibu Gulf	PSC
Digital Gas	Shengli, Daqing, Liaohe, Talimu fields	EOR
Statoil	Lufeng22-1, PRMB	Production. 1mn barrels of reserves.
BP (24.5%), Texaco (24.5%), CNOOC (51%)	Qinhuangdao 32-6 oil field, Bohai Bay	1bn barrels of oil in place. Entered production in October 2001.
BP	Yacheng 13-1 gas field, South China Sea	5mn barrels of condensate and 833bn cf of gas. Produces 3.4bn cm/y.
CACT	Bozhong 25-1-8 oil field, Bohai Bay	Discovered in 2000.
	Huizhou oil field, PRMB,160 km south- east of Hong Kong, and Huizhou 19-2-1 and 19-3-1 oil wells on block 16-19	Houizhou consists of 10 oil fields with reserves of 64mn barrels with six wells under production and six wells under development. It reached peak produc- tion of 27,000 b/d in 1999. HZ 19-2-1 and 19-3-1 were discovered in 2001 and their commercial development is being evaluated.
Japan's JHN	Lufeng 13-1, PRMB	Reserves of 3mn boe.
BP/Kerr McGee	Liuhua 11-1, PRMB	10mn boe in reserves. Commissioned in 1996.
Primeline Energy, Canada	Block 32/32 and Lishui 36-1, East China Sea	\$10mn work programme finalised.
Agip	Qaidam Basin	Oil and gas exploration.
Kvaerner	Changbei gas field and Huizhou 19-3-1	FEED and detailed engineering of onshore gas gathering, processing and transmission for Shell's Changbei gas field and FEED for CACT's HZ19-3-1.
Husky Oil	Wenchang 13-1 and 13-2, PRMB, South China Sea	Production at Wenchang to begin in 2H2002 and reach peak rate of 50,000

Table 3: Foreign participation in China's oil and gas sector

encourage investment in gas projects. Foreign investors are also being wooed by being allowed to hold majority interests at every stage of the gas projects.

On the domestic front the increase in production is to come from recent gas finds. The Tarim Basin in Xinjiang has gas reserves of 700bn cm and potential reserves of 1tn cm. The Inner Mongolia Autonomous Region is proving quite prolific. In its Ordos Basin four large gas fields with reserves of over 100bn cm each were recently discovered. Reserves in the Basin are expected to reach 2tn cm within a decade and annual output to between 40bn and 50bn cm/y.

Other major finds in the area include the Sulige gas field with reserves of 500bn cm, near the Changqing oil field, and a 700bn cm gas reservoir in the Ih Ju League. In the Qaidam Basin in Qinghai Province there are three large gas fields with reserves of 220bn cm, which are expected to increase to 300bn cm by year end. Production in the Basin is expected to reach 1bn cm/y.

In the East China Sea production is to be doubled at the Pinghu field by 2003 and the Chunxiao gas field, with reserves of more than 1.6tn cf, is expected to become a significant producer within the decade. The Shapingchang gas field is to be put into production with 11 new wells and the Dongfang1-1 field, with reserves of 1.274bn cf, in the northern part of the South China Sea is to be developed in two phases. Phase One consists of two production platforms, two onshore gas terminals, a 116-km subsea gas pipeline and 113-km onshore pipeline, and 12 development wells.

In the western South China Sea, four gas fields and 15 gas-bearing structures have been found – Yacheng 13-1, a joint venture with BP, is producing 3.4bn cm/y. In addition, in the East China Sea, two gas fields and eight gasbearing structures have been found – the Pinghu field, 250 miles from Shanghai, is already onstream. In the Bohai Sea, one gas field and 18 structures have been discovered.

PetroChina plans to put to tender 18 oil and gas blocks in the Tarim, Ordos and Songliao Basins. A total of 13 of the blocks are in the west and include the Kela-2 gas field. On one of the blocks the foreign operators are expected to take all the exploration risks and share any commercial discoveries with PetroChina. The other two blocks include three for gas development, 11 for oil development and three for production improvement.

Sunwing Energy, a subsidiary of Ivanhoe Energy, is to develop three major blocks in the Sichuan Province with estimated reserves of 20tn cf. Sunwing will carry out a feasibility study before finalising a PSA (production sharing agreement) with PetroChina.

West-East pipeline

To transport the gas from the western regions to the eastern and northeastern regions of the country, the Chinese Government is determined to go ahead with the construction of the West–East pipeline despite some western concerns over the commercial viability of the project. The pipeline will carry gas from the Tarim Basin to Shanshan and Hami and further east to Shanghai. Construction of both the western and eastern sections of the pipeline – from Lunnan in Xinjiang to Jingbian in Shaanix Province, and from Jingbian to Shanghai, respectively – will start at the same time.

The feasibility study for the project was carried out by the PetroChina Pipeline Engineering Company and construction was scheduled to proceed as *Petroleum Review* went to press. The pipeline will have a capacity of 12bn cm/y and will cost a staggering \$14bn. It is scheduled for completion in 2003. Equipment purchasing – which is to be domestically sourced and, if this is not possible, as part of a joint venture with foreign companies – is expected to account for 90% of the investment.

Participation by foreign companies in the construction of the line is limited to consultancy and supervision services. There is no limit, however, on the equity stake that foreign companies can hold. To interest the western oil majors PetroChina is offering equity production at the Kela-2 field – one of the country's largest gas fields. The government has also opened up the urban construction of a natural gas network for the cities affected by the project to foreign involvement. The Chinese Government expects a minimum of 12% return on investment.

Memorandums of Understanding have been signed with a number of foreign consortia, with Shell and Gazprom considered to be in the strongest position.

There are other major pipeline projects, currently underway as well as planned, that are to feed the West-East pipeline. There are two regional pipelines to be built by 2003. One is a 695-km line with a capacity of 3bn cm/y running from Sichuan through Wuhan (Hubei Province) to Hunan Province. The other is 900-km line linking Xi'an (Ordos Basin) in the northwest Shaanxi Province through Xinyang in Henan Province to Beijing and the northeastern Hebei and Shangdong Provinces.

A 935-km line that will deliver Qaidam gas (Qinghai Province) to Lanzhou is to begin operation this month. It has cost \$301mn and is planned to link up with the Xi'an-Beijing pipeline.

CNOOC also plans to build a major gas pipeline in Hainan in southern China, linking the Yangpu development zone to Haiku, the provincial capital. The 252-km line will cost \$60mn

Onshore	
Sichuan	730
Daging	225
Xinjiang	155
Liaohe	115
Zhongyuan	115
Shengli	90
Others	495
Total	19,925
Offshore	
Yacheng	325
Others	100
Total	425
Total	2,350
Source: Energy Econo	omist

source. Energy Economist

Table 2: Natural onshore and offshore gas production in 1999, mn cf/d

and is scheduled for completion in 2003. It will link the Dongfang gas field to a power plant in Yangpu.

Last year, Shell signed an agreement with PetroChina for a joint gas transmission and market development study for the Changbei gas field in Shaanxi in northwest China and Inner Mongolia in central China. The \$3bn project, in which Shell holds a 51% stake, involves gas extraction, pipelines and associated power generation. The Changbei field has reserves of 70bn cm and is expected to deliver up to 3bn cm/y to the eastern regions.

LNG imports

China's first LNG import terminal is to be located near the city of Guangdong in the southeast. It will have a capacity of 3mn t/y, with an initial investment of \$604mn. The project is a joint venture between BP (30%), CNOOC (30%) and a consortium of local firms from Guangdong and Hong Kong with the remaining stakes. BP will build the terminal that will go onstream in 2006. Its investment in the project is reported to be \$253.7mn. The tendering for the supply of the LNG is expected to start before the year-end. CNOOC has indicated interest in acquiring stakes in natural gas reserves in countries seeking to supply the LNG. However, two potential supplies for the project are considered to be BP's Tangguh project in Papua New Guinea and Australia's Northwest Shelf project.

CNOOC is also considering building LNG terminals in Fukien and Shandong on the eastern coast. A pre-feasibility study is underway. Shandong will have access to natural gas supplies from Bohai Bay as well as the supplies from the West-East pipeline – making it more likely that the import terminal will be located at Fukien.

China has also an agreement with Russia for the supply of gas from the Kovyktskoye gas field near Irkutsk in Siberia across a 2,700-km pipeline to Daging. The pipeline was planned to begin deliveries in 2006 of 20bn cm/y of gas by 2010 and 30bn cm/y by 2020. The cost of the pipeline is estimated at \$12bn. The feasibility study for the pipeline is due for completion by late 2001 or early 2002. The main foreign backer of the project is BP, which has a 30% stake in Russia Petroleum - the licensor for the gas field. However, with the decision to go ahead with the West-East gas pipeline and the Russian oil pipeline, construction of the Irkutsk-Daging pipeline has moved down the list of investment priorities.



Chad oil to flow in two years

One of the world's leastdeveloped countries is set to become a significant oil exporter by the end of 2003, through one of the world's most risky oil developments.

frica

ExxonMobil has jumped political, financial and environmental hurdles to launch the Doba Basin oil development. Field work and pipeline construction have now begun, writes *Martin Quinlan*. There can have been few less promising oil developments than that now being implemented in the south of landlocked Chad – a former French colony in the heart of Africa, whose 8mn citizens have a life expectancy of under 50 and exist on an average income of \$230 per year. Although oil was discovered in the Doba Basin (by Conoco) in the late-1970s, the country's instability, together with the cost and political risks of building a pipeline to the coast, made a development project out of the question.

ExxonMobil took over as operator of the Doba licence from Conoco, but it was not until 1990 when the country's civil war had run its course and the current President – Idriss Deby – had come to power, that development of the area was reconsidered. By that time the Basin's three large fields – Komé, Miandoum and Bolobo – had been discovered and recoverable reserves of about 1bn barrels established.

Risks and complications

However, the company's planned development project came with weighty risks and complications. An export pipeline route over neighbouring Cameroon to the Atlantic Ocean coast at Kribi necessitated tying Cameroon into the project. Finance had to be secured and, perhaps most difficult of all, the approval of the world's environmental groups had to be sought for a development which would involve driving a pipeline through the remote lands of Bakola pygmy tribes.

Cameroon was brought into the scheme through a small equity share in the pipeline - the share, together with that offered to the Chad Government. being financed by World Bank loans. (It is estimated that Cameroon will benefit by up to \$900mn over the 30-year life of the project while Chad will benefit by up to \$8.5bn, the exact amounts depending on oil prices.) However, financing the \$3.5bn project proved to be more difficult to achieve in view of the wariness of commercial lenders towards cross-border projects, particularly in Africa. Eventually, ExxonMobil and its partners agreed to provide 80% of the total cost directly, with 17% coming from the International Finance Corporation, export credit agencies, and loans from commercial sources. The remaining 3% is accounted for by the

two government interests in the pipeline – which will be owned by two joint-venture companies, Tchad Oil Transport Company and Cameroon Oil Transport Company.

Environmental aspects were tackled through what is claimed to be the most extensive public consultation and study process ever carried out for an international project. Launched in 1993, the process sought the views of 250 organisations internationally, and nearly 900 meetings were held at village level in Chad and Cameroon. The environmental assessment of the development ran to 19 volumes. The process continues - ExxonMobil says 33 full-time environmental monitoring staff are now working on the project, up from 25 last vear. The Worldwide Fund for Nature has described the project as 'one of the best-planned oil pipelines in the world."

Partner problems

ExxonMobil also had to overcome, at a crucial time in the project's planning process, one unexpected difficulty – the withdrawal of its two partners, Shell and former-Elf, who evidently viewed the risks and costs to be unacceptable. Together, the two departing firms had 60% of the venture. But within a few months ExxonMobil had been able to replace them with Malaysia's Petronas and Chevron, interests in the development becoming ExxonMobil 40%, Petronas 35% and Chevron 25%.

The uncertainties and challenges of the planning process have been matched by the development's engineering aspects - daunting because of the scale of the work, and because of the lack of infrastructure and local facilities. Work along the pipeline route started in October 2000, initially on the construction of infrastructure. Roads are being driven along the pipeline route from the coast, bridges are being built (including a new crossing of the M'béré river), accommodation has had to be constructed, medical facilities provided, and workers trained. ExxonMobil says the number of people employed on the project has built up to 3,500, or about half the estimated peak labour requirement.

Oilfield work

Because the oil is relatively heavy (although low in sulfur), 300 production *continued on p40...*

Pipelines

offshore

Offshore pipeline prospects

Pipelines form a major segment of the offshore oil and gas industry and over the period 1996-2000 some 32,135 km have been laid worldwide. But what are the prospects for the next five years? Here, Roger Knight of Infield Systems and Douglas-Westwood's Barney Parsons outline the findings of a recent study* that forecasts a recovery in the pipelines market followed by accelerating growth.

number of clearly definable macro trends are affecting the world offshore oil and gas industry at present, and will be of considerable significance to the offshore pipelines industry. Despite short-term regional declines such as occurred in South East Asia in 1998, the demand for offshore oil is set to grow and gas even more so. Alternative energy may offer great opportunities, but it is most unlikely that this will make any significant impact on offshore oil and gas demand over the next decade or so.

Over the past 10 years, global demand for natural gas has risen by over 18% to exceed 2,063mn toe, mirroring the increase in world industrial output. Natural gas now accounts for 24% of primary energy. With the exception of the Former Soviet Union (FSU), all the key regions have experienced this growth in demand, although to differing degrees. European growth has been 36%, slightly higher than North America at 32% but behind the Middle East and Asia-Pacific with 91% and 95% respectively, where gas use for electricity production is taking off in a big way.

Predictions of future demand vary widely – however the largest study, conducted by the European Union (EU) Energy Directorate, predicts that European demand for natural gas in 2020 will be close to 697mn toe, double the level achieved in 1998 and requiring an average of 3.1% per annum compound supply growth. This forecast is in line with that from the International Energy Agency (IEA) of slightly over 100% growth in demand in the period to 2020.

Security of supply

One of the consequences of the increased use of natural gas has been a developing anxiety amongst the EU and its members on the issue of security of supply. The EU has been actively promoting an increase in indigenous production and a greater range of transit

routes into and through the region. Over the next 10 years, security of supply is likely to become as important a factor as demand in the planning and instigation of major gas trunk pipelines.

Overall growth in global gas demand is set to continue, but markets are often long distances from sources of supply. At the same time offshore gas flaring is being actively discouraged. Over the next decade, these factors should also serve to increase greatly the requirement for large diameter trunk gas pipelines.

Shallow water field decline

Many of the major shallow water production areas are now in long-term decline. In the Gulf of Mexico the overall oil production trend has been downwards since 1971–1972. The North Sea is now set to follow, with reserve depletions exceeding additions. This year could mark a transition point in the development of the North Sea as an increasing number of fields become depleted and unable to sustain economic production levels.

As long as offshore infrastructure remains intact it can offer the potential of cost-effective tie-backs for the many new small fields or remote 'pools' of oil and gas in existing reservoirs. This will result in growth in the demand for flowlines.

In the past, giant North Sea fields such as Forties or Brent, which had flow rates exceeding 400,000 b/d, dominated industry thinking and resulted in the installation of massive offshore pipeline systems. But the game has changed by an order of magnitude – over the period to 2005 about 94% of all new oil fields and prospects under consideration are likely to have maximum sustainable production rates of less than 40,000 b/d.

Lure of deepwater

The understandable reaction of the oil majors has been increasingly to focus their attention towards the economies of scale offered by the largest prospects

Country/Region	1996-2000	2000-2005
Europe	10,304	11,843
North America	8,013	7,702
West Africa	1,966	3,872
Asia-Pacific	6,658	10,931
Latin America	2,704	3,273
Middle East	1,868	2,831
Others	622	1,643
Total	32,135	42,095

Table 1: World offshore pipeline market by region (km)





which mainly lie in the deep waters of the 'golden triangle' formed by the deepwater areas of the Gulf of Mexico, West Africa and Brazil. This process has been greatly aided by increasing confidence in the ability to produce economically from great water depths. So, for a number of years deepwater (in this context >500 metres) has been one of the strongest growth sectors of the offshore oil and gas industry.

One startling change is the main players' huge growth taking place in deepwater prospects. The World Deepwater Report* states that over the past five years only Shell bought some 2bn boe of deepwater reserves onstream. Over the next five years, the company has 2.8bn boe of prospects under consideration and is likely to be joined in the deepwater super league by five other players - Petrobras (2.9bn boe), BP (3.1bn boe), ExxonMobil (2.4bn boe), TotalFinaElf (2.7bn boe) and also perhaps ChevronTexaco (1.9bn boe). BG International also enters the picture with 1.2bn boe of prospects.

Over the past five years, some 51% of pipeline kilometres have been laid in

water depths down to 100 metres. But a fundamental change occurred in 1999 as the amount of pipeline laid in depths greater than 500 metres dramatically increased. The indications are that deepwater activity will continue to grow.

Future market

After the oil price fall of 1998 and the resulting decline in business in 1999 and 2000 we now expect the demand for offshore pipelines to resume its long-term growth trend. Our forecasts are that the overall market for offshore pipelines will grow in value from \$38bn in the five years from 1996 to 2000 to over \$50bn in 2001 to 2005. This is a result of an increase in the total length of offshore pipeline laid from 32,135 km in 1996 to 2000, to over 42,000 km in 2001 to 2005.

Up to 2004 we are expecting a steady growth overall to be followed by a more substantial growth in 2005 due to major trunklines being installed in the Asia-Pacific region. Europe is expected to show steady growth throughout the forecast period, but North America's activity is expected to remain relatively stable. West Africa is expected to show a peak in activity in 2003 and Latin America a peak in 2004.

The operators – The pipeline business is characterised by the large numbers of operating companies, some 420 in total. Of these, the top 20 account for 63% of future prospects. The names of the top five hold no surprises – BP, Shell, TotalFinaElf, ChevronTexaco and Petrobras.

Flexible lines – These form a special high value segment of the market which between 1996–2002 is likely to average some \$800mn/y. Our forecasts suggest a surge to levels of \$1.3bn in 2004 and 2005, much of this coming from increased activity offshore Brazil which is expected to account for about 65% of the 600+ km market by 2005. Europe is the second most important region in this market, which is expected to have a value of about \$1.3bn by 2004/2005.

Lay and burial – About 86% of steel pipeline kilometres are installed from conventional lay barges. Lines are reasonably equally divided between buried, surface lay and trenched. On average about 69% are trenched or buried in some way, reflecting their predominance in shallow waters.

About 99% of all kilometres of flexible lines are reel laid. Only 20% of kilometres are trenched or buried as many lie in deeper waters. Overall, pipeline trenching/burial remains a major activity.

Some outstanding new lay vessels are now entering the market and these justifiably attract long-term contracts and enhanced day rates. However, within the five years of our forecast these premiums may be eroded by competition. Rates for lay and trenching of small diameter flexibles and cables may also be affected by vessels entering the market from the telecoms sector that is currently suffering over-capacity.

Offshore pipeline prospects

In the past five years, some 32,135 km of pipeline have been laid worldwide, but for 2001–2005 there are identified prospects for 51,660 km. However, it is very important to differentiate between *prospects* and *forecasts*, as it is quite likely that a number of these lines will not be laid. Our forecasting process begins by establishing the km of pipeline that currently exist and are under consideration for the future. These identified future projects are placed in to three specific categories: 'planned,' 'possible,' and 'alternative.' A probability is then placed on each category.

However, the numbers resulting from this process eventually decline due to a lack of data for future years, particularly on small diameter (<16-inches) pipelines.

Pipelines

offshore

Therefore the result is adjusted for each of the five years on a region-by-region basis to take into account future discoveries that we believe will come forward for development.

The overall process results in our forecast of future pipeline kilometres to be laid. This figure is significantly below the level of total prospects. We then apply typical pipeline costs based on diameter and water depth and type of materials used to develop a \$ capex for each pipeline.

World market to 2005

Over the past five years some 32,135 km of subsea pipelines have been installed worldwide – our forecast is that over the next five years some 42,000 km will be laid. This should cause the annual value of the world offshore pipelines market to grow from \$8bn in 2001 to \$13bn in 2005, giving a total of \$50bn (compared to \$38bn in the previous five years). See **Figure 1**.

Europe will continue to form the largest segment of this market, at 29%, but we expect the largest future growth to be in the Asia-Pacific due to plans for the large diameter gas pipelines in the region (see **Figure 2**, **Table 1** and p28).

Apart from region, the other major segmentation of the market is pipe diameter. The market tends to divide at 16-inch. We expect pipelines up to 16inch to account for 54% of the future km forecast and 57% of the \$ value.

Looking ahead

The offshore pipeline markets show every chance of enjoying long-term demand growth prospects driven by the fundamentals of a continuing increase in demand for offshore oil and gas. The offshore industry, however, has a highly cyclical nature, due to the impact of variations in oil and gas prices and the differing state of maturity of individual regions. Therefore, those companies that are able to offer the widest range of pipe types and diameters, as well as methods of installation across the greatest range of geographic markets are likely to prosper most.

Thus, this continues to be a market best suited to those able to operate on a global scale and make a corporate commitment measured in decades.

* The World Offshore Pipelines & Umbilicals Report 2001–2005 is published by Douglas-Westwood, Tel: +44 (0)1227 831879; Fax: +44 (0)1227 832092; e:**admin@dw-1.com**; **www.dw-1.com** The oil and gas data on which the report is based is held on the Infield Database.

... continued from p37

wells will have to be drilled to produce a flow of about 225,000 b/d soon after start-up. Output is forecast to decline fairly rapidly to about 150,000 b/d after six years and to under 100,000 b/d after ten years. The drilling effort will be eased by the shallow reservoir depths, however - most wells will be only about 5,200 ft deep and it is expected that they will take only a week each to drill. Therefore, only two or three rigs will be needed. The Komé field - the largest of the three - will have 200 production wells, while Miandoum and Bolobo will each have 50. Each well will have an electric downhole pump at its base, and most will need gravelpacking to control sand production from the reservoirs' unconsolidated sediments.

The oil will flow from multiple payzones and will be accompanied by large volumes of produced water, which will be re-injected through an initial 25 injection wells, each designed to handle 25,000 b/d. As much as 900,000 b/d of produced water is expected after the first ten years of production.

Earlier this year ExxonMobil said that the first 50 wellsites had been identified, and were being prepared for the start of drilling before end-year. The site for the main gathering and treatment centre at Komé is being prepared. Komé will also be the location for the administrative and support buildings, an airfield, a generating facility and a topping unit. The generating plant, of 120 MW capacity, will be dual oil/gas-fired, with the small volume of field gas available covering about one-third of its fuel requirement. The large power output is necessary because of the need for electric downhole pumps from the outset of production. The topping unit, processing 1,000 b/d of crude, will produce about 100 b/d of diesel for field operations.

Trenched pipeline

The pipeline, running 1,050 km in a southwestern direction from the fields to Kribi (with 170 km in Chad and 880 km in Cameroon), will be trenched throughout its length – a decision prompted as much by security concerns as by environmental aspects. Most of the line will be a metre under the surface, although sections near surface installations and under roads will be deeper. The line will be 30 inches in diameter, giving a capacity of 250,000 b/d, with three pumping stations – one

at the Komé field and two in Cameroon, at Dompta and Belabo. The second and third pumping stations will have oil-fired heating systems to raise the temperature of the crude to 71°C to improve its flow characteristics. At Kribi, the oil will be piped 12 km offshore to a floating storage and tankerloading facility based on a tanker with 320,000 cm of storage capacity.

Pipe sections, manufactured in Germany, started arriving at the end of last year at Douala – the main receiving port for the project which is expected to handle some 340,000 tonnes of supplies during the project's construction phase. ExxonMobil says the pipe sections have now been moved onward to inland supply bases and that trenching is scheduled to start before the end of this year.

Construction of a pipeline into the heart of Africa will, for the first time, make exploration of the continent's landlocked states an attractive proposition. Up to now, the small discoveries which have been made in Chad, in the neighbouring Central African Republic and in inland Cameroon have been unexploitable, but spare capacity in the pipeline – which will increase as production declines – could allow small finds to be exploited at relatively low cost.

As soon as groundwork on the project started, the Cameroon Government said it had been approached by companies seeking blocks in the country's Logone Birni Basin, in northern Cameroon. Blocks in the Basin had been offered in 1999 in the country's third licensing round, but there were no takers then. In the north of the Central African Republic, an affiliate of US firm Grynberg is exploring a large block that extends to the border with Chad. The block covers parts of the Doba, Doseo and Salamat Basins, said to be part of a geological system which includes Nigeria's Benue Trough, Sudan's Muglad Basin and Chad's Chad-Doba Basin.

Chad also has plans for the development of the small Sedigi field, in the north of the country. A Sudanese firm, Concorp, says it will bring the two-well field onstream to produce some 5,000 b/d, which it will pipe 330 km to Chad's capital, N'Djamena. A small refinery will be constructed at N'Djamena to cover Chad's product requirements, which at present are all met by imports from Nigeria and Cameroon. Fuel oil from the refinery will be supplied to a new generating plant. OF PETROLEUM

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Breaking fresh ground ...

Cadman Lecture



Sir Mark Moody-Stuart KCMG, former Chairman of the Royal Dutch/Shell Group of Companies, became only the sixteenth holder of the Institute of Petroleum's most prestigious award, the Cadman Medal, which was presented to him at The Gibson Hall, London, on 26 September. Here, his Cadman Memorial Lecture – entitled 'Springboard for Progress: Building on the Energy Industry's Record of Responsiveness' – follows in its entirety.

t is a great honour to be invited to give the Cadman Memorial Lecture at the Institute of Petroleum tonight – following those distinguished previous speakers who made such a contribution to our industry.

In 1965, just before I joined Shell, the lecture was given by John Loudon – the father of the modern Royal Dutch/Shell Group. He looked forward to the state of the industry in 1990. Of course, not everything developed as he foresaw. But he was remarkably prescient. From the perspective of the post-war boom he expected demand for oil and gas to grow threefold in the following 25 years. In fact it only doubled after the 1970s' oil shocks curtailed growth. More important was his confidence in the industry's ability to meet expanding needs – finding new resources and extending recovery.

In particular, he recognised the increasing importance of offshore reserves and anticipated the industry's advance into deep water. When he spoke, production had only reached out to some 250 feet of water. By 1990 he expected it from 2,000 feet, or even more. And he wasn't far out. The remote-controlled, subsea production systems he envisaged are now common. He wouldn't have been surprised at our ability to develop the Mensa field in the Gulf of Mexico – in 5,000 feet of water and nearly 70 miles from the host platform.

We haven't yet realised his suggestion that gas could be liquefied underwater. But we look forward to doing so in floating LNG plants soon. His most striking foresight was in understanding so early the profound impact of the information and communications revolution – that tools like closed-circuit television, communications satellites and linked computers would transform international business.

I will be gratified if what I say endures half as well as John's insights.

Reflecting on responsiveness

The things he talked about remain central to our industry today – reflecting the long-term forces shaping energy businesses. One of these is the industry's responsiveness to changing conditions, expectations and possibilities – my theme tonight.

Early in my career the industry was transformed when major producing countries nationalised the concessions of international companies. In 1970, equity production of the seven majors accounted for over 60% of oil supplies... ten years later just half that. Their future was unclear. Would they end up merely as marketers of oil and gas produced by others? Or would they increasingly find their niches in new businesses – such as metals, coal, nuclear... or even department stores?

The 1974 Shell Transport annual report caught the uncertain mood when it asserted that 'oil and gas are likely to remain the central feature of Shell companies' business for the next decade or more.' Ironically, the cover picture – of a Brunei LNG tanker – illustrated a business which has expanded fivefold and looks forward to continuing strong growth.

As you can imagine this uncertainty was of some concern to those who had recently joined the industry... especially as an exploration geologist. So it was a particular pleasure, just before my retirement, to represent Shell at a ceremony in Saudi Arabia to launch major international projects to find, develop and harness the Kingdom's gas resources for national development. We are excited to have been chosen to lead one of the three core projects and to participate in another. This historic initiative reflects the far-sightedness of His Majesty King Fahd and His Royal Highness Crown Prince Abdullah. It is also a testament to the industry's responsiveness.

By responsiveness 1 mean understanding how our environment, markets and competitive situations are changing; how the expectations of our customers, partners and society are developing; how new possibilities could offer opportunities or threats. And then responding to those shifts – changing what we do and how we do it, engaging with those expectations, addressing the concerns, realising the opportunities. This responsiveness has been fundamental to the evolution of energy businesses – and will be essential for tackling the major energy challenges ahead. Let me reflect on the industry's response to some continuing challenges:

- extending resources,
- offering new choices,
- raising standards,
- working better,
- meeting expectations, and
- becoming trusted partners.

Extending resources

A prime responsibility is to provide the supplies to meet people's energy needs. Demand has grown by 80% since 1970, with developing countries taking an increasing share. Oil remains the dominant fuel. But gas is challenging coal, despite its use having been restricted. Nuclear – which was heavily promoted – meets about 8% of demand.

Many people didn't think we had the resources to meet expanding needs. In fact I believe that what the world is short of is not resources – material or financial – but of governance, capacity and social structures to address the issues which face us all.

The early 1970s also saw the publication of the Club of Rome's influential *Limits to Growth* – forecasting imminent exhaustion of reserves of many materials, including oil and gas. They didn't properly take into account that reserves are an estimate only of what can be recovered from known reservoirs under prevailing conditions – technology enables us to improve recovery and find more. Before passing on, I should mention that *Limits to Growth* was the first place I saw reference to rising atmospheric carbon dioxide concentrations. We shouldn't too easily dismiss all its messages.

But what does this tell us about our ability to meet energy needs over the next 30 years?

With the bulk of the world's people still in the full flight of development, energy consumption could grow even faster. By 2030 the world could be consuming twice as much as now – 60% of it in today's developing countries. The exclusion of the international industry from major producing areas in the early 1970s unleashed its capital, skills, and energy on a restless worldwide search for new resources. There are many more producing countries.

We had two strokes of luck. The first was the high prices without which learning to develop fields in the hostile waters of the northern North Sea would have been much more difficult. Some early projects were saved by sharp price increases. In a sense, this was a price subsidy allowing the development of new technologies. The other was the parallel development of computing. John Loudon mentioned automation and communications. The computer-based revolution in subsurface imaging was also fundamental.

I joined Shell just as the change from analogue to digital seismic was beginning. I remember a ingenious device for optically stacking analogue seismic in Brunei in the late 1960s. 3D seismic began transforming our vision from the mid 1970s – at first only to appraise discoveries and plan development then over wider areas for exploration.



Paul Tempest, past Director General of the World Petroleum Congress (WPC), questions Sir Mark Moody-Stuart at the Cadman Lecture.

Cadman Lecture

Seismic resolution and accuracy has continued to advance. Time-lapse seismic tracks reservoir performance. Reservoir models integrate subsurface information with modelling and simulation. There have been striking advances in visualisation. Drilling has responded to the new possibilities. I remember as a student working on cable tool rig thumping water wells for Burton on Trent beer. Then, as a wellsite geologist in Brunei, directing deviated wells - with a whipstock and magnetic compass cards in the drill collar. That is an age away from today's high-tech wells, steered - with real-time information from the drill bit - through a succession of precise and increasingly distant targets. The development of intelligent multilateral wells - automatically measuring and controlling production and downhole processing - will transform reservoir management.

After getting used to high oil prices for over a decade, their collapse in 1986 posed a fundamental challenge. But the industry responded by driving down costs with technological and organisational innovation. The marginal cost of non-Opec oil production is now below \$15/b... and falling. Costs of non-conventional resources are also being cut.

I don't share the pessimism of those who expect imminent resource constraints. I see no reason why the industry's responsiveness should suddenly wither. On the contrary, I detect a very healthy creative spirit. Liquid resources should be able to meet rising demand at least until 2025. Gas resources are less well known, but should be sufficient to meet even rapid demand growth for as long, and possibly far longer.

Offering new choices

But meeting energy needs is not just about extending reserves of oil and gas. It is also about offering new choices to our customers. The industry has a long record of doing this. Perhaps the most important extension of energy choice during my career has been the expansion of gas – previously largely confined to North America. Gas was in direct competition with fuel oil, which then accounted for nearly 40% of European oil sales. Fortunately, we were able to crack surplus heavy oil and add hydrogen to it to supply growing demand for transport fuels.

Gas has great competitive advantages for heating and power generation, as a source of ultra-clean



Left to right: Jeff Pym, Director General of the IP; Charles Henderson, IP President; Sir Mark Moody-Stuart and his wife, Judy.

liquids to help meet rising fuel standards and, potentially, as a source of hydrogen for fuel cells.

Emitting much less carbon than coal and negligible sulphur, gas is a vital bridging fuel for reducing greenhouse emissions, as well as improving air quality in developing cities. Gas consumption could double – perhaps grow threefold – by 2030. Extending gas use and developing new forms of energy such as gas-to-liquids, hydrogen fuelcells and renewables – overcoming technological challenges and fierce competition – requires long-term commitment.

The pioneering Shell Middle Distillate Synthesis plant at Bintulu was built in the late 1980s, when I was in Malaysia. With this experience – and many difficult lessons – we can now build second generation plants, competitive with LNG for commercialising remote gas.

People have been pursuing the potential of fuel cells for over a century. Shell worked on them 30 years ago before concluding they couldn't then compete - and donating our experimental car to the Science Museum. They are now very definitely back on the agenda - for distributed power generation and transportation. Many companies, including Shell, are investing heavily to develop renewable energy businesses - solar, wind, biomass, geothermal. Much progress is being made. For example, in wind energy - one area where Shell is active - the latest turbines, taller than the Statue of Liberty, can generate 10 times the power at a third of the cost of their 1990 predecessors.

The relentless, competitive drive to innovate, experiment, improve produc-

tivity, offer new choices and discard the unsuccessful – in response to market signals – is a powerful spur to technological progress.

Governments also have an essential role. But I believe they achieve most by establishing a framework that encourages enterprise to pursue new possibilities. Let me give an example from Texas. Prudently Texas wants a small percentage of renewable energy in its electricity supply. Suppliers can either generate the energy themselves or trade it in - or be fined more than the market clearing price. The low percentage and some federal tax breaks means this has a negligible impact on costs. So consumers support it. As a result of this regulation driven but market-based approach targets for renewable energy have been exceeded - mostly from wind as ranchers are happy to lease land to wind developers.

Renewable energy has an important role in providing clean and efficient energy to the more than one billion people who must rely on firewood or animal waste – and suffer badly from the physical burden, damage to health, and exclusion from amenities.

Raising standards

As well as meeting growing and shifting energy demand, the industry has raised its standards – reflecting changing societal attitudes. Our operations have become much safer and healthier. Their environmental impact has been greatly reduced. We have helped provide solutions to wider environmental problems.

For instance, there is a popular perception that vehicle emissions are growing. In reality, vehicle emissions of major pollutants in Britain fell by a half during the 1990s – despite a 12% increase in mileage – and are forecast to do so again by 2010. But, although pollution is being tackled in developed countries, there are still severe problems in developing ones. The industry has an important role in spreading advances.

The climate threat represents a more fundamental challenge for a world that depends on fossil energy to support rising living standards. Anyone who has read the scientific section of the *IPCC Third Assessment Report* cannot fail to be impressed by a solid and unemotional piece of work. I commend it to you. This is the quality of work on which we base our investment decisions. The range of uncertainty is clearly identified, as are the assumptions.

I think the upper end of the range of emissions scenarios is as unlikely as it is undesirable - a simple extrapolation from the present. The lower end results from a doubling of atmospheric carbon dioxide concentrations from pre-industrial levels. It assumes significant, but entirely achievable, changes in energy patterns. It shows carbon dioxide climbing to about 550 ppm - raising temperatures by two degrees (in the range 1.4°C to 3.2°C), and sea levels by 30 centimetres (in the range 10 to 55 centimetres) by the end of the century. I believe the emissions patterns that would stabilise atmospheric carbon dioxide at this level are achievable, and the resulting changes are probably tolerable although we would need to adapt.

But how do we ensure that global energy patterns evolve to deliver these results? I referred to expanding energy needs as developing economies climb the energy ladder. In the medium term, these can only be met by hydrocarbons.

We need to switch to less carbon intense fuels. Meeting the growing energy needs of India and China – with more than one-third of the world's population – with gas rather than by burning coal would be a major advance. We need to work hard on energy efficiency. We need to develop regulatory frameworks that shape the direction of power generation but leave the market to deliver the most economic solution, as in the Texas example.

And then there is the great challenge of transportation. I was recently asked by a European environmental minister what we could do to wean the public off its great love affair with the motor car. We all know the dangers of interfering in other peoples' love affairs and I think this is a misguided approach. Recent events have shown that there are limits to taxation, which can also distort competition.

But the love affair is with personal transport and personal space, not the internal combustion engine. What we need is regulation to guide overall fleet efficiency while leaving companies to respond to the wants of their customers. There is no market for hair shirts in either the developed or developing worlds. So we have to deliver the required comfort and performance much more efficiently. The possibilities are already being demonstrated.

My wife recently bought a Toyota Prius petrol-electric hybrid. It is highly efficient with computer-controlled choice of energy source – including regenerative braking – to suit driving conditions. It is a pleasure to drive, with good comfort and performance. The Hypercar project is working to put together a range of advances – state-ofthe art electronics, hybrid technology, fuel-cells, control-by-wire, lightweight construction – to create a luxury car with high performance, safety and environmental standards. They hope to have it in production in the next six years.

Rather than hair shirts we need what I call eco-hedonism – taking pleasure from performance and comfort, as well as cleanliness and efficiency. We also must start developing emissions capping and trading systems as soon as possible. This requires national and international action.

Individual companies are experimenting. In Shell, we set ourselves climate related targets in 1997, but even as an energy company it took us two years to understand our own emissions. We are just beginning to learn how such systems really work and getting the cost of carbon routinely factored into business decisions.

The industry's response to such challenges follows a predictable pattern. We start by crying that it is all too difficult and expensive. Then, when we see that it is inevitable, we stop arguing, apply our creativity and come up with all sorts of ideas for doing things... sometimes even without cost.

Let me give one example. The gas plant that handles production from some deepwater fields in the Gulf of Mexico had to be shut-down for maintenance. Normally this would either have required flaring associated gas or cutting oil production. The team responsible – conscious of both business and environmental imperatives – decided to do neither, without knowing how they would achieve this. They found they could supply the gas directly to the distribution system – with tight communications to deal with any production problems. Their solution has

IP Cadman Medal

The prestigious IP Cadman Medal and Cadman Memorial Lecture commemorate the late Lord Cadman of Silverdale, CGMC, Chairman of the Anglo-Iranian Oil Company (now BP) and President of the Institute of Petroleum from 1916–1917 (as Sir John Cadman) and 1935–1937.

The Cadman Memorial Fund was set up in 1946 by Lord Cadman's colleagues and friends at Anglo-Iranian and provides for the endowment of a memorial lecture on some aspect of the science of petroleum and the presentation of the Cadman Medal. The Award is made by the IP as trustee of the Fund, and is made on an international basis for outstanding service to the petroleum industry.

Previous recipients include Sir David Simon in 1997, now Lord Simon of Highbury, Sir Alastair Down, Sir Peter Baxendell and Sir Peter Walters.



The Cadman Medal on one side bears a portrait of Lord Cadman and, on the other, a figure holding a bowl with the inscription 'Per Ingenii Lumen Ad Scientia Auctum' (Through the Light of Intelligence to the Increase of Knowledge).

Cadman Lecture



IP President Charles Henderson presents Sir Mark Moody-Stuart with the Cadman Medal.

become a standard approach.

The key point is that they took the decision themselves and had the detailed knowledge to find a solution. We need to state the goals, provide the framework, and then encourage and enable people to respond.

Working better

An important aspect of improving responsiveness has been developing better ways of working – less hierarchical, based on interdisciplinary teams, focusing on learning and sharing knowledge, encouraging creativity and emphasising personal accountability. This has had a huge boost from electronic communications, making possible global knowledge management.

Now e-commerce is poised to transform the way business is done providing new ways of understanding, reaching and serving customers, and creating efficient, transparent, immediate online markets in such areas as procurement, trading, logistics and currency.

Meeting expectations

Society's expectations of what multinational companies should deliver have changed. In the past, we were held responsible for the way we behaved and our own operational standards. Now we are also expected to make a wider contribution to the communities and societies where we operate.

Because business in seen as being powerful, we are seen to be at fault when something goes wrong – even as a result of misgovernment. Of course, all those who work in this industry, and those who have a stake in it, are also part of society and reflect those changing ideas.

The first essential, I believe, is to have clear and assured principles, adopted throughout an organisation. People should be able to say with confidence 'this is what we do, or do not do.'

Some principles, of course, can be stated categorically, such as prohibiting bribery; while others, such as commitments to supporting human rights or sustainable development, are by their nature much more complex. In Shell, we have learned to engage with such issues – with the help of outside experts – to develop a shared understanding of how to act.

We should always be prepared to make a contribution where we have something to offer. We should never just say 'this is not our concern.' If it is a problem for society, it is a problem for us. But we also need to recognise the limits on our mandate and capabilities. We need to engage with people's concerns and expectations – discussing how we can respond, confronting difficult issues, working with others to find solutions. Doing so will help to build trust. But this also requires a commitment to transparency so that people can properly judge whether we are doing what we say. One of the things I am most pleased about is the development of the *Shell Report* as the focus of our transparency and engagement processes. But we need to keep working at it.

Being trusted

I started with the breach with major producing countries in the early 1970s. The industry is rebuilding relationships with them – and in major markets – by demonstrating that we can be trusted to help meet their aspirations without threatening their sovereignty or values.

In Shell, we believe that this is demonstrated in our long-standing, committed relationships around the world. These are based on strong, locally-rooted companies which harness our global capabilities and standards to develop their country's resources, meet its energy needs and contribute to its development.

But enduring relationships can never be based on sentimentality. They depend on always delivering added value – access to capital, better technology, operational skills, markets.

People respond

I have talked about the industry's responsiveness. In truth it is people who respond. What we have achieved is a testament to the quality of people in this industry. Their skills and commitment will be vital for meeting future energy challenges, which is vital for our world.

Doing so requires attracting, developing and getting the best from the best people. We need to be truly multinational – valuing cultural diversity and individual worth throughout our operations. People will work for an organisation whose values they can share, and where different ideas and approaches are welcomed.

We know that customers buy from companies they feel comfortable with – again a reflection of both the values and the people in the company.

I have no doubt that working in energy industries – applying scientific knowledge and advanced technologies to deliver the energy people need, contributing to sustainable development, working in diverse international teams, enjoying the stimulation of commercial competition, serving people – will remain a very rewarding and worthwhile career.

I have certainly found it so. It has been an honour to part of a great endeavour for some 35 years and I thank all who have made it so enjoyable.

THE INSTITUTE OF PETROLEUM

Training Courses 2001

5 - 6 November 2001, London

in association with

THE EXPLOITATION AND MANAGEMENT OF OFFSHORE TRANSBOUNDARY HYDROCARBONS

Many of the world's prospective offshore basins are located in areas where maritime jurisdiction is claimed by more than one country. Overlapping jurisdictional claims are rarely good news for the oil industry, but they do not necessarily spell disaster. This 2-day workshop will examine how governments and oil companies have approached the exploitation and management of transboundary hydrocarbon resources, with a particular emphasis on the purpose, function and different models of joint development zones.



in association with MCH

OIL & GAS CONSULTANCY



19 - 23 November 2001, Hong Kong

LP GAS TRADING, MARKETING AND PRICE RISK MANAGEMENT

This residential five-day course is aimed at developing the understanding of the dynamics of LPG supply, pricing, shipping, trading & marketing in the region and the identification and management of price risk. The interactive course will include presentations from industry experts, case studies and a visit to LP Gas facilities in the area. Subject matters to be reviewed and discussed will include: global and regional supply and demand; market implications; price setting; shipping; marketing sectors; trading; managing the price risk.

26 - 30 November 2001, Cambridge in association with PRICE RISK MANAGEMENT IN THE OIL INDUSTRY

Delegates will become part of Invincible's fictional trading team identifying and managing its exposure to price risk. They trade the full range of derivative markets, including the live, futures markets which are received on-line through Reuters and Telerate. Options are traded using a simulation programme. Delegates compare the performance of different instruments over time and changing market conditions and learn how to choose an instrument to match their objectives. The course explains the workings of futures, forward, swaps and options markets and how they can be used for hedging and price management purposes. The course expects a high degree of participation from delegates.





13 - 14 December 2001, London in association with SGS CUSTODY TRANSFER OF CRUDE OIL -TRADING AND LOSS CONTROL ISSUES

This two-day course covers the principles of custody transfer, the units of measurement and the terminology used. Participants will become aware of the need to minimise the uncertainties during the various measurements that are crucial in performing a custody transfer. They will also learn the acceptable limits within which measurements may differ and what can cause excessive differences and their effect on the final outcome.

For more information please contact: Lynda Thwaite at the Institute of Petroleum Tel: 020 7467 7154 Fax: 020 7255 1472 E-mail: Ithwaite@petroleum.co.uk www.petroleum.co.uk/training



Utility system solutions now available online

Linnhoff March – a UK pinch analysis and process optimisation company – has made its utility system software products available online following the recent signing of an agreement with Texas-based online software engineering provider and hosting service WaveOne.com (www.waveone.com). The deal covers three products – ProStream, which is used for steam system design; WaterTracker, which provides rapid water and containment balancing; and WaterPinch, which minimises freshwater and effluent costs in process plants.

WaveOne's website allows products to be purchased directly, on a time-used basis, using a fully automated and secure system. For users, this means rapid access to powerful modelling tools and much easier sharing of results.

Tel: +44 (0)1606 815100 Fax: +44 (0)1606 815151 e: sales@linnhoffmarch.com

Measuring coating thickness

A wide range of hand held options for measuring coating thickness have been developed by Fischer Instrumentation (GB). The MPOD basic instrument model is designed for applications where full onboard statistical analysis is not necesary. It has an integrated constant pressure probe for one-hand operation, with the screen displaying the coating thickness reading instantaneously. There are three basic models: Permascope and Isoscope for ferrous and non-ferrous substrates, and the Dualscope which automatically determines the substrate before making a measurement. At the top end of the scale, the Dualscope MP40 combines the magnetic induction and eddy current methods in one instrument.

Tel: +44 (0)1590 684100 Fax: +44 (0)1590 684110



'Breakthrough' with 3D borehole radar

T&A Radar of Amsterdam has unveiled its new 3D borehole radar technology. Claimed to represent a 'breakthrough' in ground radar technology, the new product is reported to provide a faster and improved quality of information. It has a variety of uses including the detection of unexploded ordnance tunneltrack survey, determination of the diameter of jetgrout columns, and oil and gas reservoir surveys.

3D borehole radar (BHR) combines the techniques of directional sensitivity with energy bundling by placing rotating reflectors behind the dipole transmitting and receiving antennas. This laser concept is claimed to be unique – 'until now no-one has successfully integrated a transmitter and receiver into one system that is capable of surveying soil construction and has the range and accuracy to determine the exact position of objects within boreholes,' states the company. 'Depending on soil composition, it is now possible to survey an area up to 15 metres within the diameter of the borehole. Previously, the maximum diameter of the surveyable area was roughly 1 metre.' The company has taken out a patent on the technology.

The application of 3D BHR for detection surveys of unexploded ordnance is claimed to reduce, in most cases, the amount of drilling. 'In comparison with existing methods, this can lead to cost reductions of between 60% and 80% and improve quality, claims T&A Radar.

Tel: +31 20 665 1368 Fax: +31 20 668 5486 www.ta-radar.nl

Dosing pump range extended

Milton Roy's G Series of mechanically actuated diaphragm dosing pumps has recently been extended following the introduction of the new GM version. The new pumps are of all-metal construction so that they can be easily multiplexed for automatic process situations. Multiplexing is possible with the same or different heads, flow rates and materials, states the company.

Models are available which provide flows from 2 l/h up to 500 l/h, at pressures up to 12 bar. The wide choice of motor options extends to those for use in hazardous areas and others that offer variable speed control. Stroke counting is also possible which means the pumps can be used for batching applications.

Single or double mechanically actuated PTFE diaphragms can be specified, with stainless steel, polypropylene and PVDF liquid ends supplied as standard.

Tel: +44 (0)118 977 1066 Fax: +44 (0)118 977 1198



NEWSchnology

Electro-optic level switches in customised lengths

Gems Sensors has unveiled its ELS-300 Series liquid level switches, designed to offer users 'enhanced levels of versatility.' The single point, electro-optic switches are available in lengths to 380 mm, specified in 3 mm increments. This is reported to allow engineers to provide intermediate liquid level monitoring from a sensor mounted in either the top or bottom of a storage vessel; most conventional electro-optic switches must be installed through the side of the tank.

The switches are reported to be extremely reliable as they have no moving parts and offer simple, onepiece installation. Typical applications include leak detection, hydraulic reservoirs and pharmaceuticals.

The switches feature a simple yet reliable operating principle, states the manufacturer. The electro-optical sensor contains an infra-red LED and a light receiver. Light from the LED is directed into a prism, which forms the tip of the sensor. With no liquid present, light from the LED is reflected within the prism to the receiver. When rising liquid immerses the prism, the light is refracted out in to the liquid, leaving little or no light to reach the receiver. Sensing this change, the receiver actuates electronic switching within the unit to operate an external alarm or control circuit.

The switch range is claimed to perform with a repeatability of ± 1 mm, and operate on 5 VDC or 10-28 VDC with current consumption of 25 mA. It also offers an operating temperature range between -20°C to 100°C, in operating pressures up to 10 bar G.

Tel: +44 (0)1256 320244 Fax: +44 (0)1256 473680



Infra-red fingerprinting of heavy duty coatings

International Protective Coatings (IPC) claims to be the first, and only, coatings company to be promoting the systematic infra-red fingerprinting of heavy duty coatings in order provide a 'global guarantee' that the coating is 'all that it claims to be.'

The company explains that 'it is common knowledge... that it's possible to mislead the client as to the content of a paint formulation... [in order to appear] more competitive.' It is not always a case of 'a backdoor way of improving profitability' for the coatings supplier, however, 'for many companies the globalisation of the coatings business has inadvertently caused problems of consistency and supply of goods, particularly in the more remote geographical areas.' Problems include the fact that where brands are made under licence, the brand owner is not able to control the details of manufacture and may not know that the formulae are being strictly adhered to, points out IPC.

Fingerprinting identifies chemically whether a product specified at head office and registered as such is the same as the product supplied on site. IPC promotes the use of independent random infra-red fingerprinting on any of its global product range, wherever they are produced. The company has 21 factories around the world, each producing wholly owned products to identical formulae. Raw materials suppliers are required to ensure all their products are supplied to the same grade and quality worldwide.

'All specifiers need do,' states the company, 'is to write into the specification the requirement that suppliers of coatings will be subjected to random, independent infra-red testings. We actively encourage our customers to request this.'

Tel: +44 (0)171 479 6000 Fax: +44 (0)171 479 6555 www.international-pc.com

Bearings help pump up reliability

NSK has developed a new series of bearings – the BMPC Series, designed specifically to meet the rigorous demands of centrifugal pumps, in particular the requirement to extend the periods between pump failures.

The new bearings are claimed to 'exceed the API 610 specification with the strongest machined brass cage in the industry, providing superior reliability in the harshest of applications.' They are also reported to offer longer service life, through smoother running, reduced levels of friction and lower temperatue rise as a result of the better heat dissipation of the brass cage material.

The BMPC bearings are manufactured with 40° contact angles in order to ensure

the optimal angle to support both the thrust loading and rotational speeds of pumps. They also have universally ground faces to allow mounting versatility in either pairs or triplex sets, on a wide range of shaft sizes from 20 mm outside diameter (OD) to 150 mm OD.

Single row angular contact bearings with stamped steel or pressed brass cages, and universally ground faces, are available for less critical pumping applications. Also included in the range are double row angular contact types, single row deep groove ball bearings and spherical, cylindrical and tapered roller bearings.

Tel: +44 (0)115 936 6600 Fax: +44 (0)115 936 6702





Multi-gas monitor offers one-touch simplicity

Crowcon has developed a version of its Custodian personal gas monitor that is said to offer simplified features and easy operation via a single button. With a weight of just 500 grammes, the Custodian C is designed for users who require continuous protection against multiple gas hazards without advanced software features such as datalogging. The instrument is capable of monitoring up to four gases simultaneously, warning of dangerous levels with powerful audible and visual signals.



Wristwatch beacon

Aberdeen-based electronics company SML Technologies has developed a wristwatch personal locator beacon claimed to achieve ranges of up to 1.5 NM to a fast rescue craft. In recent trials in Europe, signals from the minute radio transmitter were picked up by standard helicopter direction finding modules, states the company. SML has already secured £500,000 worth of contracts from seven North Sea operators, including BP. It has also signed a \$850,000 contract with Conoco Indonesia in a deal that includes multiple marine radar tracking systems to be used in the West Natuna transportation project in the Asia-Pacific.

Tel: +44 (0)1224 338338 Fax: +44 (0)1224 338339 The monitor is available in two configurations – a three-gas unit measuring oxygen, flammable gas and hydrogen sulfide, and a four-gas unit also measuring carbon monoxide. Both feature an auto-zero function to assure the user of correct operation when the unit is switched on.

Gas levels are displayed on a highcontrast, back-lit display which automatically scrolls between readings. If a hazard is detected, a wailing siren is triggered (producing 85 dBA at 1 metre), together with ultra-bright flashing LEDs which are said to be visible over a 270° range. Alarms are reset by pressing the single button control, which is oversized to allow easy use when thick gloves are worn.

The removable battery pack, secured to the monitor by a click-lock mechanism, is certified intrinsically safe, allowing it to be changed in hazardous areas if required. Unlike NiCad (nickel cadmium) batteries, the NiMH (nickel metal hydride) pack can be tricklecharged and recharged at any point without damage. A full charge will power the unit for at least 12 hours.

Tel: +44 (0)1235 553057 Fax: +44 (0)1235 553062 e: sales@crowcon.com www.crowcon.com



Pigging the deep pipeline

Halliburton Subsea and UK pigging system specialist GD Engineering have teamed up to offer a new subsea pig launcher (SPL) designed to pig deepwater pipelines without interrupting production. The alliance provides oil and gas field operators with the design, fabrication, installation and servicing of the SPL.

Said to be capable of operating at a design pressure of 10,000 psig (689 bars) in up to 10,000 ft (3,048 metres) of water, the SPL has been developed to provide a cost-effective solution to flow assurance problems in long subsea tiebacks. The conventional method of connecting satellite fields to host facilities, via dual flowlines, allows round-trip pigging operations to clean the lines. This new system is reported to enable operators to use a single flowline for tie-back, resulting in 'considerable field development and cost savings.'

The SPL holds between 10 and 12 conventional pigs and uses a proven, remotely operated hydraulic pig delivery system from the service umbilical to ensure that positive control of pig displacement and release is achieved. The system is reported to overcome problems commonly associated with 'pig hang-up' in more con-ventional gravity feed systems, a development that allows the SPL to be installed in both vertical and horizontal orientations. The reloading of pigs is carried out from a standard remotely operated vehicle (ROV) support vessel. Only the initial SPL installation and launcher barrel recovery require the use of a multi-service vessel (MSV).

To avoid the release of hydrocarbons or methanol, environmentally friendly hydraulic fluid is used to launch the pigs into the flowline. Since at no time can hydrocarbons or methonal enter the retrievable section of the SPL, pigs can be left in the launcher barrel on the seabed for a long period without any degradation, explain the companies.

Tel: +1 281 575 4162 Fax: +1 281 575 5066

If you would like your new product releases to be considered for our Technology News pages, please send the relevant information and pictures to: Kim Jackson Associate Editor, Petroleum Review 61 New Cavendish Street, London W1G 7AR, UK



Corrosion Onboard Crude Oil Tankers*

(Available from Intertanko, Bogstadveien 27B, PO Box 5804 Majorstua, N-0308 Oslo, Norway). 52 pages. Price: \$50 Intertanko member; \$100 non-member.

Publication of this cargo tank corrosion awareness guide followed Intertanko's investigation of accelerated pitting corrosion rates found in the cargo tank bottom plating onboard a number of recently built double hull crude oil tankers. Certain ships of this type have also experienced higher than average corrosion rates at the cargo head tanks in the ullage space. The report highlights the nature of the problem and factors which may be relevant, and goes on to recommend measures that the industry should consider in order to minimise the impact of such corrosion. The wide range of information currently available on tank head and bottom corrosion is also noted.

ICED 2001

Editors: S Culley, A Duffy, C McMahon & K Wallace (Professional Engineering Publishing, Northgate Avenue, Bury St Edmunds, Suffolk IP32 6BW, UK). Available in four volumes: Design Research – Theories, Methodologies, and Product Modelling, ISBN 1 86058 354 7, 752 pages, £165; Design Management – Process and Information Issues, ISBN 1 86058 355 5, 656 pages, £149; Design Methods for Performance and Sustainability, ISBN 1 86058 356 3, 800 pages, £179; Design Applications in Industry and Education, ISBN 1 86058 357 1, 544 pages, £119. All four volumes offered at a discounted price of £549, a saving of 10%.

The proceedings of the 13th International Conference on Engineering Design (ICED) 2001 have been published in four volumes. The papers focus on the process of planning, developing and designing technical systems and products, covering all aspects and disciplines of engineering design, from general product development and innovation to feature-based geometric reasoning and design for later life phases.

Petrol Retailing Within a Global Context*

Marcel Cohen & Edward Bradfield (Whurr Publishers Ltd, 19B Compton Terrace, London N1 2UN, UK). ISBN 1 86156 243 8. 120 pages. Price: £29.50 (hardback).

This book is aimed primarily at executives and new graduates in oil companies. It describes the workings of the petrol retailing industry, but in a challenging way aiming to 'break the mould' and stimulate fresh approaches to old problems. It begins with the shape of the industry, the motivation of customers in buying petrol and the nature of the petrol business. It then homes in upon the components of the product on offer and the marketing variables that surround it. The authors then turn to some broader issues such as regulatory restrictions, new competitors and a blueprint for the future. The theme of the book is that oil companies have tended to 'play safe' when faced with dilemmas. However, the authors show that playing safe can be dangerous!

Motor Vehicle Emission Regulations & Fuel Specifications (1996–2000)*

(Available, free of charge, from Concawe, Boulevard du Souverain 165, B-1160 Brussels, Belgium.) 297 pages.

This report (no 2/01) details the development of worldwide legislation and regulations governing motor vehicle emissions, fuel specifications and fuel consumption from 1996 to 2000. It describes legislation on emissions limits and emissions testing, vehicle inspection and maintenance programmes, and legislation aimed at controlling in-service emissions performance, fuel consumption and carbon dioxide emissions. Automotive fuel specifications (including reference or certification fuels) and fuel characteristics are also documented.

*Held in the IP Library



YOUR OFFICE AWAY FROM HOME

New Editions to Library Stock

IP Members are welcome to suggest additions to Library stock. Please e-mail or write to Catherine Cosgrove giving as many details about the publication as possible, and quoting your IP Membership Number.

- Buyers Guide and Directory of Members 2001–2002. Pigging Products and Services Assocation (PPSA), Stroud, UK, 2001.
- Drilling Technology in Nontechnical Language. By Steve Devereux. 1st ed. Pennwell, Tulsa, US, 1999.
- Foresight: Energy Futures Task Force: Fuelling the Future A Consultation Document. Department of Trade and Industry (DTI), London, UK, 2000.
- Fundamentals of Oil and Gas Accounting. By Rebecca A Gallun; John W Stevenson; Linda M Nichols; Charlotte J Wright. 4th ed. Pennwell, Tulsa, US, 2001.
- Oil and Gas Prospects: 2001 Update. Aberdeen City Council, Aberdeen, Scotland, 2001.
- OTC 2001: Offshore Technology Conference Proceedings. Society of Petroleum Engineers (SPE), Richardson, Texas, US, 2001.
- Seminar on Offshore Oil and Gas Environmental Research Priorities. Department of Trade and Industry (DTI), London, UK, 2001.
- World Energy Resources Map. 1st ed. Petroleum Economist, World Energy Council, London, UK, 2001.

Library & Information Service Hours

Open 9.30 am to 5 pm Monday to Friday (except Bank Holidays). Non-members are welcome on payment of an entrance fee of £20 for half a day or £30 for a full day. Student non-members may use the Library for £2 per day if they bring a letter of introduction from their tutor and their student ID card.

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- Sally Ball, IFEG Secretary, +44 (0)20 7467 7115

Fax any of the above on +44 (0)20 7255 1472 or e-mail: lis@petroleum.co.uk Visit our website at www.petroleum.co.uk

Membership News

NEW MEMBERS

Ms F O Adeyemo, Nigeria LNG Ltd Mr A A Adeyinka, Lagos Mr D C Baker, Stourbridge Mr J M Baran, London Mr B Bean, Castletown Mr P Bond, Mutual Trust Management Mr B Bricelj, Lazard Brothers & Company Ltd Ms D S Cooper, Ashstead Mr I Driver, Hornchurch Mr P N Gichana, Securicor Distribution Ltd Mr T Grigalashvili, Itochu Petroleum Company, Singapore Mr A W Hayley, SIP Limited Mr T A Jones, MDT International Dr N A Keron, Bedford Mr I Khan, SCI Limited Mr L K Kleppe, Repsol YPF Ms C Kong, Brunei Professor T Lange, Holywell Mr S Nishi, Cosmo Oil (UK) plc Mr M O Oka, Alba Petroleum Marketing Company Mr S Penn, Alpeco Ltd Mr N L Redford, Alba Power Ltd Mr Y Sato, Cosmo Oil (UK) plc

OBITUARY

PHILLIP GRIX 1938–2001

The Institute of Petroleum regrets to announce the death of Phillip Bertam Grix, a former employee of IP Corporate Member Conoco, on 22 September 2001.

Phillip joined the RAF in 1956 and stayed in service for 12 years working as a ground electrician and fitter in Germany and Malta. He then briefly had a desk job before joining Conoco at the Humber refinery in December 1970 as an Operator Trainee on the crude distillation units. He became a Shift Laboratory Technician at the refinery in 1974.

Those who travelled to work with Phillip at this time will remember the huge, heavy Humber Hawk that his mechanical knowledge kept running well beyond its 'sell by date', and trying to push start it on winter mornings! It was this interest that led him to take over the job of 'engine man' on April 1985 when Charlie Patchett retired. He quickly became an active and enthusiastic member of the IP CFR Engine Panel, taking over the Chairmanship of the Cetane Engine Section in 1991, a position he held until his retirement in June 1995. Through his CFR engine work he became involved with CEN and the ASTM.

Our thoughts go out to his wife, Vicky, and children Yvonne, Kenneth, Anthony and Timothy.

Dr W E Schollnberger, BP plc Mr D Spitsyn, Douglas Mr S Wade, Vinson & Elkins Mr F R Welsh, Pump & Petroleum Services Mr S D York, Uinson & Elkins

STUDENTS

Mr D S Goode, Tamworth Ms S L Huntley, Cranfield University (CCAS) Mr K Issabekov, London Mr A W Shote, University of Dundee

DEATHS

We have been notified, over the past few months, of the deaths of the following members:

	Born
Ar W T Cooper	1922
Ar D S M Harriss	1925
Ar C F Hunt	1922
Ar J C Jewell	1912
Ar P I Webb	1929

Update on IGEM/IP merger plans

Over the last month discussions have continued concerning the proposed merger of the IP and IGEM. Preliminary meetings have been held with the Secretary of The Privy Council (responsible for IGEM's chartered status) and a Charity Commissioner (both organisations are registered charities). The DTI's view was also sought. All these consultations produced positive results.

The Councils (the ruling bodies of both organisations) each approved in principle the process to continue towards a possible merger. The IP Council has approved the appointment of specialist lawyers to help us get through the complex process required by charity and charter legalities and a small budget to fund the first steps.

They also asked that the IP management take soundings to assess the views of the membership before a 'decision' is put to them. This process has begun with the Director General having informal discussions with the CEOs of our corporate oil company members, a positive view from the meeting of the Branches Committee (which also endorsed the process) and the start of presentations to individual branches (Aberdeen on 9 October 2001).

Petroleum Review will continue to keep members informed about progress with this process as it develops.

EVENTS

London

NOVEMBER 2001

5-6

The Exploitation and Management of Offshore Transboundary Hydrocarbons Details: IP Training Department e: training@petroleum.co.uk

Brussels

5-6 Commercialising Green Energy Details: Eyeforenergy, UK Tel: +44 (0)20 7375 7575 Fax: +44 (0)20 7375 7511 e: hmundy@eyeforwenergy.com www.eyeforenergy.com

5-7 The Netherlands

16th Annual European Autumn Gas Conference Details: Overview Conferences, UK Tel: +44 (0)20 7650 1430

e: confs@economatters.com www.overview-gas.com

6-7

London Design and Operation for Abnormal Conditions II Details: Royal Institute of Naval Architects, UK Tel: +44 (0)20 7201 2401 Fax: +44 (0)20 7259 5912 e: conference@rina.org.uk

6-8 Roma Submarine Communications Details: IBC Global Conferences, UK Tel: +44 (0)1932 893855 Fax: +44 (0)20 7636 1976 e: cust.serv@informa.com www.submarinecomms.com

7 Calgary Horizontal Well Technology Details: The Petroleum Society of CIM, Canada Tel: +403 237 5112 Fax: +403 262 4792 e: info@petsoc.org www.petsoc.org

7-8 Johannesburg South African Oil & Gas Symposium Details: Institute of International Research, South Africa Tel: +011 880 6000 Fax: +011 880 8260

12-14 Madrid ERTC 6th Annual Meeting Details: Global Technology Forum, UK Tel: +44 (0)1737 365100 Fax: +44 (0)1737 365101 e: events@gtforum.com www.gtforum.com

14

Utilities Asset Management Details: The Adam Smith Institute, UK Tel: +44 (0)20 7608 0541 Fax: +44 (0)20 7490 2296 e: utilities@confs.co.uk www.marketforcecommunications.co.uk

13-14

London Sakhalin Oil & Gas Details: IBC Global Conferences, UK Tel: +44 (0)1932 893857 Fax: +44 (0)1932 893897 e: cust.serv@informa.com www.ibcenergy.com

13-14

London 14th Annual Ship Finance Conference Details: Lloyd's List Events, UK Tel: +44 (0)1932 893861 Fax: +44 (0)1932 893894 e: cust.serv@informa.com www.lse-shipfinance.com

19-20

London

Libyan Oil & Gas III Details: SMi Energy Conferences, UK Tel: +44 (0)870 9090 711

customer services@smi-online.co.uk www.smi-online.co.uk

20

London Welding Calamities - Causes and Avoidance Details: TWI, UK Tel: +44 (0)1223 891162 Fax: +44 (0)1223 891264 e: meetings@twi.co.uk

20-21

Emart Energy Details: Emart Energy 2001 Fax: +31 346 590 601 www.emart-energy.com

The Savoy, London **IP Awards Luncheon 2001 Details: IP Conference** Department e: events@petroleum.co.uk

22-24

Prague IFNE 2001 – Single Market Strong Europe Details: IFNE Group, UK Tel: +44 (0)20 7821 0481 Fax: +44 (0)20 7821 0516 e: solan@ifne.org www. ifne.org

London

Power Asia 2001 Details: The Asia Business Forum Tel: +65 536 8676 Fax: +65 536 4356 www.abf-asia.com

26-27

26-27

LNG 2001 Details: IBC Global Conferences, UK Tel: +44 (0)1932 893851 Fax: +44 (0)1932 893893 e: cust.serv@informa.com www.ibcenergy.com

26-28

Hong Kong

Aberdeen

PowerCon 2001 **Details: Worldwide Business** Research, Singapore Tel: +65 323 9201 Fax: +65 325 4512 e: powercon@wbr.com.sg www.wbresearch.com

26-30 London **Oil Price Risk Management Details: IP Training Department** e: training@petroleum.co.uk

Cluster Fields Conference Details: IBC Global Conferences, UK Tel: +44 (0)1932 893851 Fax: +44 (0)1932 893893 e: cust.serv@informa.com www.ibcenergy.com

27-28

Milan

27-28

Budapest Oil & Gas Transit & Supply in Central & Eastern Europe Details: The Energy Exchange, UK Tel: +44 (0)1242 529090 Fax: +44 (0)1242 529060 e: lisa.hannant@lineone.net www.theenergyexchange.co.uk

28-29

29-30

London Ship Repair & Conversion 2001 Details: Lloyd's List Events, UK Tel: +44 (0)20 7372 1870 Fax: +44 (0)20 7553 1820 www.shiprepairex.com

London

Investing in Cuba Details: IBC Global Conferences, UK Tel: +44 (0)1932 893851 Fax: +44 (0)1932 893893 e: cust.serv@informa.com www.ibcenergy.com

PETROLEUM REVIEW NOVEMBER 2001

Singapore

Amsterdam

IP Discussion Groups & Events

Energy, Economics, Environment

'Risks in Financing Oil and Gas Projects'

by **Peter Buchanan**, Royal Bank of Scotland

15 November 2001, 17.00 for 17.30 at the IP.

Contact: Laura Viscione Tel: +44 (0)20 7467 7100 e: lviscione@petroleum.co.uk

IP 🖓 THE INSTITUTE OF PETROLEUM

College

Branch Activities

lan Robinson +44 (0)1932 783774

London

Contact: 20 Nov:

Southern Contact:

13 Nov:

Veronica Cloke Browne Tel: +44 (0)1962 715399 Wine tasting

18.00: 3D visualisation demo at Imperial



OBITUARY RICHARD WARREN MBE

29 January 1945 - 5 October 2001

The Institute of Petroleum regrets to announce that Richard Warren has died after a long and valiant struggle against the paralysing effects of neurofibromatosis. Richard's career started his life in the oil industry working as a Mud Logger but moved rapidly through consulting (Gaffney Cline) to Ball and Collins (a company which ultimately became Premier Oil). After a spell with Norcan International in 1979, he joined Monsanto Oil where he was to make a lasting mark discovering the Ivanhoe and Rob Roy fields and taking acreage on which eventually the Bittern and Schiehallion fields were discovered.

In 1986, Monsanto UK was taken over by Amerada Hess and Richard became a member of that company together with all the assets he had so lovingly nurtured. The cry in those days was 'Those Hess boys stole my oil', but not for long. He was too busy working as Area Exploration Supervisor, covering Amerada Hess' Atlantic Margin and Western Approaches acreage.

It was about this time that the effects of neurofibromatosis really began to be felt. Time spent in surgery and recuperation, together with encroaching paralysis, prevented him from continuing a fully operational role. Instead he became the Company Scout, in which function his values were recognised by all. Despite the progress of his illness he managed to attend field trips, crick-et matches, discussion group dinners and other functions. He was never heard to say that there was anything he could not tack-le. Every morning he arrived by taxi and every evening he left the same way. He had many devoted helpers who ensured that right to the end he could perform his job to a high standard.

Recently he was awarded the MBE and this year he flew to Denver to receive in person the Special Award of the American Association of Petroleum Geologists. The following paragraphs are taken from the citation Christopher Floyd wrote when Richard Warren was given the award:

"...Rather than retreat from affliction, Richard tackled it head on. He became a personality in the working disabled community, featured in press and radio, actively involved with groups championing the cause of the disadvantaged. He worked particularly hard at raising money for the Leonard Cheshire Fund. This charitable foundation, established by Leonard Cheshire VC, specialises in rehabilitating disabled people. Aside from fundraising activities, Richard championed their cause in his media appearances. He acted as a judge for their "Enabled" awards, where people receive recognition for their achievements in overcoming the difficulties of disablement and living life to the full.

Richard initiated a novel feature in the 1998 London Marathon when, with the help of relays of colleague Amerada Hess "pushers", his was the first assisted wheelchair to cross the finish line in the event's history. Since then, he has appeared in three more London Marathons and in 1999 took his wheelchair and cohorts to New York, where he established another first when he crossed the finish line in the New York Marathon.

On Sunday, 5 November, 2000, Richard completed the New York City Marathon, being pushed by one man and completing the race in 3 hours 38 minutes, which is testimony to an ability to both overcome personal problems and imbue enthusiasm in his colleagues and helpers. The aim this year was to raise his cumulative contribution to the Leonard Cheshire Fund over the £50,000 mark – a truly remarkable achievement by a truly remarkable man....'

Richard Warren was an inspiration to us all. There but for the grace of God go I, was in many of our thoughts when we saw him. We hoped that we would be so brave; that we would never give way to despair; that we too would fight to the end to inspire and encourage those who are handicapped and those with other, and often more trivial, concerns.



IP Week 2002

18-21 February 2002 London, UK

PROGRAMME EVENTS OF

Monday 18 February	Tuesday 19 February		Wednesday 20 February		Thursday 21 February
09.00 - 17.00	08.30 - 12.00	09.00 - 12.00	08.30 - 16.00	09.00 - 12.15	08.30 - 16.45
International Conference: Meeting Growing Expectations - Challenges and Opportunities for	Seminar: Prospects for the World Gas Markets in association with IGEM	Seminar: The Majors: Is Scale and Integration the Real Answer to Sustained Shareholder Value in the 21st Century? sponsored by Andersen, HSBC, OIES	Seminar: European Downstream Oil Industry Seminar: Challenges of Working in the EU Business	15th Oil Price Seminar: The Changing Face of the Energy Market: Implications for the Industry	International Conference on Floating Production Systems in association with
Industries	1 Great George Street	HSBC The Dorchester Hotel	Environment in association with	Seminar and Lunch sponsored by NYMEX	OGP
1 Great George Street	12.30	- 14.45	EUROPIA		
	IP ANNUAL LUNCH GUEST OF HONOUR AND SPEAKER: THIERRY DESMAREST Chairman and Chief Executive Officer, TotalFinaElf The Dorchester Hotel		europia 1 Great George	New York Mercantile Exchange	Arrectation eron & Gu
	15.00 - 18.30	14.45 - 17.40	Street	Street	Street
	Seminar: Transporting Gas: Capitalising on the FSU Pipeline Potential in association with ITE	Seminar: European Refining - Addressing the Key Issues, Challenges and Opportunities sponsored by	18.45 for 19.30		ALL AND
	1 Great George Street	Wood Mackenzie			through a
Drinks Reception & Exhibition Viewing 1 Great George Street	18.45 - 19.45		AL ACTIVITY OF A ALL AND A		the second
	IP London Branch Discussion Meeting The Institute of Petroleum		The Grosvenor House Hotel		
There will be an	oil industry related EXHIBITI maximise on the business and	ON taking place at 1 Great Geo promotional opportunities at IP	rge Street. It will enable orga Week 2002. All delegates an	nisations involved in the oil a e invited to view the exhibition	ind gas industry to on.

• Bloomberg • CGES • Commodities Now • Energy Day • IGEM • OGP • Platts • PetroVantage • PH Energy • SAP (UK) • World Petroleum Congress

IP Week 2002 will bring together an impressive panel of speakers including:



Richard V Giordano Chairman **BG Group**



Dr. Ria Kemper Secretary General Energy Charter Secretariat



Thierry Desmarest Chairman and Chief **Executive Officer TotalFinaElf**



Loyola de Palacio Vice-President Commission of the EU and Commissioner for Energy & Transport



Dr. Pierre Jungels Former Chief Executive CEO, Gas and Power Enterprise Oil Plc



Linda Cook Shell

MOVEpeople

Enterprise Oil has announced the appointment of **Sam Laidlaw** as Chief Executive. He will succeed **Pierre Jungels** who will be retiring. Laidlaw was most recently President and Chief Operating Officer of US E&P company Amerada Hess Corp. Jungels is due to become President of the IP next year when the two-year term of **Charles Henderson** of TotalFinaElf comes to an end.

CGG's Data Processing & Reservoir services has announced two new appointments. **Bertrand Chavane** has become Manager of the company's Massy (Paris) centre. Chavane was previously Product Manager for GeovecteurPlus/Geocluster. **Cato Bolstad**, previously the Manager of a client-dedicated centre, is now the manager of CGG's London data processing and reservoir services centre.

The Board of Sasol has announced that **Dr Z Z R Rustomjee** has been appointed as non-Executive Director.

Weatherford International Inc has appointed **Liz Paddon** as Marketing Communications Manager for Eastern Hemisphere Operations based in Aberdeen. She joins from Aberdeen and Grampian Chamber of Commerce where she held the position of Public Affairs Manager since 1999.

Offshore Crane Engineering (OCE) has announced the appointment of **Charles McLaughlan** to its Board. McLaughlan takes up the new post of Chief Executive. Formerly Regional Director with Salamis, he has 27 years' experience in the oil and gas construction industries.

Jack Berglund has been appointed Vice President of Marketing and Sales at Davie Industries Inc.

The International Marine Contractors Association has appointed **Philip Wiggs** to the newly created post of Technical Co-ordinator. He was formerly Marine Manager at Lawrence Graham.

Chairman of World-Wide Shipping Agency Ltd, **Dr Helmut Sohmen** will succeed Helmut Chr Schmidt of A P Møller as Chairman of the International Tanker Owners Pollution Federation Ltd (ITOPF). Sohmen has been a director of ITOPF since 1986.

Head of Exploration & production head at Wintershall in Germany. **Reinier Zwitserloot** has been appointed Chairman following the retirement of **Herbert Detharding**. **Bernhard Schmidt** replaces Zwitserloot in his former role. Detharding will remain on the company's Supervisory Board.

Sibneft has appointed **Joseph Carl Granger** to the newly created post of Chief Technology Officer. Granger formerly worked for Schlumberger.

UK training provider RGIT Montrose Ltd has announced the retirement of its Managing Director, **Jim Boner. Murray Strachan**, currently the company's Group General Manager, will take over the day-to-day management of the group.

John Shenton has been appointed Sales and Marketing Director for Blackburn Starling. He was formerly UK Sales Manager for Eurotherm.

Shell International Ltd has appointed **Mary Jo Jacobi** as Vice President External Affairs. She succeeds **Bart de Beer**, who retired on 1 October 2001. Jacobi joins the company from Lehman Brothers where she was Managing Director, Chief

Brand Strategist and Global Head of Marketing and Corporate Relations. She will report to **Malcolm Brinded**, Director of Planning, Environment and External Affairs.

Igor Rounov has taken office as Head of the International Road Transport Union (IRU) Permanent Delegation in Moscow.

Mick Borwell has joined the UK Offshore Operators Association (UKOOA) as its new Assistant Director with special responsibility for environmental issues. He replaces **Gordon Harvey** who has left the organisation after four years to join BP.

Sibneft has appointed **Iskander Diyashev** to the newly created post of Chief Engineer. Diyashev formerly occupied a position in the Noyabrsk office of the company's alliance partner Schlumberger, where he was involved in the development of Sibneft's horizontal drilling programme.

Elfab has appointed Simon Keenan as Managing Director. Formerly General Manager of Viasystems Tyneside, he brings more than ten year's experience in industrial management to his new role.



Ashurst Morris Crisp has announced the appointment of a new Energy, Transport and Infrastructure Partner, **Susan O'Rourke**, who joins the firm's Singapore practice from Australian firm Mallesons Stephen Jaques. O'Rourke has beena legal adviser on all recent major pipeline developments in Australia and has worked on projects in Japan, Hong Kong, Singapore, Indonesia and the US.

BJ Pipeline Inspection Services has appointed **Andrew Staszewski** as Marketing and Sales Manager in charge of international business development. In his new role Staszewski oversees all aspects of the company's sales and marketing initiatives throughout the world from the division's base in Calgary, Alberta.

John Donnelly, writer and editor in the oil and gas industry was recently named Editor for the Society of Petroleum Engineers' monthly publication the *Journal of Petroleum Technology*.

Mark A Rubin has been named Executive Director of the Society of Petroleum Engineers (SPE). Rubin is currently Upstream General Manager for the American Petroleum Institute in Washington DC. He replaces **Dan Adamson**, who retired in late September after a 36-year career with SPE.

Tim Branston, Head of Tax for the Gas and Power Division of Shell, has become a Tax Partner within Andersen's energy and Utilities Group.

Nigel Brabbins has been appointed UK Chief Operating Officer of 4imprint Group plc. Brabbins will be responsible for the majority of the company's UK operations and will report to **Martin Varley**, Managing Director, European Operations. Energy. Nothing better for moving ahead.

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