Petroleum review

JUNE 2003

Africa

- Algeria's hydrocarbon reform bill frozen

Middle East

- Turkey's strategic post-war role

Drilling

- 'Big Straws' and NMR

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ABBREVIATIONS

The following are used throughout *Petroleum Review*:

mn = million (10^6)	kW = kilowatts (10^3)
bn = billion (10^9)	MW = megawatts (10^6)
tn = trillion (10^{12})	GW = gigawatts (10^9)
cf = cubic feet	kWh = kilowatt hour
cm = cubic metres	km = kilometre
boe = barrels of oil equivalent	sq km = square kilometres
t/y = tonnes/year	b/d = barrels/day
	t/d = tonnes/day

No single letter abbreviations are used.
Abbreviations go together eg. 100mn cf/y = 100 million cubic feet per year.

Front cover: Sperry-Sun's BAT™ (bi-modal acoustic) sonic tool, part of the Stellar™ MWD/LWD suite, provides compressional and shear measurements in fast and slow formations. BAT™ tools come in sizes ranging from 9-1/2" to 4-3/4" Outer Diameter that give operators critical well-bore evaluation answers from spud to total depth of the well.
Photo courtesy of Halliburton

contents

news

special features

features

regulars

ROUNDUP From the Editor

Running Iraq has to work well

One of the oldest and most intractable of debates around the oil and gas industry is the degree to which it should be involved in or influence the way sovereign governments use the revenues oil and gas production provides.

Pressure groups in the west increasingly believe that companies should adopt moral positions. These groups have over recent years become increasingly powerful and it can be argued that they effectively forced the major western companies to quit Burma (Myanmar) and Sudan, and pressuring them into becoming more 'political' in various Latin American countries as well as in Nigeria. Some countries have effectively resisted what they characterise as outside interference – notable examples being Angola, Kazakhstan and Azerbaijan. In these countries the size of the resource means they have a prize too valuable to be passed up.

Christian Aid has just weighed into the debate with a pamphlet entitled *Fuelling Poverty: Oil, War and Corruption*. In this it convincingly shows that hydrocarbon riches are often a very mixed blessing for the populations of producer countries who, it claims, suffer a lethal cocktail of:

- greater poverty for the majority of the population;
- increased corruption;
- a greater likelihood of war or civil strife; and
- dictatorial or unrepresentative government.

While it is hard to argue with the analysis for producers such as Angola, Sudan, Kazakhstan or, until very recently, Iraq, plausible solutions are harder to find in the report.

Christian Aid is calling for a Global Oil Deal with an international commission to draw up new global regulations to reverse this injustice. Alas, if the problem was that simple to solve it would have been solved long ago and supra-national agencies such as the UN would work much better than they in fact do.

In Iraq the pretense that the US and UK can even operate through local politicians is rapidly being dropped. International recognition is now being sought for an occupation and adminstration that is to last at least a year. In short, the US and UK are now looking for a 'Mandate' like the ones given to Britain (Iraq, Transjordan, Palestine) and France (Syria) after the First World War. Most of the world viewed those mandates as establishing temporary colonies. That is a key danger in the present situation.

The pretense that oil was not the primary motivation was undermined by the sight of British soldiers rushing to guard the southern oil fields, US parachutists capturing the northern oil fields and marines prioritising the guarding of the only unbombed Ministry in Baghdad – the Oil Ministry. There is a certain irony that having successfully captured the oil installations largely unharmed we are now finding that everything is so decrepit that large sums of money will have to be spent to even achieve pre-invasion production levels.

Now the challenge is to make Iraq's hydrocarbon wealth a real benefit to its people. This may not be the only answer to Christian Aid's complaints about the misuse of oil and gas wealth, but it is certainly one that could work.

This month's (May 2003) *Oil Market Report* from the International Energy Agency (IEA) provides instructive reading. End-March commercial stocks of crude and products in the OECD area at 2,338mn barrels were 260mn barrels (11%) below year earlier levels. This translates to six days' less stock. Crude stocks are now significantly below the five-year range, while gasoline stocks are at the bottom edge of the five-year range.

Opec looks to be in a much stronger position to defend its price range than appeared likely even a month ago. We now effectively know what Opec's current capacity is. It is what they managed to produce in March and April. The answers, in '000 b/d, with the newly agreed June quotas in brackets are – Saudi Arabia 9,300 (8,256), Algeria 1,080 (811), Indonesia 1,050 (1,317), Iran 3,725 (3,729), Kuwait 2,200 (2,038), Libya 1,430 (1,360), Qatar 750 (658), Nigeria 1,900 (2,150) and Venezuela 2,000 (2,923). Now Indonesia can't produce its quota (and is probably no longer a net exporter), while Nigeria and Venezuela are still rebuilding production after strikes. But Saudi has already announced large cutbacks and rebuilding stocks requires up to 3mn b/d.

It will take a miracle in Iraq to undermine current oil prices.

The opinions expressed here are entirely those of the Editor and do not necessarily reflect the view of the IP.

(e)world

A new 'Transport Fuels Technology (TFT) Update Service' is to be published on the Institute of Petroleum's website at **www.petroleum.co.uk** in July 2003. The service – which will deliver carefully selected abstracts from worldwide literature, including technical journals, conference proceedings, special reports, books and databases – will be accessible to subscribers via a customer password or by e-mail delivery direct to their desktop. Bibliographic and reference details will be provided to assist with further study where needed. An online index is also provided for the accompanying textbook, *Transport Fuels Technology* (see p47) – for more information, please e: **sfm@petroleum.co.uk** or visit **www.petroleum.co.uk**

The UK Health and Safety Commission (HSC) has unveiled its policy on regulating high hazard industries such as nuclear, railways, offshore installations and major hazards sites, through the use of permissioning regimes. For more details, visit **www.hse.gov.uk/enforce/index.htm**

Shell has launched a new Russian-language website showcasing its leading-edge technology. The site contains more than 25 Shell scientific papers and technical reports, focusing on E&P technologies. It also includes reports from Shell's Oil Products business and Shell Global Solutions.

The UK Government has published a consultation paper seeking views on the introduction of special administration provisions for energy network companies. Such special administration schemes already exist in the railway and water sectors, to help ensure vital services continue in the event of an operating company going into administration. The paper can be found at **www.dti.gov.uk/energy/consultations/special_admin_con.pdf** Responses are invited by 20 June 2003.

Plimsoll Publishing has launched a new company valuation service that includes a definitive valuation of a user's company plus a valuation of its nearest 10 competitors. For details, visit **www.valueyourcompany.com**

A consultation document seeking views on whether it would be appropriate to provide for an appeals procedure against Ofgem decisions on certain gas and electricity code modifications has been published at **www.dti.gov.uk/energy/consultations/index.shtml**

The Canadian Centre for Energy Information's website was recently launched at **www.centreforenergy.com** providing comprehensive information about all sectors of the Canadian energy industry.

In Brief

UK

The UK Government has given the final *consent for TotalFinaElf's development plan for the Nuggets N4 field in the northern North Sea. Nuggets N4 is due onstream in 4Q2003 and will increase overall production from Nuggets (N1, N2, N3 and N4) from 165mn to 210mn cfld of gas.**

Shell and BP are reported to be *seeking farm-in partners to develop the Ben Nevis structure in the Atlantic Margin, believed to be the largest undrilled prospect in UK waters at present. It is thought that the structure could hold as much as 20tn cf of gas.*

Europe

The local authorities in Ireland have *refused planning permission for a terminal to receive gas from the offshore Corrib field.**

Heerema of Denmark has secured the *contract to fabricate a 2,000-tonne jacket for ExxonMobil's South Venture platform offshore Nova Scotia, part of the oil company's Sable gas project. First gas from South Venture is expected in late 2004.*

Complete news update

The 'In Brief' news items in *Petroleum Review* represent just a fraction of the news we regularly publish on the IP website @ **www.petroleum.co.uk** via the 'News in Brief Service', together with our daily News 'ticker' on the main home page.

Furthermore, those news stories marked with an asterisk (*) in the magazine are covered in more detail on the News in Brief Service.

Why not visit the site to find out more about the latest developments and trends in your industry? Click on

www.petroleum.co.uk

Addendum

The May issue of *Petroleum Review* featured an article on 'The Third Scramble for Africa' (pp24–36). Please note that the author, Dr Duncan Clarke, Chairman and CEO of Global Pacific & Partners, can be contacted on T: +44 (0)20 7487 3173 or e: **duncan@glopac.com**

NEWS Upstream

Tax relief opportunities for North Sea development

How to prolong the useful economic life of North Sea oil fields is a burning issue for operators and service companies alike. However, help may be available from an unexpected source in the form of new Research & Development tax credits, reports Deloitte & Touche.

From 1 April 2002 large companies have been able to claim a 'super-deduction' for tax purposes for their qualifying R&D costs. Similar relief for smaller companies was introduced in 2000. For every £1mn spent on qualifying R&D, a large company can deduct £1.25mn from taxable income. SMEs can deduct £1.5mn or can claim a cash repayment of £240,000.

'There is still value to be extracted from many North Sea reserves, but only if operators can manage costs and develop engineering techniques that maximise efficiency,' comments Derek Henderson, Aberdeen Tax Partner at Deloitte & Touche. 'This is how the US operators prolonged the life of fields in the Gulf of Mexico and North Sea operators will now have to develop and build on those techniques.'

In doing this they may be able to claim 125% of the eligible costs in their tax returns, or up to 150% with an option for cash refunds if they meet the SME definition, states the company. Recent commentary from the Inland Revenue makes it clear that, although R&D relief does not cover the activities of exploration and appraisal, it is available for innovative engineering projects.

'The relief covers improvements to processes, including reductions in production costs and also solutions to environmental issues, so it is highly likely that a significant part of oil and gas activities would qualify. All companies involved in developing technological solutions, whether they are operators or service companies, should take a close look at their activities,' advises David Cobb, R&D Solutions Partner.

Kittiwake and Mallard field deal

Dana Petroleum has entered into an agreement with Shell Expro and Venture Production to acquire a 50% interest in the North Sea Kittiwake and Mallard oil fields, as well as surrounding development and exploration acreage in blocks 21/17a, 21/18a and 21/19. The deal will also increase Dana's current stake in block 21/12, which contains the Goosander oil field, and block 21/13a to 50%.

In parallel, Venture will also increase its current interest in the above fields and blocks, collectively termed the Greater Kittiwake Area (GKA) assets, creating a new, commercially aligned Dana/Venture 50:50 partnership covering the entire GKA region. Venture, which will become operator of the assets, will receive a net £2.7mn to reflect its increased abandonment liability over the fields. Dana will receive £2.4mn.

New North Sea asset transfer arrangements

UK Energy Minister Brian Wilson has announced that UK oil and gas companies, working jointly with the Department of Trade and Industry through the Pilot government/industry partnership, have agreed a new commercial and legal framework – known as the Master Deed – to speed up the transfer of North Sea assets and pave the way for new entrants.

The Deed creates a mechanism that will simplify the complex and time-consuming procedures currently involved in the sale and purchase of offshore assets in the UKCS. It also modifies and limits certain existing rights of pre-emption that effectively give the present co-owners of UKCS assets a right of first refusal on the disposal of any part of such assets.

The first major deal to benefit from the use of the new transfer arrangements will be the sale by BP of its UK southern North Sea Bacton assets to Perenco, reports the government. Under the $135mn deal, BP will also sell its interests in 11 non-operated fields – Indefatigable (Inde) and South West Inde, Bessemer, Bell, Baird, Beaufort, Brown, East Leman, Boyle, Davy and North Davy – and its stake in the Inde and Leman joint facilities. BP's share of proved gas reserves for the fields at 31 December 2002 was some 25.2mn boe. Its share of production in 2002 was 93mn cf/d of gas (16,000 boe/d).

The Master Deed can be viewed at **www.og.dit.gov.uk/upstream/licensing/index.htm**

NEWS upstream

Independent audit of Lukoil reserves

Lukoil reports that it has completed an evaluation and independent audit of its oil and gas reserves as of 1 January 2003. According to the data audited by Miller and Lents of the US, Lukoil's proved reserves as of that date are estimated at 19.3bn boe (compared with 16.8bn boe as of 1 January 2002), including 15.3bn barrels of oil and 24.2tn cf of gas.

Consolidated reserves amount to 19.7bn boe following the acquisition of controlling stakes in Tebukneft, Ukhtaneft, RKM-oil and YaNTK earlier in 2003 and a reclassification of interests in some affiliates after post-report acquisitions.

The company has also restated its plans for the exploration and management of reserves till 2013:

- Annual replacement ratio of no less than 80% on average.
- Increase in proved oil reserves up to 2.5bn tonnes and 1tn cm of gas reserves by 2012.
- Increase of the share of developed reserves up to 75% for oil (compared with 63% in 2002) and up to 60% for gas (compared with 10% in 2002).

Lukoil also reports that its affiliate Lukoil Overseas has completed the sale to Inpex Southwest Caspian Sea (an affiliate of Inpex Corporation and the Japan National Oil Corporation) of its entire interest in the Azeri-Chirag-Gunashli project for $1.35bn in cash. The transferred interest includes a 10% share in the project's production sharing agreement, an 11.11% stake under the related joint operating agreement, a 10% interest in each of the Azerbaijan International Operating Company (AIOC) and the Georgian Pipeline Company, and interests in other ancillary project assets.

Opec cuts production quotas

In light of the situation in the oil market and the expected seasonal downward turn in demand during the second and third quarters, Opec member countries (excluding Iraq) were to reduce actual Opec production by 2mn b/d to 25.4mn b/d from 1 June 2003. The decision will be reviewed at the Extraordinary Meeting of the Conference, scheduled to convene in Doha, Qatar, on 11 June 2003.

Member country production will be: Algeria (811,000 b/d), Indonesia (1.317mn b/d), Iran (3,729mn b/d), Kuwait (2.038mn b/d), Libya (1.360mn b/d), Nigeria (2.092mn b/d), Qatar (658,000 b/d), Saudi Arabia (8.256mn b/d), UAE (2.217mn b/d) and Venezuela (2.923mn b/d).

CMS III's McAdam field enters production

The McAdam gas field in the southern sector of the UK North Sea has come onstream at an initial rate of between 60mn and 65mn cf/d from the single well development. Production is above the originally anticipated 50mn cf/d. McAdam is the third field to be brought into production as part of the five-field CMS III development utilising the production and transportation facilities of the Caister Murdoch System (CMS).

Output from the first two fields – Murdoch K and Hawksley – has exceeded expectations since first gas was produced in September 2002. The combined production of Murdoch K, Hawksley and McAdam is forecast to plateau at 300mn cf/d.

The fourth well in the programme, Boulton H1, is currently being drilled and is due onstream in 3Q2003. The Watt field will be the last of the five to be developed.

CMS III partners are ConocoPhillips (operator, 59.5%), GDF Britain (26.4%) and Tullow Oil (14.1%).

Developments upstream Middle East

Stella Zenkovich reports on recent Middle East E&P developments:

- Ali Al-Naimi, the Saudi Minister for Petroleum and Mineral Resources, has belatedly announced the discovery of the new Yerbin oil field located 260 km southeast of Riyadh on the southern edge of the large Al-Gnewar oil field, where first drilling began in May 2002. The Yerbin field is currently producing 5,100 b/d of light crude and 7.4mn cf of gas.
- The Syrian Government, worried by declining gas production, has called a tender for developing the gas fields of the Palmyra region.
- The Government of Pakistan is expecting a cash injection of $2.3bn during this fiscal year from the oil and gas sector through licences granted, tax, surcharges and other levies.

In Brief

Norsk Hydro reports that its North Sea *Grane development is due onstream in October and is NKr1bn below the budget frame of NKr16.5bn.**

North America

The US House of Representatives has *put Alaska drilling back into its latest energy bill while, on the other side of Congress, the Senate has backed away from the contentious issue, reports* Philip Fine. *In May 2003 a majority of House members defeated a series of amendments that would have exempted the Arctic National Wildlife Refuge (ANWR) from the bill. Republicans in the Senate, on the other hand, said the drilling will not be included in their energy bill. The House bill includes $18.7bn in tax breaks over 10 years, much of it incentives for oil and gas development.**

Synthetic crude production in Alberta, *Canada, is reported by the province's Energy and Utilities Board to have edged ahead of light and medium crude volumes for the first time last year. Synthetic output from the northern Alberta oil sands deposits totaled 161mn barrels, up 33.7mn barrels from 2001 and slightly more than conventional production of 160mn barrels, which slipped by 15.2mn barrels from year earlier production.*

Amerada Hess (27.5%) reports that *development plans have been approved for the Llano field located in Garden Banks blocks 385 and 386 in the Gulf of Mexico. Llano's initial phase of development will consist of an expandable subsea system with two wells tied back to the Auger tension leg platform. First production is expected in 2Q2004, with peak rates forecast to reach 25,000 b/d of oil and 75mn cf/d of gas during that quarter.**

Middle East

Iran is to soon finalise development *plans for the Bangestan oil field, forecast to produce up to 260,000 b/d.**

It has been reported that Saudi Arabia *may cut oil supplies to its Asian customers by as much as 15% to comply with Opec production cuts. Opec has agreed to cut 2mn b/d from June to halt the fall in oil prices.*

The United States introduced a *resolution on 9 May, calling for the*

In Brief

United Nations to lift sanctions on Iraq immediately and phase out the oil-for-food aid programme over the following four months.

***Anadarko Petroleum (operator, 92.5%)** has commissioned a new permanent production facility at the Al Rayyan oil field in block 12 offshore Qatar. The Al Morjan platform, which replaces the Amina temporary early production facility, has the capacity to process up to 45,000 b/d of oil.**

Russia & Central Asia

***Russia, Kazakhstan and Azerbaijan are** reported to have 'inked a triple agreement on adjacent sectors in the floor of Caspian Sea'. Baku Today reports that the document was signed at a conference focusing on developing the convention on legal regime in Caspian Sea at which were present Deputy Foreign Ministers from the littoral nations. Iran, however, still insists on holding a 20% interest in the Caspian Sea, although it is understood to be keen to resolve problems concerning the legal regime in the region.*

***Russia's national Energy Strategy** predicts that oil production will reach between 9mn and 10.5mn b/d by 2020, compared with the current output of 8mn b/d. Gas output is forecast to rise from the current 595bn cm to 700bn cm in 2020.**

***Members of the North Caspian Sea** Production Sharing Agreement have united to prevent China National Offshore Oil Corporation (CNOOC) from acquiring BG's 16.67% interest in the consortium. Six of the participating companies decided to pre-empt the sale by exercising their rights as existing partners to buy the share.*

***Lukoil's proven hydrocarbon reserves** have grown 17% since 1 January 2002 to 19.7bn boe, making it the world's second-largest by reserves after ExxonMobil. Most of the growth came from new reserves of natural gas. Lukoil said its gas reserves are up 82% and oil reserves 5% since the beginning of 2002.*

Asia-Pacific

***BHP Billiton and partners in the North** West Shelf (NWS) Venture have signed further agreements under which CNOOC will purchase a 25% interest in a new joint venture – China LNG Joint*

NEWS Upstream

Rising gas, falling oil output on UKCS

UK oil production, at 2,062,937 b/d, fell on both the month and year in February, while gas production of 12,949mn cf/d increased on both the month and year, according to the latest (April 2003) Royal Bank of Scotland *Oil and Gas Index*.

'The return of relative stability to world oil markets in the past two weeks should help improve investment confidence,' comments Senior Economist Tony Wood. 'However, there remain major uncertainties relating to the ability of Opec to reduce output and geo-political risk in other major producing countries. Closer to home, the 9 April tax changes to the application of Petroleum Revenue Tax to tariff income will provide a positive boost to the viability of a number of marginal fields in the UK Continental Shelf.'

Year Month	Oil production (av. b/d)	Gas production (av. mn cf/d)	Av. oil price ($/b)
Feb 2002	2,247,395	11,732	20.20
Mar	2,153,321	11,640	23.80
Apr	2,230,781	11,175	25.70
May	2,106,088	10,227	25.50
Jun	2,142,356	9,128	24.10
Jul	1,938,677	7,569	25.70
Aug	1,831,386	8,744	28.40
Sep	2,001,329	8,699	28.40
Oct	2,133,641	10,611	27.60
Nov	2,165,277	11,276	24.20
Dec	2,230,434	12,175	28.30
Jan 2003	2,133,139	12,200	31.20
Feb	2,062,937	12,949	32.20

Source: The Royal Bank of Scotland Oil and Gas Index

North Sea oil and gas production

Gulf of Mexico record for SmartWell

WellDynamics has completed the installation of six subsea SmartWell® completions for TotalFinaElf and Marathon's Gulf of Mexico deepwater projects. The wells are reported to set the record for the Gulf of Mexico with Marathon's Camden Hills project being developed in 7,209 ft water depth, followed by TotalFinaElf's Aconcagua development at 7,096 ft water depth. Both field developments are tied-back to the Williams owned and operated Canyon Station processing facility via a 55-mile long umbilical. Seabed temperatures were recorded at 39°F.

The implementation of the SmartWell technology allows TotalFinaElf and Marathon to remotely operate their deepwater field developments from Canyon Station and to control gas production profiles and water breakthrough issues without the need for intervention by deepwater drillships or semi-submersibles. All the deployed systems incorporate multiple gauge systems to permit remote data recovery of tubing and sandface temperatures and pressures.

Each of the completions comprise two-control sleeves and a gauge package with the lower sleeve shrouded to permit separation of the upper and lower pays, providing selective control of each zone. The wells are completed with stacked gravel packs and were successfully flow tested after installation.

Much interest in UK licensing round

UK Energy Minister Brian Wilson has announced the applications for the 21st Offshore and 11th Onshore licensing rounds, which show that the momentum of interest generated by the North Sea in recent years continues.

Some 30 'traditional' offshore production licence applications were received, together with 40 new 'Promote' licence applications (see *Petroleum Review*, March 2003), covering 140 blocks in total – an increase of over 100 on the previous round last year and the largest number of blocks applied for since the early 1970s. Applications were received from 75 companies, 36 of which are potential newcomers to the North Sea.

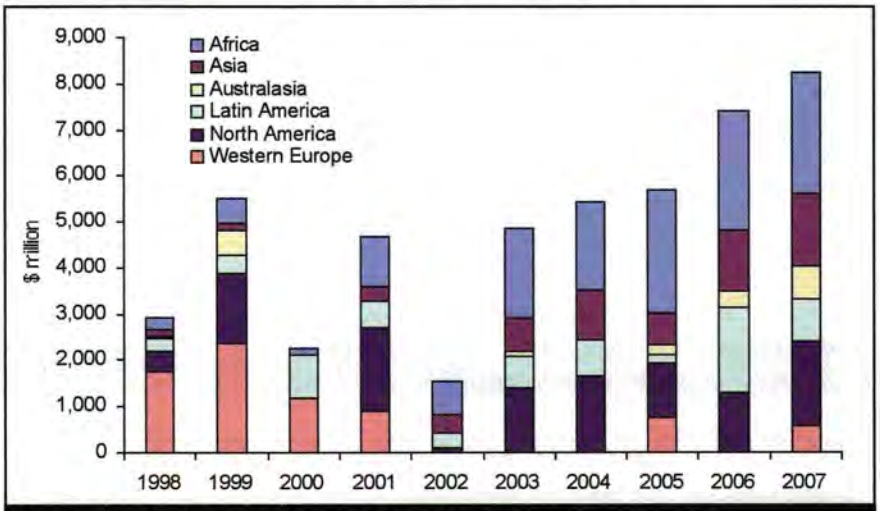
A further eight applications were received for onshore acreage.

Major investment in floating production

Over the past five years capital expenditure on floating production systems has totalled some $17bn, while over the next five years capex is forecast to increase by more than 80% to reach almost $32bn, according to the latest *World Floating Production Report* from Douglas-Westwood and Infield Systems.

Some 116 floaters are expected to be installed worldwide over the next five years. Africa is expected to get the lion's share of activity in the sector, with 34 installations and investments of almost $12bn destined for the region to 2007. Asia is second only to Africa in terms of the number of vessels forecast for the period. However, its capex of $5.5bn is lower than that forecast for North America ($7.4bn) and not far ahead of Latin America ($4.4bn) – regions where newbuilds and/or higher specification vessels predominate.

Of the 116 floating production systems forecast for the period 2003–2007, FPSOs are expected to account for the largest proportion (77 vessels), along with 10 floating production semi-submersibles (FPSSs), 16 tension-leg platforms (TLPs) and 13 spars. Expenditure on FPSOs is expected to total $21bn, or 67% of the forecast capex, with the remainder being divided fairly equally amongst FPSSs, TLPs and spars.



Floating production capital expenditure ($mn) by region, 1998–2007
Source: The World Floating Production Report III, *Douglas-Westwood & Infield Systems*

Russian and C. Asian developments

Stella Zenkovich **reports on recent Russian & Central Asian E&P developments:**

- **A long-term 2003–2010 plan is being drawn up by the Kazakh Energy and Mineral Resources Ministry, state-run KazMunaiGaz and ExxonMobil Kazakhstan Gas Ventures for starting to develop the country's gas resources by the third quarter. The research group will assess supply and demand, the infrastructure, the regulatory and legal basis and financing, along with a preliminary analysis of Kazakh gas utilisation projects, classing them according to their priority and how prospective they are. Kazakhstan produced 13.13bn cm of gas in 2002, with production forecast to reach 20.5bn cm in 2005, 35bn cm in 2010 and 45–50bn cm in 2015.**
- **Two new oil and gas deposits are reported to have been discovered in southern Moravia, in the Czech Republic, by local exploration, production and storage company Moravske Naftowy Doly. One find is at Zarosice, near Kijov; the other is in the vicinity of Breclav. The company is planning to start development later this year.**
- **Rosneft is reported to have offered $72m – double the market price – to shareholders of London-based Anglo Siberian Oil Company, which holds licences for the Vankor and North Vankor oil fields in Western Siberia via Russian-based Yeniseyneft, in which it has a 59% interest. Estimated recoverable reserves are put at 906mn barrels of oil and 73tn cm of associated gas at Vankor and 274mn barrels of oil at North Vankor. Cash-rich Rosneft, having acquired Severnasya Neft and its Val Gamburtseva licence for $600mn, converted from a pre-emptive to an official offer in order to prevent TotalFinaElf from raising its earlier $27mn bid for 52% of Yeniseyneft, with an option for a 60% stake in North Vankor.**

In Brief

*Venture – that is being established with the NWS project to supply 3.3mn t/y of LNG to China's Guangdong LNG project.**

***New Zealand has announced a petroleum** exploration bidding round over 17 blocks in offshore north Taranaki and onshore Taranaki. Applications for the nine offshore and eight onshore blocks on offer close on 31 October 2003.*

***The Indian Government has invited** bids for 24 blocks for exploration under the fourth round of New Exploration Licensing Policy (NELP). Twelve of the blocks are in deepwater.*

***The Eni-operated (65%) Woollybutt** field offshore Australia's northwest coast has come onstream, with a target plateau rate of 35,000 b/d forecast to be achieved this year.**

Latin America

***Jamaica is set to resume oil exploration** off its southern coast after a two-decade lull.*

***Petrobras has confirmed the largest** gas discovery ever in the Brazilian continental platform, with reserves of about 70bn cm, or roughly 440mn boe. The discovery boosts existing proven natural gas reserves of about 231bn cm by 30%.*

***Pemex is reported to be planning to** install an early production system on the Lankahuasa gas discovery offshore Mexico by the end of 2003. Proven and probable reserves are put at 400bn cf, with a further 400bn cf of potential reserves.*

Africa

***Lundin Petroleum is to sell its E&P** interests in the Sudan to Petronas for $142mn.*

***First Calgary Petroleums reports that** proved, probable and possible recoverable gas reserves for the Ledjmet block 405b in Algeria have been put at 5.74tn cfe (cubic feet equivalent).**

MANY OF THE MONTH'S UPSTREAM NEWS STORIES NOT INCLUDED ABOVE CAN BE FOUND ON THE NEWS IN BRIEF SERVICE @ www.petroleum.co.uk

In Brief

UK

Edinburgh-based consultancy Wood *Mackenzie has acquired the business operations of Oil Price Assessments Ltd (OPAL) from Metal Bulletin for an undisclosed sum.*

US engineering and construction company *Chicago Bridge & Iron Company (CBI) is reported to be planning to buy the assets of UK-based design and project management company John Brown Hydrocarbons from its Russian owner Yukos for some $30mn.*

Shell has reported a 1Q2003 net *income of $5.4bn, up 136% from the same period a year earlier and claimed to be a quarterly record.**

BP has posted a record 1Q2003 result, *adjusted for special items, of $3,729mn compared with $1,582mn a year ago – an increase of 136%.**

Europe

ABB is expected to announce the sale *of its oil, gas and petrochemical business, valued at $1.5bn, by the end of June 2003.**

TotalFinaElf shareholders recently *approved the name change to Total (98.6% voted in favour). A new corporate identity has been launched.*

DONG is to supply 150mn cm/y of gas *to Swedish energy company Goteborg Energi until 2005.**

North America

The Energy Information Adminstration *(EIA) warned in April that despite a 9mn-barrel increase in US crude stocks to 286.2mn barrels, US inventories of crude and petroleum products remained uncomfortably low.**

ChevronTexaco has reported a 1Q2003 *net income of $1.9bn, compared with $725mn in 1Q2002.**

ConocoPhillips has posted a 1Q2003 *net income of $1,437mn compared with a net loss of $102mn for the same quarter in 2002. Total revenues were $27.1bn, versus $8.5bn a year ago.*

ExxonMobil has announced a three-fold *jump in 1Q2003 profits to $7.04bn, up from $2.1bn in 1Q2002.*

NEWS Industry

Yukos and Sibneft to merge Russian operations

Yukos and Sibneft shareholders have agreed in principle to merge the two companies' operations in what will be the largest-ever industrial transaction in Russia to date. The combined oil and gas company – to be known as YukosSibneft Oil Company – will not only be the largest in Russia, but will also rank as the world's fourth largest private oil producer.

The combined entity will have total reserves (including Slavneft reserves) of around 19.4bn barrels of oil and gas equivalent, based upon year-end 2001 reserves calculated in accordance with Society of Petroleum Engineers (SPE) methodology. Combined proved oil reserves are put at 18.4bn barrels, with 5.9tn cf of proved gas reserves. Current daily oil production is approximately 2.3mn barrels – equivalent to about 29% of total Russian oil production in 2003.

YukosSibneft is also expected to include six principal refineries in Russia – Omsk, Achinsk, Angarsk and three in the Samara region – as well as the Mazeikiu Nafta complex in Lithuania and additional interests in the Moscow and Yaroslavl refinery in Russia and Mozyr in Belarus arising from the purchase of Slavneft earlier this year. These facilities refined some 57.7mn tonnes (421.8mn barrels) of oil in 2002. The merged operation will also operate more than 2,500 service stations, by far the largest chain in Russia.

It is expected that Yukos' Mikhail Khodorkovsky will be responsible for the executive management of the new group, while Sibneft's Eugene Shvidler will be proposed as Chairman of the Board of Directors.

The core shareholders of Sibneft will sell a 20% shareholding in the company for $3bn in cash and subsequently exchange their remaining shareholding in Sibneft at a ratio of 0.36125% of YukosSibneft for each 1% shareholding in Sibneft.

Green light for Sakhalin 2 project

Russia's Sakhalin 2 project has been given the green light from shareholders Shell Sakhalin Holdings, Mitsui Sakhalin Holdings and Diamond Gas Sakhalin (Mitsubishi). The joint venture formally declared its positive investment decision on 15 May 2003. Sakhalin 2 represents the largest single foreign direct investment project in Russia to date, requiring investment of approximately $10bn.

The project has also reached agreement with Tokyo Gas to supply up to 1.1mn t/y of LNG for 24 years. First deliveries are expected in 2007. LNG will be supplied from the project's new plant that is to be built at Prigorodnoye on the southern tip of Sakhalin. The plant will have a total capacity of 9.6mn t/y, equipped with two gas liquefaction process trains, each with a capacity of 4.8mn t/y – claimed to be the largest LNG trains currently planned in the world.

Phase 1 of the Sakhalin project has been producing oil from the Vityaz Complex since July 1999, exporting 10.77mn barrels in 2002.

NEWS Industry

Queen's Awards to oil and gas sector

Amec has won the 2003 Queen's Award for International Trade, in recognition of its outstanding performance, principally in the oil, gas and processing industries over the past three years. Amec's expansion in areas such as Azerbaijan, China, eastern Russia, the Gulf of Mexico, Kazakhstan, Saudi Arabia, the Philippines and West Africa has resulted in a four-fold increase in export earnings for the company's UK-based operating subsidiary.

European oil service company UWG Group received a Queen's Award for Enterprise in recognition of the innovation and business success of its ground-breaking Suspended Well Abandonment Tool (SWAT). Developed to enable the abandonment of previously suspended subsea wells from low-cost ROV (remote operated vehicle) support vessels, the tool is claimed to offer a 'dramatic reduction in project costs compared to traditional methods' utilising a drilling rig or specialised vessel. More than 60 wells have been abandoned to date using the tool.

Fairbanks Environmental also won a Queen's Award for Enterprise in recognition of the development of its IT-based systems for the early detection of leaks at service stations which, in turn, reduces the risk of pollution and protects the environment.

Recent Russian & Central Asian developments

Stella Zenkovich reports on recent industry developments in Russia and Central Asia's oil and gas industry:

- The announcement of a winner for the Croatian Government's sale of a 25% stake plus one share in INA by the privatisation council, originally set for the first quarter, has slipped to mid-year after the government got bogged down in parliamentary procedures. OMV, Mol and Rosneft are among the bidders.
- The EU is pushing Russia to triple its domestic gas prices as an energy reform concession to gain its support for entry to the World Trade Organisation (WTO). However, the Russian Government is unwilling to liberalise its domestic gas market in the build-up to this year's general elections, with Chief WTO Negotiator Maxim Medvedkov stating that there will be no WTO entry on 'suicidal terms'. Meanwhile, Boris Fyodorov, the former Finance Minister and Independent Director of Gazprom, has declared that internal Russian gas prices are steadily rising and will reach a break-even point in two years for gas producers, a situation that will help new producers enter the market.
- Vladimir Pashchenko, Director General of Moscow-based Inmortrans, has confirmed Russia's readiness to invest up to $200mn to revive dormant Moldovan plans for building a Danube port and oil terminal at Giurgiulesti, with a 420,000 b/d handling capacity and a related tanker fleet, thereby creating a much-needed new export outlet for Russian crude.
- Ukrainian Fuel and Energy Minister Serhy Yermilov has called on private industry to set up a vertically-integrated oil company. President Leonid Kuchma earlier instructed the government in this respect and a draft decree ensued from the Cabinet of Ministers – but it was never implemented. Now, after a wave of partial privatisations, the state is no longer in a position to take the matter in hand, owning just 50% plus one vote in Ukrnafta, 43.054% in Ukrtatnafta, 25% in Naftokhimik Prykarpatiya and 25% in Halychina oil refinery.

Nigeria LNG gas sales

Nigeria LNG has signed a Memorandum of Understanding for the supply of 2.5mn t/y of LNG to BG via the Lake Charles import terminal in Louisiana, US, from Trains 4 and 5 of the Nigeria LNG Plus project in Finima, Bonny Island, Nigeria. The agreement is for a 20-year period, beginning in 2005/2006.

In addition, the MoU allows for BG to take, from the end of 2003, excess volumes from Trains 1, 2 and 3 that are not taken by existing long-term buyers. BG has 80% capacity rights at the Lake Charles terminal until September 2005, and 100% thereafter.

LNG from the Bahamas

The Bahamas is expecting to earn $40mn/y from LNG plants, the Minister of Trade and Industry Leslie Miller has been quoted as saying, if one or more of the three LNG projects currently under consideration is approved. Applied Energy Services of New Jersey, Belgian energy company Tractebel and Houston-based El Paso are each proposing to supply South Florida's growing energy market with LNG via a subsea pipeline.

The Bahamas would become the second English-speaking Caribbean state after Trinidad and Tobago to offer LNG storage and transport facilities.

In Brief

***Wood Mackenzie recently opened its** North American Gas Insight Service for business and immediately challenged the market view that a record high US natural gas price is sustainable in the second half of the year.**

Middle East

***The Iraqi Oil Ministry's new Chief** Executive is Thamir Abbas Ghadban. An exiled former oil official, Fadhil Othman, was named Abbas' No. 2. Philip Carroll, a former Chief Executive of Shell Oil Company and of Fluor Daniel, was made Chairman of an Advisory Board to oversee the Ministry.*

***Due to the lack of a seller some 8mn** barrels of Iraqi crude oil is still sitting in storage tanks at the Turkish port of Ceyhan, awaiting export.**

Russia & Central Asia

***Russian Energy Minister Igor Yusufov** has announced a decision to ease the government's grip over pipeline ownership, allowing private oil companies to invest in a new US export route through the Arctic port of Murmansk.*

Latin America

***Argentina regulators have approved** the sale of energy conglomerate Perez Companc to Brazil's Petrobras some six months after the deal was first announced.*

***President Vicente Fox has joined a** wave of other Mexican officials in rejecting a US congressional committee's call to link an agreement on immigration to US investment in Mexico's state-run oil company Pemex.*

Africa

***Marathon has signed a Letter of** Understanding for the supply of 3.4mn t/y of LNG to BG from a proposed LNG project to be developed on Bioko Island, Equatorial Guinea. The contract covers a 17-year period, beginning in 2007.*

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In Brief

UK

A new Power Trading Forum (PTF) has *been established in the UK to take forward market and regulatory issues on behalf of the power trading community.**

The UK Department of Trade and *Industry has launched Fuel Cells UK to help promote and raise the profile of the fuel cell industry in the UK.**

Europe

Electricité de France National (EDF) is *buying 1bn cm/y of gas over 15 years from Statoil, with deliveries set to start on 1 October 2005.*

Foster Wheeler Energy has secured a *five-year, long-term agreement from ExxonMobil for front-end engineering design, detailed engineering, procurement and construction management services on selected refinery and chemical projects in Europe.*

Shell Hydrogen has opened its first *ever Shell-branded hydrogen service station in Reykjavik, Iceland.**

What is claimed to be the world's first *supply ship fuelled by LNG was named* Viking Energy *in Bergen on 25 April and is to start working for Statoil later this year.**

North America

A process that can convert old chip oil *and other food waste into inexpensive biodiesel fuel will soon be available to food and catering companies, writes* Philip Fine. *Canada's Biox Corporation says its first bolt-on biofuel processing plant should open this summer in Oakville, Ontario.**

Houston-based FMC Technologies *and Accentus of the UK, a subsidiary of AEA Technology, have formed a new gas-to-liquids (GTL) joint venture – GTL MicroSystems – for the commercial development of GTL technology. GTL MicroSystems believes its GTL technology will allow monetisation of gas reserves as small as 10mn cf/d, equivalent to 1,000 b/d, at lower per-barrel capital costs than offered by traditional, large-scale plants.*

General Motors and BMW are *reported to be working together to*

Opening the Danish gas market to competition

DONG reports that by 1 January 2004 it will have a set of rules in place that will establish the framework for access to its offshore pipeline network. The rules – which will ensure open and non-discriminatory access to transport gas in the network – form one of the elements of an agreement with the European Commission that aims to promote competition in the Danish gas sector. Tariff terms for the use of the pipeline systems will be agreed individually between DONG and the future users on the basis of the new framework.

Under the agreement, DONG is also to introduce some changes in its trading relationship with the companies in Dansk Undergrunds Consortium (DUC – A P Møller, Shell and Texaco), which are DONG's largest gas suppliers. 'It has been agreed that we will not, for a period of time, buy gas offered for sale by the DUC partners,' says Kurt Bligaard Pedersen, DONG's Executive Vice President. 'At the same time we will be revoking the clause in our contracts with the DUC partners that gives DONG the right of first negotiation concerning purchase of any new volumes discovered by the three companies in the Danish sector of the North Sea.'

In addition, a provision entitling DONG to renegotiate the contracts with the DUC partners if they begin selling gas in competition with DONG in the Danish market will be revoked. The provision was introduced as part of the take-or-pay contract with DUC. The date of revocation of the provision is tied in with the completion date for a new pipeline from the Danish gas fields to the European market. The pipeline will enable DONG to sell any surplus gas volumes from the Danish market.

Minimising risk in gas plant operations

The Dow Chemical Company has opened a gas treating pilot plant at Freeport, Texas, that is designed to help operating companies minimise the risk involved in altering gas plant operations. It is claimed to be the first time that a pilot plant has been built by a supplier for the purpose of enabling customers to preview the impact of a potential system change before full-scale implementation in their own plants.

NEWS Downstream

UK energy suppliers go on spending spree

Merger and acquisitions activity in the UK's energy sector during 2001–2002 gave the likes of npower and Powergen large numbers of new customers, both in the residential and industrial and commercial (I&C) sectors.

However, new research from Datamonitor warns that utilities may find it difficult to hang on to both new and existing clients, especially at the top end of the market, unless they drastically improve their largely inadequate customer service standards.

The stated switching intentions of the UK's major energy users surveyed by Datamonitor at the end of last year suggest that a mere 30% of the electricity market covered by 1 GWh-plus sites can be viewed as 'secure business', meaning customers who are likely to re-sign with their current suppliers when their existing contracts expire. The others are either determined to leave, come what may, or remain undecided.

If replicated across the sector, this translates into over £3bn worth of annual contracts at risk. Between them, npower and Powergen could account for as much as a third of this exposed business.

Datamonitor reveals that a significant proportion of 'defectors' are being driven away by poor service. Similar trends are observed in the gas sector.

Datamonitor's survey results show that none of the energy suppliers in the UK are currently meeting their major customers' quality of service expectations, although the ailing British Energy, followed by London Electricity, have come the closest. Not surprisingly, these two companies acquired the most new business in 2002, and are also likely to do well in 2003. Moreover, oil companies that are increasingly active in supplying gas and electricity to major customers, such as Shell and BP, are outperforming the traditional utilities.

Cutting downstream supply chain costs

Carmine Falcone, Vice President, Manufacturing & Supply, Shell Oil Products US, recently spoke to delegates at supply chain solution provider i2's Planet Las Vegas of the need for the oil industry to halt the profligate leakages in the downstream supply chain system and turn business around by uplifting margins (see *Petroleum Review*, December 2002), writes *Emma Parsons*.

Industry consultant Cap Gemini Ernst & Young has forecast savings in the region of 50 cents/b with the development and successful implementation of an integrated supply chain solution such as i2 Downstream. In his presentation Falcone calculated overall savings of $150mn/y based on $100mn/d turnover at $25/b on a basis of 10 cents/b, also emphasising Shell's commitment to the project as 'the prize worth pursuing'.

Shell and i2 have been collaborating on i2 Downstream since March 2002 and announced the completion of the suite in December 2002.

The first completed module – i2 Downstream Demand Planner – will be launched on the market in June 2003.

Developments downstream Africa

Stella Zenkovich reports on recent African downstream developments:

- Gas Authority of India Ltd (GAIL) is considering Shell's offer of equity in two of its Egyptian city gas distribution subsidiaries – 10% in Shell CNG Company and 19% in Fayum Gas Company.
- Mobil Oil Sudan's (MOS) retailing of oil, petrol, diesel, motor fuels, jet and marine fuels, lubricants and other petroleum products – accounting for a 20% share of the country's product market – have been taken over by Petronas International, a subsidiary of the Malaysian parent, and by Engen of South Africa. MOS has been renamed Petronas Marketing Sudan. Included in the deal are three fuel depots, a refinery and a countrywide network of filling stations.
- Zambia's fuel reserves add up to only two months of supply, Energy Minister George Mpombo has declared, calling for a dismantling of 'the pipeline of middlemen', direct stockfeed imports from Iran or Kuwait and an increase of prices at the pumps.
- It is reported that the Mugabe Government's raising of fuel prices by 200% in one go and by 300% within a month at a time when inflation climbed 228% and Zimbabwe was experiencing power cuts is likely to have a 'disastrous' effect on the economy.

In Brief

*develop refuelling technology for liquid hydrogen vehicles and are to invite other vehicle manufacturers and suppliers to join their venture.**

***Newfoundland-based North Atlantic** Refining and Petro-Canada have reached an agreement for the purchase of Petro-Canada's downstream retail network in Newfoundland. The sale is expected to close in May 2003.*

Premcor, one of the largest US independent refining companies, has said it will sell an Illinois refinery to ConocoPhillips for $40mn, giving up efforts to expand in the region. Premcor said it would post a first-quarter loss of $16.6mn from the sale of processing and other assets at the 70,000-b/d refinery in Hartford, Illinois, near St Louis.

Middle East

***Two Iraqi oil refineries have resumed** production and are producing around 125,000 b/d, the Iraqi Petroleum Ministry announced on 7 May. Ten days earlier, Baghdad's Adura refinery began producing 50,000 b/d.*

Russia & Central Asia

***A consortium led by Gazprom and** including US-based Clement Power Ventures (CPV) and Gazprom-tied Dujoketana has signed an agreement for the 100% acquisition of Kaunas Energija, the second largest power station in Lithuania, reports* Stella Zenkovich.*

Gazprom has extended to 2015 a contract to supply 8bn cm/y of Russian gas to Gaz de France, having already supplied the state company with 12bn cm in 2002, reports* Stella Zenkovich.

Asia-Pacific

***Malaysia claims to be set to overtake** Algeria as the second biggest producer of LNG following the opening of the Malaysia LNG 3 plant on 8 May.*

***BP has notified a consortium of KBR** (formerly Kellogg Brown & Root), JGC Corporation of Japan and PT Pertafenikki Engineering (KJP) that it has been selected as the winning bidder in the tender for the engineering, procurement and construction (EPC) contract for the Tangguh LNG facilities in Indonesia. The consor-*

In Brief

tium submitted a commercial bid worth $1.4bn. The Tangguh facilities are due to be commissioned in 2007.

Latin America

***BG Group's Train 3 of the Atlantic LNG** $1.1bn two-train expansion project in Trinidad & Tobago has successfully entered start-up operations. The expansion project, which began construction in 2000, has increased LNG output capacity from the Point Fortin facility to nearly 10mn t/y.**

***Shell's proposed LNG regasification** terminal in Baja California, Mexico, has been granted an environmental permit by the Mexican authority SEMARNAT. The new terminal, will have a capacity of 7.5mn t/y and is due to be operational in 2007. Regasified LNG will be sent to power plants and industrial customers in northwest Mexico, with surplus gas marketed to southern California.*

Africa

***Following a comprehensive feasibility** study the Angolan Government and Sonangol have decided to go ahead with the construction of the 200,000 b/d Lobito refinery, to be known as Sonaref, that will process crude from the Kuito and Dalia fields.*

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Road charging for lorries in UK

The UK Freight Transport Association (FTA) has welcomed the government's announcement that road user charging on lorries, to be introduced from 2006, will be accompanied by a compensatory reduction in diesel duty for goods vehicles resulting in there being no net increase in the industry's tax bill.

However, it cautions that onboard equipment and billing systems must be interoperable with other equipment and schemes (such as the M6 motorway toll, European tolling schemes, and cab technologies including tachographs), and that the scheme must be easy for industry to administer (pointing out that the costs of administering the London congestion charge programme, for example, are almost equal to the cost of the charges themselves).

The FTA also states that, while it fully supports lorry road user charging as a means of part-managing the congested roads infrastructure that costs the nation some £20bn/y, such charges 'can only be the beginning' as 'it is cars that are the primary cause of congestion and the scheme must ultimately apply to them.'

Latest update on European Union news

Agreement in principle over the proposed reforms to the European Union's (EU) gas liberalisation directives has been secured at the European Parliament's key industry committee, although it is proposing important changes, writes *Keith Nuthall*. MEPs called for amendments, insisting upon close cooperation between the European Commission and national regulators regarding security of supply. The committee also wants gas industries to be externally audited for banned cross-subsidies. On a specific gas directive, the committee wants to guarantee the independence of transmission system operators or inter-transmission system generators; the optimal usage of transmission and storage resources for gas; and secure and environmentally sustainable supplies and sales.

Other EU news includes:

- The European Commission has approved the acquisition by Gaz de France (GDF) of the German oil and gas activities of Preussag Energie.
- The Commission has closed its probe into the alleged refusal by Dutch gas company Gasunie of pipeline access to the Norwegian subsidiary of US oil and gas producer Marathon. Brussels said that Gasunie has undertaken to increase transparency over network access, improve capacity management and hasten access requests processing.
- The European Investment Bank (EIB) is planning to lend Germany's E.ON Energie 300mn to promote energy efficiency within its electricity production and distribution network, including natural gas-fired schemes.
- The European Environment Agency (EEA) says that in 2001, for a second year running, EU greenhouse gas emissions have risen. Austria, Belgium, Denmark, Finland, Greece, Ireland, Italy, Netherlands, Portugal and Spain are claimed to be the worst offenders.
- The EIB is to lend 250mn to upgrade two large oil-fired plants in north Italy, owned by Endesa Italia, into combined cycle gas turbines.

UK Deliveries into Consumption (tonnes)

Products	†Mar 2002	†Mar 2003	†Jan–Mar 2002	†Jan–Mar 2003	% Change
Naphtha/LDF	75,848	256,938	263,977	696,998	164
ATF – Kerosene	848,318	254,117	2,237,951	1,896,983	–15
Petrol	–	–	–	–	–
of which unleaded	1,727,013	1,640,794	4,933,160	4,626,491	–6
of which Super unleaded	46,380	63,095	129,151	201,267	56
ULSP (ultra low sulfur petrol)	1,680,633	1,577,699	4,804,009	4,425,224	–8
Lead Replacement Petrol (LRP)	45,936	20.778	134,611	58,726	–56
Burning Oil	410,147	358,607	1,229,436	1,071,079	–13
Automotive Diesel	1,436,148	1,423,812	4,161,434	4,024,075	–3
Gas/Diesel Oil	518,001	539,624	1,605,199	1,608,051	0
Fuel Oil	212,543	201,696	602,292	638,972	6
Lubricating Oil	66,984	67,545	221,558	206,412	–7
Other Products	790,561	1,206,754	2,023,117	2,723,738	35
Total above	6,131,499	5,970,635	17,412,735	17,551,495	1
Refinery Consumption	411,978	371,402	1,301,929	1,164,261	–11
Total all products	6,543,477	6,342,037	18,714,664	18,715,756	0

† Revised with adjustments

All figures provided by the UK Department of Trade and Industry (DTI)

'Big Straw' effect from solid expandable tubulars

There is growing industry acceptance of Enventure Global Technology's Solid Expandable Tubular (SET™) technology, with applications in over 130 wells and a field test that proved the concept for a true mono-diameter well completed during September 2002. *Jeff Crook* reports.

SET systems can decrease the bore of tubulars at the top of the well or, alternatively, increase the wellbore reach to the pay zone, by eliminating the telescope effect within the wellbore. Production rates of a deepwater well are thus increased due to the 'big straw' effect. Associated benefits include the potential for reducing the size of drilling rigs – a major saving for deepwater wells – and environmental advantages through the reduction, of as much as 50% in the volume of drill cuttings produced. The technology also has the potential to allow deeper and more technically challenging reservoirs to be tapped. All these benefits are achieved by expanding the tubulars once they are installed in the well. (See **Figure 1**).

Development history

The history of this innovative technology can be traced back to the early 1990s when Shell identified the need to reduce the telescoping effect of conventional casing designs and began investigating the possibility of expanding solid oil field tubulars downhole. The original concept test was demonstrated during 1993 in The Hague, using welded pipe material similar to that used in the automobile industry. Then, Shell Technology Ventures and Halliburton Energy Services formed a joint venture company to develop and commercialise the concept using conventional oil field tubulars – this led to the birth of Enventure Global Technology in December 1998.

The concept became a commercial reality in late November 1999, when Enventure successfully and safely installed its first SET Openhole Liner (OHL™) system in Chevron's West Cameron 17 field, just outside Louisiana State waters in the Gulf of Mexico. There followed a 'nested' application during 2001, in which two SET systems were installed, one within the other, in the same well.

Then, the first well using Enventure's Mono-Diameter™ system was drilled in September 2002, which proved that a well could be successfully completed with one continuous internal diameter from surface to total depth. This latter project has laid the groundwork for a deepwater mono-diameter well towards the end of 2003.

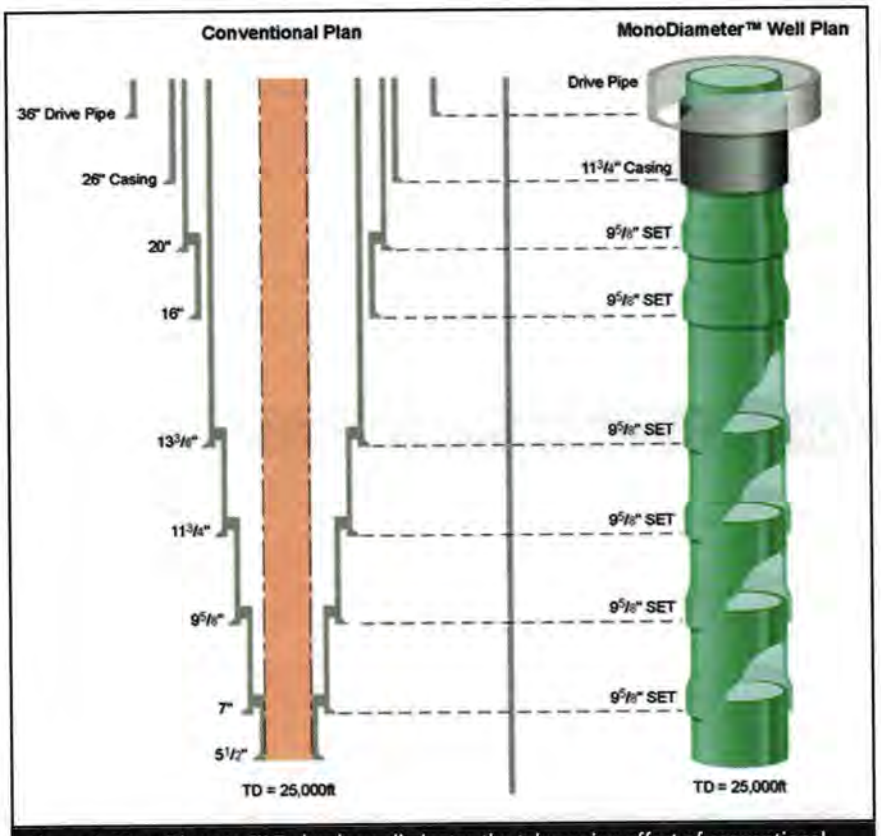

Figure 1: MonoDiameter™ Technology eliminates the telescoping effect of conventional casing, increasing the well's internal diameter by as much as 20%, thus allowing higher production rates.

Application today

In commercial applications today, expandable steel casing may look similar to conventional oil field tubulars. However, the casing is subjected to a special process to increase ductility, reduce sensitivity and increase fracture toughness. It must also meet strict quality control criteria. After a hole has been drilled below the base casing, a casing string is run into the hole section to bottom. Then the casing is deformed, to increase its diameter, by driving a specially designed expansion cone through the tubulars by hydraulic pressure.

This expansion process forces the casing metal beyond its yield strength temporarily into the plastic region of the stress/strain curve. The physical characteristics of the casing change during this deformation process – its length and wall thickness are slightly reduced. An

continued on p14...

Convenience retailing at its best

As margins from fuel sales become increasingly tight and unreliable, fuel retailers should use IT to efficiently extend their businesses into convenience retailing, writes *Ted Denham*, Business Development Manager–Oil and Gas, SAP UK.

The fuel retailing industry is growing ever more competitive and fuel margins are becoming unreliable as a source of sustainable income. To survive, forecourt operators are having to shift their operations to focus on convenience retailing, or the selling of non-fuel products, in order to generate higher margins and remain in business.

Making the move

However, making the jump is not easy for those fuel retailers that have focused for years on a limited number of products and have not required extensive supply chain, merchandising management or other complex retail business processes that extensive convenience retailing necessitates.

Lessons can already be learnt from those fuel retailers that have tried to adapt their business but found the convenience retailing operations they adopted to be disorganised and inefficient. Fuel retailers may be adept at selling gasoline and motor oil, but when it comes to non-petroleum products many have not investigated the appropriate strategies or invested in integrated technology to effectively operate retail outlets.

The reason these companies may not be reaching their desired success is that they have tried to role out convenience stores (C-stores) without the aid of systems designed specifically for the information intensive processes required for convenience retailing. They have purchased different types of technology separately with the hope of linking them to existing systems, but have thereby created islands of technology that do not work together or communicate with one other. Connecting disparate systems has proven difficult and expensive, and has often created data integrity and upgrade issues. The use of multiple systems also increases costs significantly and has given convenience retailers a lack of visibility across their operation.

Better business model

But new business strategies for convenience retailing based on sound integrated technology are here to help fuel retailers make the move to high-margin convenience retailing. Such solutions include SAP's Service Station and Convenience Retailing, a completely integrated solution designed to help the fuel retailer effectively manage their entire retail network – from end to end – while profitability increases thanks to enhanced supply chain efficiency and powerful e-business intelligence tools. SAP Service Station and Convenience Retailing provides the tools and technology needed to plan, forecast, allocate, identify customer trends, and much more.*

With the advent of such convenience retailing specific solutions, forecourt operators now have an opportunity to quickly roll-out technology that meets the challenging business needs of service station and convenience store operations.

Today's technology is designed to help all sizes of convenience retail organisations by gathering detailed operational data and converting it into powerful timely business information, as well as the standardising of business processes across a retail network of many convenience stores. At the heart of all these initiatives is a cost-effective business model that incorporates accurate and timely information provided by powerful retail-specific information technology.

Some of the business benefits from

this new technology include:

- the ability to update across the entire retail network from a central location, and
- improved data integrity derived from a fully integrated, self-contained system that captures information first at the source and stores it centrally for access by all users within the organisation via the Internet. This provides reduced store-level administration through streamlined business processes along with lower system maintenance costs because upgrades are performed at the home office and distributed centrally.

New tools designed for a new world

Fuel retailers entering convenience retailing should look for a solution with integrated capabilities, including fuels management, merchandise management, site-level operations, financial reporting and analysis, and data warehousing. These features will help support the new business model with a totally integrated infrastructure for effectively managing convenience retailing at both the individual locations and company headquarters.

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...continued from p12

elastomer-coated hanger joint allows the expanding pipe to hang off and seal inside the base casing.

There have now been over 130 installations (as of 10 March 2003) since the West Cameron project, including several deepwater wells where potential benefits are regarded as particularly significant. In addition to 'nested' (in deepwater, shelf and onshore), horizontal and Chrome13 installations for almost 40 different operators worldwide, various other difficult challenges have been tackled.

Brunei workover project

One of the more complex jobs was carried out by Brunei Shell Petroleum (BSP) and Enventure Global Technology during September 2002 when the world's first horizontal cased-hole SET system was installed in a 1,000-ft-plus workover project. The project has produced $12mn in additional oil recovery. Prior to this workover the whole section had been isolated by means of a plug due to the gas production.

Smedvig's *West Menang* rig was used to run the expandable liner, which consisted of a 5 $^1/_2$-inch nominal bore Cased Hole Liner (CHL™) inside a 7-inch nominal bore liner. The operation was carried out in an offshore oil well located in the Iron Duke field off the northwest coast of the island of Borneo.

For this project, the liner system was expanded by 11.6% using a propagation force of approximately 94,000 lbs, so that the 5 $^1/_2$-inch nominal bore liner expanded from a pre-expansion internal diameter (ID) of 4.892 inches to a post-expansion ID of 5.460 inches. After expansion the liner was perforated across three separate oil producing zones between pairs of seals, while leaving the gas zones shut-off behind the expandable liner.

'This job was one of our most complex jobs to date and significantly stretched the operating envelope of our system,' said Chan Daigle, the Operations Vice-President of Enventure. 'The elastomer seals had to be positioned within a tolerance of ±6.6 ft due to the proximity of the gas to oil-bearing zones. This was quite a feat at a hole depth of almost 13,123 ft. Also, to get to depth the liner had to be run "uphill' in an inclination of 105°.'

Deepwater drilling

The high cost of drilling deepwater wells, where the charter rate for a suitable mobile drilling unit (MODU) could be $200,000/d, was a major incentive for the development of SET technology. Slimming holes using SET systems will not only enable operators to utilise less costly risers, blow-out-preventers and drill rigs, it will also enable larger bore production tubing to be installed in the well, thus raising production rates, and increasing the financial return on investment, which could easily amount to $10mn per ultra-deepwater well.

Enventure installed the first SET system in an ultra-deepwater well for Shell Exploration & Production Company (SEPCo) in the Gulf of Mexico. The 1,186-ft OHL system was successfully run from the R&B Falcon's *Deepwater Nautilus* semi-submersible drilling rig in a water depth of 7,790 ft.

Mono-diameter well

Shell announced the successful proof-of-concept field test of the world's first mono-diameter application in South Texas in September 2002. The well was spudded on 18 May in Starr County, and was a collaborative effort between Shell Exploration & Production Company, Shell International Exploration & Production (SIEP) and Enventure Global Technology. The well is a flowing gas producer that was drilled and completed with a perfect safety record. The two mono-diameter sections used in this project were 9-$^5/_8$ inches in size.

'This is another milestone in Shell's history of developing cutting edge technology in the oil and gas industry. It is a major step in a journey that should culminate for SEPCo in the application of this well design in the deepwater Gulf of Mexico next year. We expect this revolutionary process to do for well design what 3D seismic did for geologic exploration and hydrocarbon development,' said SEPCo President and CEO Raoul Restucci.

Innovation awards

Enventure Global Technology has received various industry awards, the most recent of which was a World Oil 2002 Next Generation Award presented in November 2002. Speaking about this award, Mike Teers, Chief Operating Officer of Enventure, said: 'One of the greatest energy challenges facing America is the need to develop and deploy new and innovative technologies to responsibly explore, produce and supply oil and natural gas to meet the energy demand of all sectors of the US economy.'

'By enabling access to reserves which are out of reach of current technology or which are currently uneconomic to develop, we believe this technology can help secure the energy supplies needed to maintain global economic expansion.'

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Nuclear magnetic resonance while drilling

Matthias Appel, Shell UK Exploration and Production; *Nigel J Radcliffe*, ExxonMobil; *Prabhakar Aadireddy*, Halliburton Energy Services; *Ron J M Bonnie*, Halliburton Energy Services; and *Ridvan Akkurt*, NMRPlus, report on the successful introduction of MR-WD (magnetic resonance while drilling) in the tough drilling environment and complex geology of the UK southern North Sea – the first ever use of this technology in a gas well and in a known hard-rock environment.

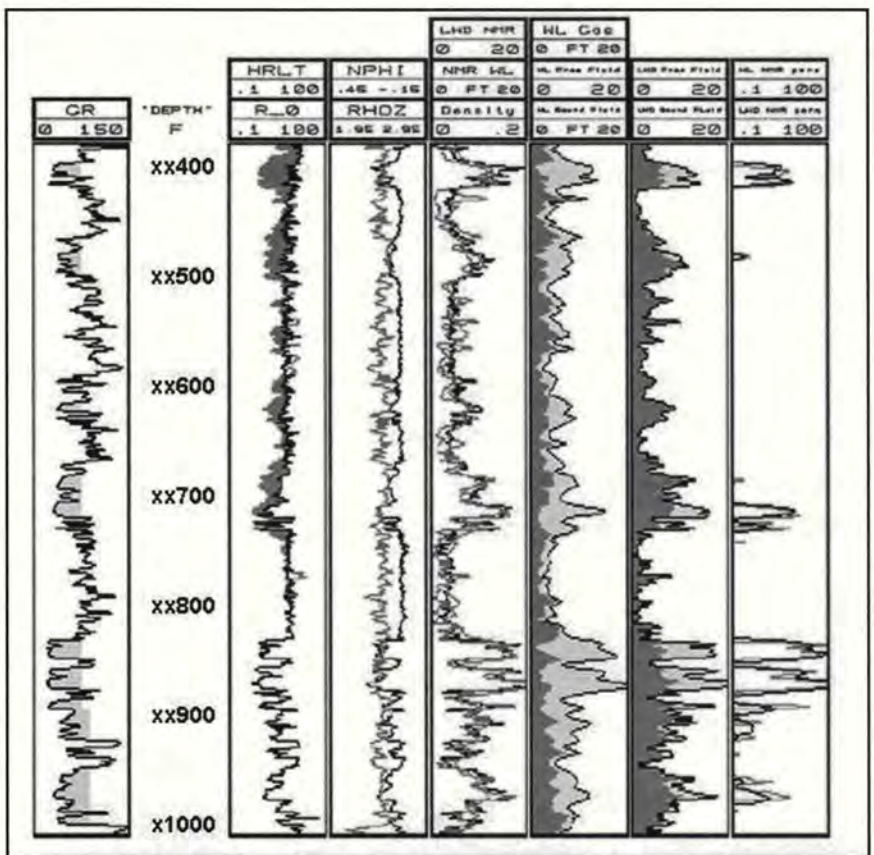

Figure 1: Overview of reservoir. Gamma ray, resistivity and neutron-density data are presented in tracks 1, 3 and 4, respectively. In track 5, porosity values derived from wireline MR and from MR-WD are compared with density-derived porosities. Tracks 6 and 7 illustrate the ratio of bound to free fluid determined from the forward modeling of the NMR (nuclear magnetic resonance) responses. In track 8 formation permeability calculated from WL and MR-WD data is shown.

In the past decade magnetic resonance (MR) logging has become a mainstream petrophysical tool for reservoir characterisation, providing, amongst other parameters, total porosity, bound and moveable fluid volumes, permeability indicators, and fluid typing. An extension of the technology – MR-WD (magnetic resonance while drilling) – was first utilised in the southern sector of the UK North Sea in 3Q2001. The outcome was highly successful, with the results from core analysis supporting the good agreement observed between wireline-derived data and MR-WD measurements.

MR logging tools applied in the oil and gas industry use permanent magnets to align the magnetic moment (or spin) of hydrogen atoms in the oil, gas, or water near the well-bore. These tools feature RF-transceivers, first, to disturb the alignment of the magnetic moments and, next, to observe their re-alignment. This re-alignment ('relaxation') is governed by various relaxation mechanisms, two of which play a key role in MR logging:

- T_1 relaxation characterises how fast the RF-induced energy is dispersed into the surrounding molecular lattice, and
- T_2 relaxation describes how quickly the precessing spins lose their phase coherence.

Both T_1 and T_2 are governed by the PVT (pressure/volume/temperature)

properties of the fluids and by the structure and surface chemistry of the surrounding rock matrix. Hence, MR logging offers the opportunity to identify and quantify fluids and to probe the pore-structure of the matrix, which can be linked to permeability, for example. Numerous T_1 and T_2 acquisition sequences have been developed. These sequences are optimised for the expected MR response of the formation fluids.

MR while drilling

The development of MR-WD was complicated by the inherent sensitivity of a MR measurement to vibrations. The impact of motions is twofold. First, vibrations of the drill string will reduce the measured T_2-relaxation time. Second, any transverse movement of the bottom hole assembly (BHA) can cause the volume that was targeted by the excitation process to no longer coincide with the volume that is sensed during the read-out process. As a result, the measured signal – and, hence, derived formation and fluid parameters – will be altered compared to a static situation.

The design of Halliburton's MRIL-WD™ tool that was deployed in the North Sea addresses both these effects – spins were excited in a much wider volume than that for the subsequent readout process. The dimensions were selected such that even in the presence of significant transverse movement, the sensitive volume falls entirely within the excited volume, yielding a measurement that is largely independent of tool motion.

While drilling, the MRIL-WD™ tool measures the longitudinal relaxation time T_1 using a saturation-recovery sequence. This approach eliminates artifacts of motion-reduced T_2 relaxation times. The potential downside is the fact that T_1 measurements typically have a lower spectral resolution than T_2 measurements. In turn, lower resolution may complicate the separation of the measured relaxation spectra into components originating from clays, bound and moveable fluids.

The MRIL-WD™ tool that was run is capable of switching between the motion-tolerant T_1 measurement and a conventional T_2 measurement similar to a wireline tool. Based on the rotation of the BHA, this tool will automatically switch measurement mode (high rpms: T_1 mode, low/no rpms: T_2 mode), allowing for the acquisition of high-resolution – with respect to relaxation time – T_2 data during wiping and tripping.

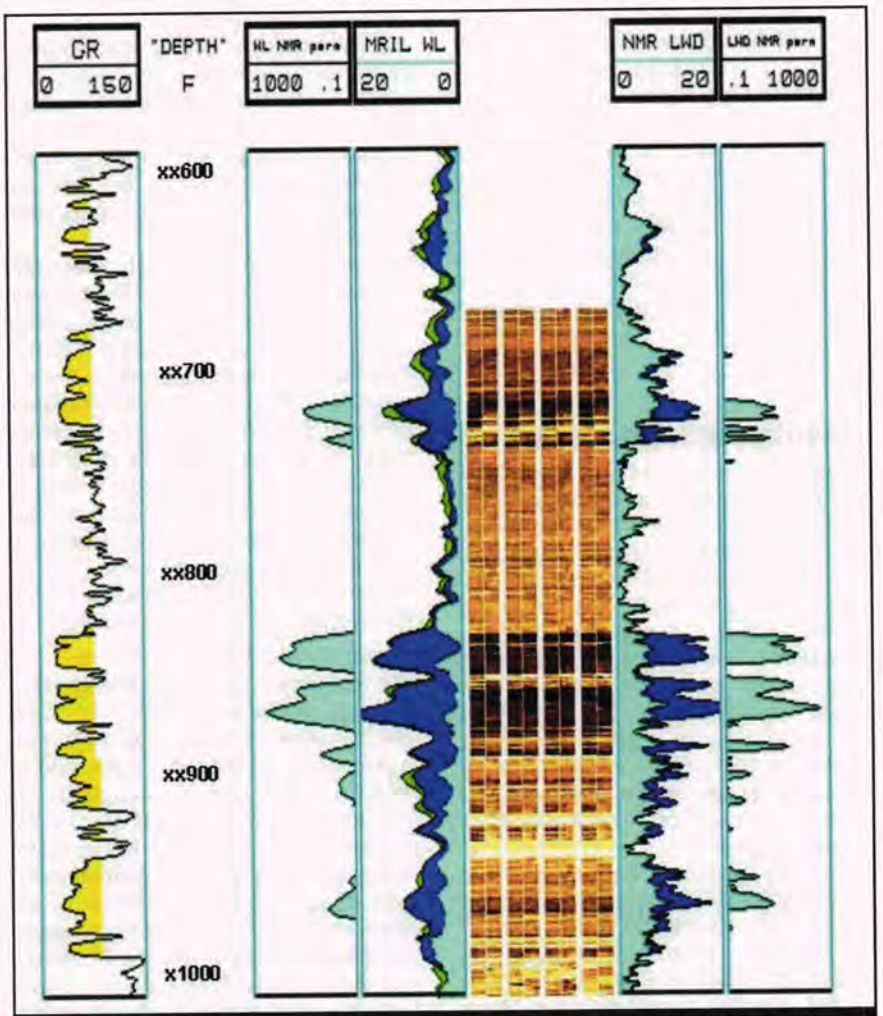

Figure 2: Comparison of the vertical resolution of wireline MR responses and MR-WD responses with formation resistivity images. Track 1 shows GR; the yellow shading indicated sands. Permeability and fluid volumes derived from wireline MR data are presented in tracks 3 and 4 respectively. The MR-WD equivalents are shown in tracks 6 and 7. Wireline formation resistivity images are presented in the fifth track.

Operational issues

Running MRIL-WD™ in an exploration well in the UK southern North Sea in 3Q2001 was the first-ever application of this new technology in a known hard-rock environment. By including MR-WD technology in the logging programme it was hoped that formation evaluation could be improved at an early stage of the drilling programme, in support of the decision-making during the operations. Typical questions that needed answering at this stage were related to geo-steering in fractured and fairly thin-bedded lithologies, to the identification of fluid contacts, and to a precise quantification of the reservoir properties. While all these questions can be fully addressed with open-hole wireline logging, LWD (logging while drilling) technology is advantageous for complicated wells where wireline or pipe-conveyed operations are either prohibited or risky. Furthermore, significant cost savings can be realised if formation evaluation can be based entirely on LWD data.

The data acquisition programme in the well under discussion was extensive. LWD resistivity at the bit (RAB) and the gamma ray were run separately and in combination with the MR-WD tool. In addition, a full wireline suite comprising gamma ray, resistivity, density, neutron, formation resistivity imaging, magnetic resonance, seismic profiling and formation pressures, was also obtained. Furthermore, about 300 ft of core was taken from the reservoir section.

The MR-WD tool was deployed with the BHA used to drill to target depth through the basal section of the Rotliegendes and into several hundred feet of Carboniferous. As such, the tool was subjected to a much harsher drilling environment than originally planned. Inclusion of the MR-WD tool, however, did not impair the drilling process in any way

and data were acquired over some 92% of the planned drill section in addition to taking measurements whilst sliding across the previously cored section. At the very end of the drilling run there were significant shocks with peak-values up to 100 g and background level shocks of some 10 g in the Carboniferous. These shocks resulted in failure of the power cartridge of the tool. This experience initiated a change of design of this particular power cartridge.

Results and discussion

Figure 1 summarises the open-hole logging data (LWD and wireline) and compares porosity, fluid fractions, and permeability derived from the MRIL-WD™ and from wireline MR-data. The MRIL-WD™ was first run while wiping and reaming over the previously cored interval; only MR data below xxx656 ft was collected while actually drilling. The absence of any clear density-neutron cross-over indicates that gas was displaced by invading water at the time logging. Absence also indicates relatively poor reservoir quality.

The separation in bound/free fluid was established by application of 33 ms and 50 ms cut-offs on the T_2 and T_1 MR-spectra, respectively. Finally, the MR-based permeabilities were computed using the standard Coates-Timur equation.

Porosity measurement

Overall there is a very good agreement between core, wireline, and LWD derived porosity values. Furthermore, the character of the formation is clearly represented with the MR-WD measurements, emphasising the benefit of MR-WD in exploration and development wells.

The noticeable difference between MR-WD and density porosity in the top sand around xx400 ft is related to gas effects, giving rise to an overestimation of formation fluid density in that section. For the rest of this well there is a good agreement between MR-WD and wireline density data, with some undercall of MR-WD porosity in the lower porosity class 0 to 5%. The timing of the saturation recovery sequence used to measure T_1 or the inversion procedure applied to this data set may not be sensitive enough to fast relaxing protons in clays and shales.

Measurement of relaxation time

The most important difference between the longitudinal or T_1 (MRIL-WD™) and the transverse or T_2 (wireline MR) measurement is that the latter is affected by molecular diffusion. Consequently, T_2 will be reduced proportionally to the product of the magnetic field gradient and the diffusivity of the probed molecules (fluids). Data taken well below the gas-water contact shows excellent agreement between the T_1 and the T_2 spectra, and details of the formation are equally well presented with both measurements.

The differences observed in this well between T_2 and T_1 relaxation times in a proven gas-bearing section are attributed to the fast diffusion of gas molecules. These differences demonstrate a very powerful application of MR-WD – comparison of T_1 data acquired during drilling with T_2 data measured during a wiping pass across the same interval will confirm the presence of gas.

Vertical resolution

Figure 2 compares LWD-derived fluid fractions with the corresponding wireline-derived curves. This figure clearly shows that the MR-WD data have better vertical resolution. The MR-WD-derived fluid fractions and the permeability indicator follow far more closely details of varying reservoir quality shown by the resistivity imaging tool. This data set suggests that the MR-WD tool is capable of identifying shale inter-layers as thin as 2 ft.

Powerful tool

MR-WD technology provides a powerful addition to the existing LWD tool suites and offers an attractive and cost effective alternative for formation evaluation. Major technical benefits and cost savings are envisaged through the incorporation of MR-WD technology in the formation evaluation programmes. Extended-reach/multi-lateral wells, where conventional wireline or pipe-conveyed logging may be considered inappropriate, provide the greatest challenge and opportunity for MR-WD technology. ●

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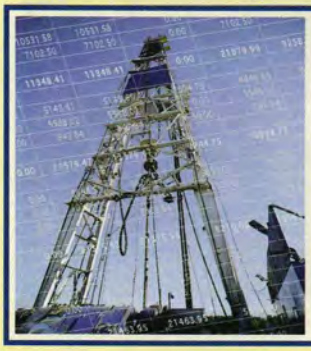

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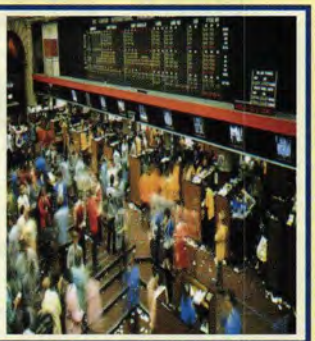

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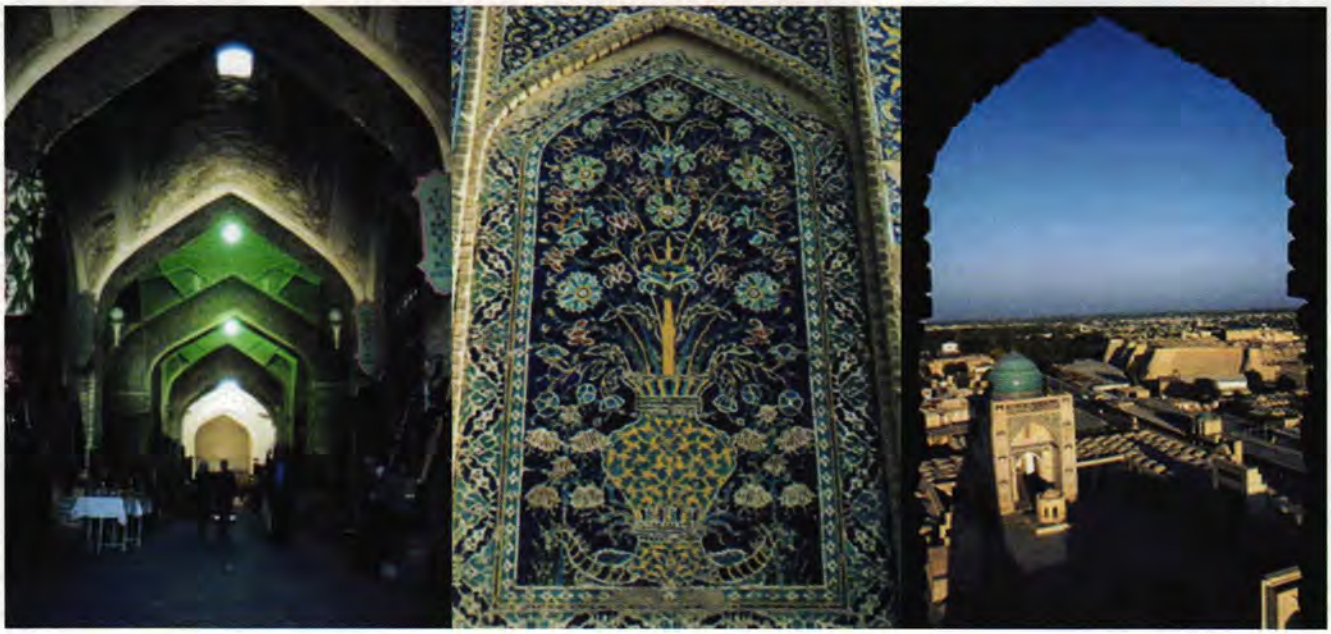

An expanding and capital-hungry economy

Rich in mineral resources and self-sufficient in energy, Uzbekistan has a strong and vibrant economy that is close to the point of economic take-off. The national economic priorities are now being focused on strengthening external trading links, communication infrastructure and a strong inflow of capital and technology from foreign businesses. However, the challenge will be to use that valuable inflow to derive optimum long-term national benefit, writes *Dr Malika Saidkhodjaeva*,* Tashkent State Economic University – International Business School 'Kelajak Ilmi'.**

The location of the Uzbekistan capital, Tashkent, at the heart of the five Central Asian Republics gives the city a coordinating role in the wider region and it is a key stepping-stone between Europe and China. (See **Table 1**.) Uzbekistan also has a secondary and potentially rewarding part to play in the ancient and reviving North–South flow of goods, services, capital and people emanating from Russia and Northern Europe towards Afghanistan, Pakistan and India, and in a developing trade in the reverse direction. As a key trading, communications and energy hub, Uzbekistan is therefore forecast to attract increasing levels of foreign investment. The challenge, however, will be to use that valuable inflow to derive optimum long-term national benefit.

Following the break-up of the Soviet Union in 1991, the newly independent Uzbekistan Government found itself faced with many intractable economic problems. Subsidies from Russia and neighbouring FSU states had been withdrawn, capital inflow had been virtually halted and income from cross-border trade had declined sharply. In turn, this led to declining industrial and agricultural output and high domestic inflation.

Opening the economy

The government decided to implement a new economic policy that included

continuing self-sufficiency in energy. Its cautious strategy and step-by-step approach to economic reform and the opening-up of the economy to international interest and support has meant that Uzbekistan has experienced a much shallower economic recession than its neighbours. For example, the other large Central Asian Republic, Kazakhstan, has since that time been experiencing the tumultuous and destabilising effect of high capital-inflow into the oil and gas sector.

The opening-up process in Uzbekistan is an ongoing process. A number of privatisation projects in the electricity and banking sectors have already completed, while invitations made to leading Western universities to set up out-reach academic and technical training centres in Uzbekistan have been readily taken up. Some of these centres are already in full operation in Tashkent and Samarkand, and others are planned in Urgench and the Fergana Valley.

Sound energy mix

Uzbekistan's continuing energy self-sufficiency is a source of great economic strength. In 2001 consumption rose by 7.8% to 54.8mn toe after sluggish growth over the previous five years.

Oil production, which had slumped 33.6% over the previous decade, plays only a small role (11.9%) in the energy mix (see **Table 2**). Coal (1.1mn toe) and hydro (1.3mn toe) barely count for anything in the mix. There is no nuclear and no significant alternatives (solar, wind, geo-thermal etc).

Modern gas economy

Today, Uzbekistan is predominantly a modern expanding natural gas economy. Natural gas production has risen 36.9% over the decade to 46mn toe (82.9% of total energy consumption) and is still capable of expanding strongly (see **Table 3**). This level of gas production puts the country in first place among the five Central Asian states – although Turkmenistan, at 43.1mn toe, is not so far behind. [A decade ago Turkmenistan gas production was double that of Uzbekistan.]

What is more significant, however, is that Uzbekistan's natural gas consumption is four times that of Turkmenistan and five times that of Kazakhstan. In other words, Uzbekistan is far ahead of the other Central Asian states in the modern distribution and utilisation of natural gas – a very useful economic under-pinning to kick-start the Uzbekistan economy into a period of high industrial growth and agricultural diversification.

Photo: Anvar Ilyasov

Rich petroleum resources

In geological terms, Uzbekistan is a strategic centre of the semi-ring extending from the Persian Gulf through the Caspian and Tarim Basins – an area that comprises some 85% of proven global crude oil reserves and a vast reservoir of natural gas, much of which has been only superficially explored and evaluated to date.

The country has a total of 155 oil, condensate and natural gas fields that the international industry rates to be of high prospectivity. However, it would be unwise to burden the national budget with development of these fields at a time when the international oil industry is demanding improvements in participation and taxation terms. Such adjustment of terms for foreign participation will permit a strong inflow of advanced technology and external capital – this does not imply any selling off of national assets, merely a more practical working relationship between the public sector and the new outsiders.

Tashkent – an IT hub

Various efforts have been made to establish the Uzbekistan capital – Tashkent – as the key communications hub for the Central Asia region. There are very many sound economic and commercial reasons for such a development. Yet the critical mass of computing resource and the level of penetration of IT use in Uzbekistan still falls below the levels considered as essential in the industrialised countries – not far below, but still below.

To make this jump is not a difficult one and, if managed properly, can be achieved swiftly with little charge to the government budget. Countries such as India, Japan and Malaysia may be able to supply the most appropriate model. A competent analysis of the rel-

	Population (millions)	Area (sq miles)
Uzbekistan	25.0*	175,000
Kazakhstan	17.8**	1,050,000
Tajikistan	6.2***	55,000
Kyrgyzstan	4.8****	75,000
Turkmenistan	4.7*****	190,000
Total	**58.5**	**1,545,000**

** of which 69% Usbeks; 10% Tajiks*
*** of which 36% Kazakhs*
**** of which 60% Tajiks; 23% Usbeks*
***** of which 52% Kyrgyz*
****** of which 72% Turkmen*

Source: PTA London from UN sources

Table 1: The five Central Asian Republics

	1991	1996	2001
Production	2.8	7.6	7.3
Consumption	11.0	7.4	6.5

Oil reserve/production ratio, 2001 – 11.2 years
Oil self-sufficiency, 2001 – 112.3%
Source: PTA London from international oil industry sources

Table 2: Uzbekistan oil sector statistics (mn toe)

	1991	1996	2001
Production	35.2	41.1	48.2
Consumption	33.4	39.0	46.0

Gas reserve/production ratio, 2001 – 33.2 years
Gas self-sufficiency, 2001 – 104.8%
Source: PTA London from international gas industry sources

Table 3: Uzbekistan gas sector statistics (mn toe)

ative backwardness in IT in the countries of Kazakhstan, Turkmenistan, Tajikistan and Krygyzstan compared with Uzbekistan may also be helpful.

Without doubt, oil and gas production acceleration, minerals development, agricultural diversification and a consumer-led period of high economic growth would benefit sharply from stronger communication links and local IT trading facilities. An example within the energy sector would be to build on the daily cooperation and quarterly meetings of the region's five Energy Ministers, to go beyond energy supply issues of mutual concern to the introduction of advanced IT and Western market mechanisms to manage and regulate peak levels of energy demand. ●

Note: Statistical sources for main article: IMF, World Bank, BP, International Energy Agency, Oil & Gas Journal

* Consular of the Chairman of the Board, Science Industrial Holding Inc. Republic of Kazakhstan.

**This article is an abridged version of a paper written for a presentation to be given at the 26th Annual International Conference of the International Association of Energy Economists in Praha, Czech Republic, on 4–7 June 2003. It also supplements more detailed information presented to IAEE-24 in Houston, US, in June 2001 and to IAEE-25 in Aberdeen, Scotland, in June 2002.

IP Certificates of Appreciation

John Phipps (right), IP Technical Manager, Standards, presents Les Mehew with the IP's Certificate of Appreciation. Les, who works at the TotalFinaElf Lindsey Refinery, is retiring as the Chairman of the IP ST B-1 CFR Engine Operators and Experimental Panel after 14 years in the chair.

Les Mehew (left), of TotalFinaElf and outgoing Chairman of the IP ST B-1 CFR Engine Operators and Experimental Panel presents Eddie Roche with the IP's Certificate of Appreciation. Eddie, who recently retired from working at the ConocoPhillips Whitegate Refinery, Cork, had been a member of the panel since 1958.

New requirements for respirator fit testing

A revised version of the UK Control of Substances Hazardous to Health Regulations (COSHH) was introduced in November 2002. The main changes to the legislation came about from the requirement to implement the Chemical Agents Directive (98/24/EC). Many of these changes reflect the more prescriptive tone of the European legislation plus a general tidying-up of the format, reports *Mark Elsome*, a member of the IP Occupational Hygiene Sub-Committee.

One change likely to be significant has been included under COSHH Regulation 7, which deals with 'Prevention or control of exposure to substances hazardous to health'. While every effort must be made to control exposure to hazardous substances by means other than respiratory protection equipment (RPE), where RPE is considered appropriate and the equipment has a tight fitting facepiece, the wearer must be fit tested using quantitative or qualitative test methods. These test methods are described briefly in the guidance and are fully explained in the UK Health & Safety Executive's Information Document 282/28 entitled *Fit Testing of Respiratory Equipment Facepieces.*

Quantitative procedures should be used for full-face masks, with an option to use either quantitative or qualitative methods for half-masks and filtering facepiece types. This is in sharp contrast to previous COSHH regulations where RPE had simply to be 'capable of controlling exposure and be suitable for the purpose'. The guidance in the COSHH Approved Code of Practice also referred to the need for RPE to be 'correctly selected and used' and 'matched to the job and the wearer'. In the past many companies will have relied on simple techniques such as negative pressure tests to perform part of this wearer matching process.

Extension of the employer's duty

In fact there's nothing really new about these fit test procedures – they have been around for a long time and were first introduced into guidance governing the asbestos removal industry. However, the extension of the employer's duty under COSHH and the Control of Lead at Work (CLAW) Regulations to fit test certain types of RPE is new.

Alternative types of loose fitting RPE such as ventilated visors and helmets and powered hoods/blouses rely on sufficient airflow through the facepiece and are less dependent on a tight fit to the wearer's face. Hence the selection criteria are less onerous and these devices do not require fit testing. Nevertheless, the impact of the fit test requirement is likely to be considerable, as this covers not only general users of RPE, but also all employees who use breathing apparatus including emergency services personnel.

Quantitative fit testing

There are three main methods of quantitative fit testing:

- Test chamber method
- Particle counting devices
- Controlled negative pressure

Method 1 is only likely to be available at test houses and research establishments, but methods 2 and 3 have the capability to be used at the employer's own facility. All of them follow an exercise protocol, which includes different breathing modes, head turning and movement of the jaw during reading of a prepared text (the 'Rainbow Passage') or counting aloud, with evaluations carried out during, or at the end of each exercise.

Each test has some limitations – for example in the particle counting method the subject must refrain from smoking for at least 60 minutes prior to the test, otherwise exhaled smoke particles can give false fit test results. A minimum pass criteria is recommended in each test, and if the subject fails to reach this target then obvious defects should be corrected and the test repeated, or a different facepiece size or type tried in the case of repeat failure.

Qualitative tests

Qualitative tests are less costly than quantitative fit testing methods, but rely on the subject being able to detect a bitter or sweet aerosol or an odorous chemical (isoamyl acetate), the latter often contained in a 'scented strip'. To ensure the subject can taste or smell the challenge compound, sensitivity tests need to be carried out using dilute solutions to establish the subject's taste or smell threshold. The compounds are added via a hood worn by the subject or into an enclosure containing the subject, and the same exercises are carried out. The odour test is limited to respirators that can be fitted with an organic vapour cartridge.

Resource implications

Whichever fit test regime is adopted there are resource implications for industry in terms of expenditure, manpower, training and time. The fit test forms only part of the overall RPE training, and other aspects such as the features and application of the RPE, practice in donning the equipment, fit checks and maintenance should not be forgotten.

It will be a matter for individual businesses as to whether they take this new arrangement for fit testing onboard, or contract it out to an external fit test provider.

With these new requirements firmly in place, provision of RPE as a response to a chemical hazard is unlikely to be thought of ever again as an easy option.

Her Majesty grants Royal Charter to the Energy Institute

Following a meeting of Her Majesty's Privy Council on 8 May 2003 a Royal Charter was granted to the Energy Institute (EI). It is expected that the Royal Charter will be sealed this month, bringing the new Institute into existence as a legal entity. In July 2003, the assets and liabilities of the Institute of Petroleum (IP) and the Institute of Energy (InstE) will be transferred to the Energy Institute.

Pierre Jungels CBE CEng FInstPet, President of the Institute of Petroleum, commented to the energy media that: 'This merger builds on the strengths of both organisations and the Privy Council's approval allows us to lay the foundations for the Energy Institute and the future of energy professionals.'

John Blackhall CEng FInstE, President of the Institute of Energy, went on to say: 'The Privy Council's approval of the Royal Charter is another historical step in the creation of the Energy Institute.'

Significant operational progress

In other merger news the Interim Council, which has delegated authorities to oversee the merger integration activities, met on 29 April. High on the agenda were human resource (HR) matters and principally the EI's organisation structure. Significant progress was made on these issues, with the senior staff structure to be announced this month, followed swiftly by the confirmation of all other appointments to create the EI's staff team. The Staff Consultation Committee, made up of elected members of staff, continues to meet on a regular basis for discussion and consultation with the Director General of the IP and the Chief Executive of the InstE.

At its April meeting the Interim Council also discussed a new governance structure for the Energy Institute. This structure is likely to be presented to the next Interim Council meeting. Following this, election and appointment procedures will be developed for officers and Council members of the Energy Institute.

The Interim Council also received a progress update on the workstream groups as they work towards merging the operational activities of the two current organisations. The IT workstream has completed an audit of current software and hardware, as well as completing an evaluation of the IT needs of the new Institute and developing a migration plan for IT systems to be transferred to 61 New Cavendish Street.

Key communications

Another key task for the new Institute is communicating the operations of the merged body, as well as the benefits arising from it. This area is being looked at in detail both by the communication and information services workstream groups. Benchmarking of the existing activities of the two organisations in these areas is progressing well. As well as ongoing meetings with members at national and branch events and activities, meetings with leading figures in industry, government and academic circles continue to communicate the development and future direction of the Energy Institute. This includes Lord Sainsbury, Science Minister, who is deeply committed to the engineering technology and science community.

The publications and event programmes have been reviewed for 2003 and work is progressing on the programmes for 2004. In addition, production cost savings for the two magazines have already been identified. At the end of May a combined Institute of Petroleum and Institute of Energy branch meeting was held over two days at the Institute of Petroleum offices to look at the future branch structure, operations, finances and future branch events. Also in May there was the second in a series of focus groups to test possible logo and branding options for the Energy Institute, with both members and staff involved.

The education and training workstream group has completed a needs analysis for a sample of members in different grades to evaluate the portfolio of professional development services that EI members will require. Discussions with key partners will continue over the next few weeks as EI services are put into place. Both the individual and group member workstream groups have also been busy. Work to identify the current profile of the combined membership, matched with potential membership services is a key task. The current member offerings have been reviewed and benchmarked with other membership organisations to ensure EI members receive access to an enhanced range of benefits as one of the most important commitments expressed in the merger prospectus.

Now that formal approvals have been received and with the operational merger activities progressing well, we are on track to create your Energy Institute in line with the timetable set out in the merger prospectus. The legal creation of the Energy Institute in the summer and its formal launch will be marked by a series of events in the autumn.

IP THE INSTITUTE OF PETROLEUM

new publications

Petroleum Measurement Manual Part X: Meter Proving

Section 13: Recommended Operational Practice for Proving LPG Meters

This new document addresses the proving of LPG meters on vehicles, in distribution terminals and refineries. It looks at methods currently employed within the industry, and its primary objective is to promote uniformity and consistency in both meter proving and the interpretation of results.

In order to ensure that an LPG meter is reading accurately, it is necessary to periodically carry out a test or series of tests in which its readings are compared with measurements obtained from proving equipment that is traceable to national standards. For satisfactory results skilled personnel should carry out proving in accordance with an agreed procedure based on this document.

The document sets out guidelines for proving against volumetric and gravimetric devices. Recent developments are addressed, such as the use of load cells to measure the mass of LPG in storage or vehicle tanks.

Essential reading for all involved with the measurement of LPG and the proving of LPG meters.

ISBN 0 85293 398 3 Full Price £66.00 25% discount for IP Members April 2003

Institute of Petroleum Research Report:

Investigation of factors causing leakage at road tanker loading gantry coupler/tanker adaptor interface

This publication provides the report of an investigation commissioned by the IP to enhance the knowledge of the petroleum distribution industry of the mechanical factors which may cause leakage of petroleum product at the interface between the road tanker loading gantry coupler and the road tanker adaptor.

The investigation focused on the mechanical wear that occurs to loading gantry couplers and road tanker adaptors during normal operations, and on providing options that may reduce the frequency of loss of containment incidents.

This new publication describes the results of the investigation. It will be of interest to those involved in the distribution of petroleum products from road loading terminals, and in the manufacture and supply of equipment for use in such operations.

ISBN 0 85293 399 1 Full Price £32.00 25% discount for IP Members April 2003

Guidelines for the design and protection of pressure systems to withstand severe fires

Mitigation of the impact of severe fires on hydrocarbon, petrochemical and chemical processing plants is critical to minimise the risk to personnel, to reduce damage and to limit capital loss.

These new guidelines are intended for design and process engineers concerned with large, essentially fully enveloping pool fires and jet fire impingement on pressure vessels, their associated pipework, valves, flanges and other equipment, referred to collectively as pressure systems.

The scope of the guidelines covers a wide range of steel pressure vessels used both onshore and offshore. These include process vessels, fixed storage vessels and transportable vessels such as road and rail tankers whilst at the loading/unloading facility. (These guidelines do not apply to small portable pressure vessels such as gas cylinders as these already have specific requirements related to their portability).

These guidelines are intended for use primarily for designing new facilities and specifically deal with fires that are more severe than the open pool fires currently covered in other documents. These guidelines are therefore intended to be used in conjunction with the existing codes and recommended practices such as API RP 520 and 521, which cover the design and fire protection required for all other fire scenarios.

ISBN 0 85293 279 0 Full Price £45.00 25% discount for IP Members March 2003

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Energy needs through 2020

For many years ExxonMobil has conducted analyses of world energy markets to gain improved insight into future supply and demand for the oil and gas industry's products and services. In turn, these findings serve as a basis for the Group's major business decisions. *David Byers*, Issues and Planning Manager, ExxonMobil, provides a summary of the key findings and expectations of the company's most recent worldwide energy outlook that forecasts energy needs through 2020.

The most recent outlook indicates that world energy demand is growing, and that oil and gas will remain the predominant energy sources. Efficiency improvements and advanced technologies are integral to the meeting of these growing needs. However, supplying this expanding global demand will require not only access to resources but also technological gains and government cooperation.

Rising world energy demand

Growing economies will continue to require reliable and affordable energy supplies. By 2020, the world is forecast to require over 40% more energy, primarily as a result of an expanding world economy in developing nations (see **Figure 1**). Hydrocarbons – which currently account for about 80% of energy supply – are expected to maintain a significant share of this world energy demand.

Economic growth will remain the primary driver of energy demand. The global economy has grown at an average rate of about 3%/y since 1970. Growth is expected to continue at that pace, on average, for the next couple of decades as developing nations play a greater role in the global economy and increases in productivity offset lower population growth as a demand driver.

It is anticipated that conventional fuels will remain the dominant energy source, at least through the middle of the century. Wind and solar power will continue to grow rapidly – but due to significant government policies and incentives, not market economics. To put this in perspective, solar power can cost somewhere in between $100–$250/boe. Furthermore, the intermittent nature of solar energy can result in additional costs because incremental generation capacity is needed as backup. Starting from a low base today, wind and solar energy are unlikely to exceed a 1% share of the world's energy needs by 2020, even with double-digit growth rates. This view recognises the role and scope of hydrocarbon supplies today, including their enduring competitive advantages in terms of cost and ease of use in multiple applications. (See **Figure 2**.)

Oil and gas are expected to remain essential to economic growth impetus throughout the world. Their share of the world's energy supply – close to 60% today – is expected to remain relatively stable over the next two decades. In the industrialised world, oil demand is expected to grow less than 1%/y, whereas stronger growth is predicted in the transportation sector in developing countries. (See **Figure 3**.)

Special mention

Natural gas deserves special mention. Some 50 years ago, gas consumption accounted for just 10% of the world's energy demand. Today it exceeds 20% of demand. Over the next couple of decades this trend is expected to continue, with natural gas capturing about one-third of all incremental energy growth. Driving this growth is the fact that natural gas remains the fuel of choice to meet increasing electricity demand around the world. By 2020, gas is likely to supply about one-quarter of global energy requirements – second only to oil. (See **Figure 4**.)

Expected efficiency gains

Worldwide energy demand is predicted to grow at about 2%/y despite significant, but yet-to-be-achieved, advances in energy efficiency that are expected to save close to 60mn boe/d by 2020.

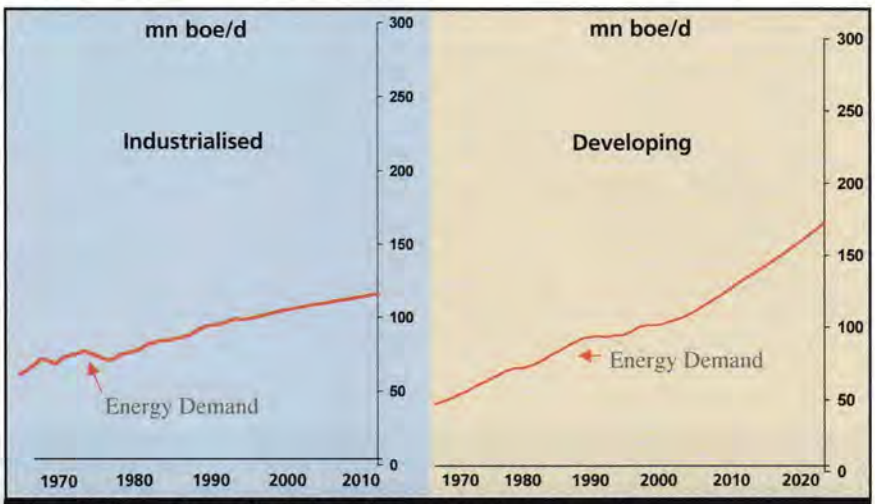


Figure 1: Energy demand for industrialised and developing countries

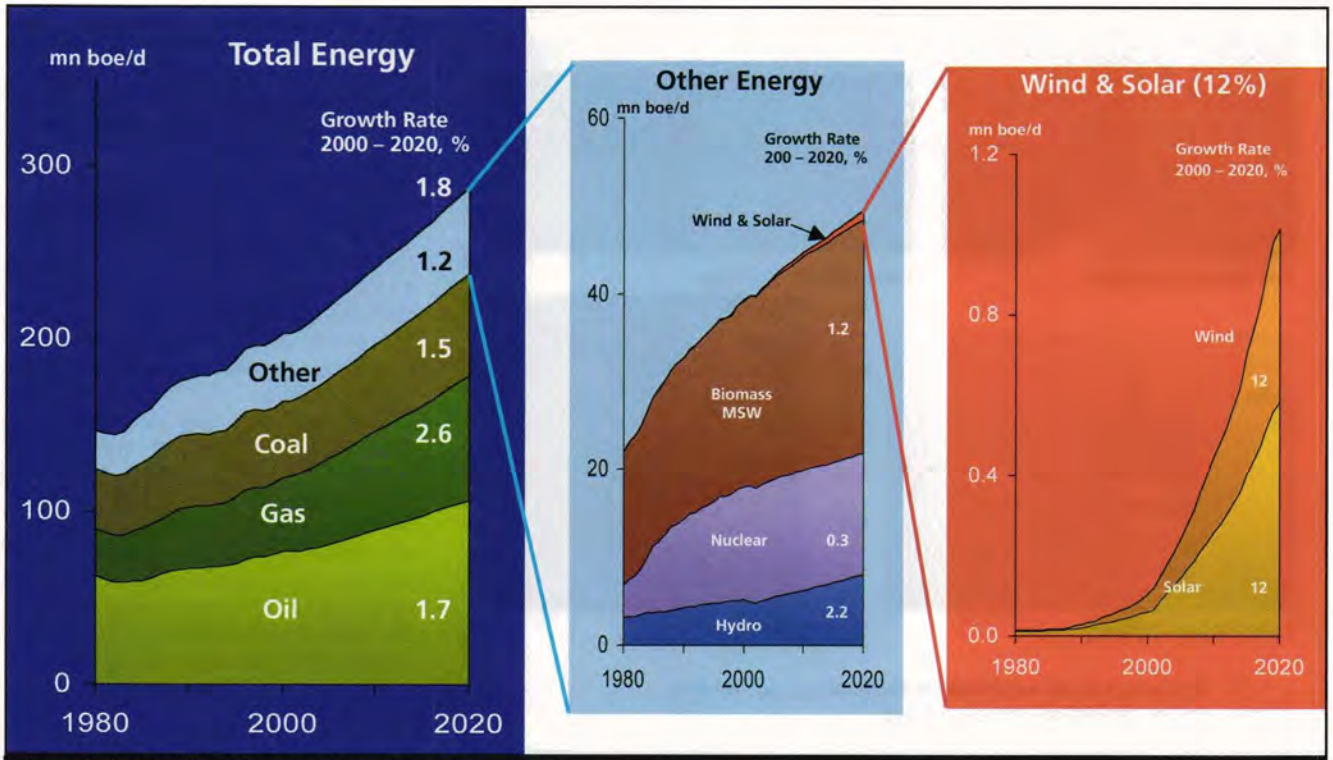


Figure 2: Composition of energy demand or supply

Contributing to these efficiency gains will be the development and deployment of new technologies such as natural gas combined-cycle turbines for power generation and advanced internal combustion engine and hybrid vehicles. Even so, we expect world energy demand will be close to 290mn boe/d by 2020 – about 40% more than today.

In an expanding world economy, much work remains to be done. Today, roughly 85% of the world's population lives in developing countries, where GDP per capita is only about 6% of that in the developed world. Some 1.6bn people have no access to electricity and more than 1bn people lack access to safe drinking water. Such needs provide a tremendous opportunity and responsibility to help improve the quality of life for people around the world.

New supplies and technological advances

It has always been the task for the oil and gas industry to find, produce and deliver energy products in an economic and environmentally sound manner; that is, to meet demand and offset natural field decline. For the ninth year in a row, ExxonMobil demonstrated its ability to meet this challenge by adding energy reserves in excess of production – 1.9bn boe, replacing 117% of reserves produced. Significantly, these high-quality additions are in established areas as well as areas where we anticipate substantial future growth.

By 2015, the industry will likely need to add some 100mn boe/d in order to meet demand – an amount close to 80% of today's production levels. Meeting growing energy demand will require access to resources, significant investments, timely development, and the cooperation of host governments. As indigenous supplies of oil and gas within mature market areas struggle to keep pace with demand, the dependency between importing and exporting countries is expected to grow. Supplies are forecast to increase from West Africa, Russia, the Caspian and the Middle East to support higher imports into the US, Europe and Asia.

However, the prospect of higher import levels continues to raise concerns about security of supply. The key to security will be found in diversity of supply. Governments can do much to help this effort by promoting diversity through access to resource acreage in all regions.

New technologies will also continue to extend the recoverable liquid hydrocarbon resource, as demonstrated in the past by improvements in 3D seismic imaging and reservoir modeling, advanced drilling, and also arctic and deepwater resource development. ExxonMobil's commitment to new technology will enable unconventional resources to contribute more significantly to future energy supplies. (See **Figure 5**.) Our $631mn R&D programme (2002) is aimed at providing in-house proprietary technologies that

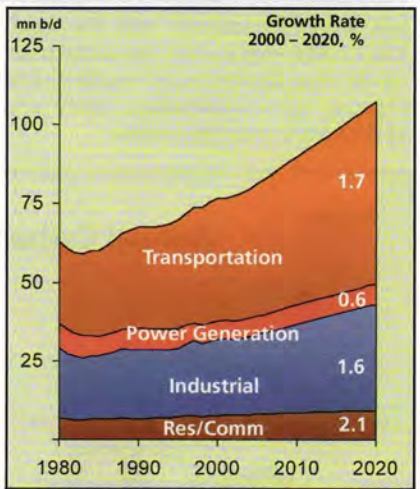


Figure 3: Focus on oil by end-use

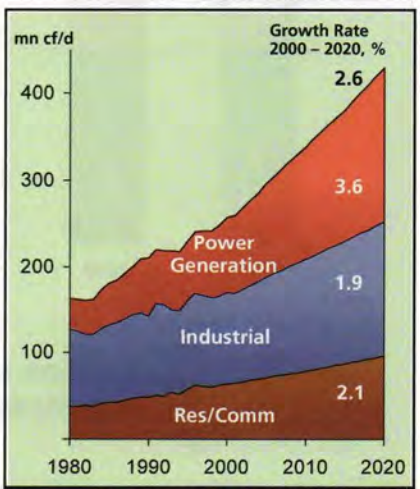


Figure 4: Focus on gas by end-use

3-D Seismic Imaging

Deep Water Drilling

Cold Ocean Drilling

Advanced Drilling

Advances in oil exploration technology are adding to the global oil resource base

Figure 5: Some technology examples that are expanding reserves

will lower investment and the operating costs, expand our resource base, create new products and markets, and improve our operational, safety and environmental performance.

Managing carbon emissions

With the forecast increase in the use of hydrocarbon fuels, carbon emissions are predicted to continue growing – estimated to be at least 3bn tonnes between 2000 and 2020. Some 80% of this growth in emissions is expected to come from growing demand for electricity and motor fuels in developing countries (see **Figure 6**).

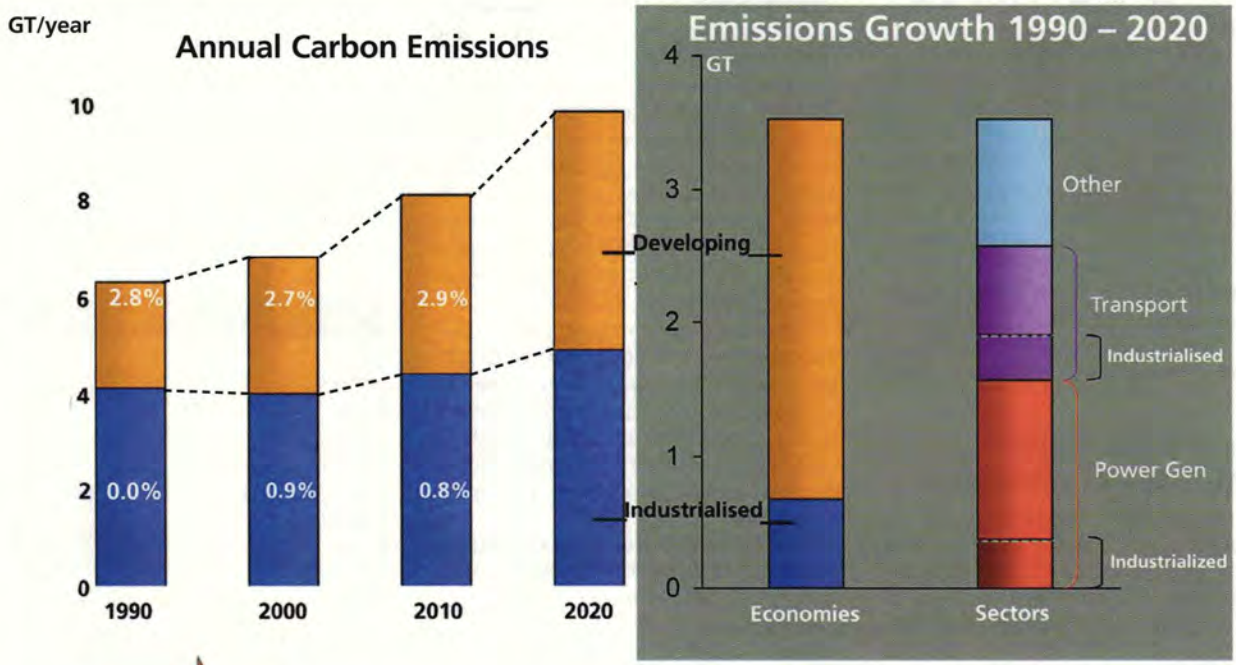
ExxonMobil continues to make significant investments in energy efficiency and new technology. Across all of our operations we devote substantial investments to energy conservation, a noteworthy example being our significant investment in cogeneration.

Most recently, we announced a $100mn investment in the Global Climate and Energy Project, to be led by Stanford University. This unprecedented alliance of scientific researchers and other participating companies will work to find innovative and commercially viable new energy technologies that have the capability to substantially reduce greenhouse-gas emissions.

The final word

The international oil and gas industry faces a promising future where innovation and disciplined execution will be essential elements for success.

As a global player, ExxonMobil is well positioned to take advantage of this future.



Carbon emissions growth will be highest in developing countries due to higher economic growth

Figure 6: Carbon emissions growth – projections

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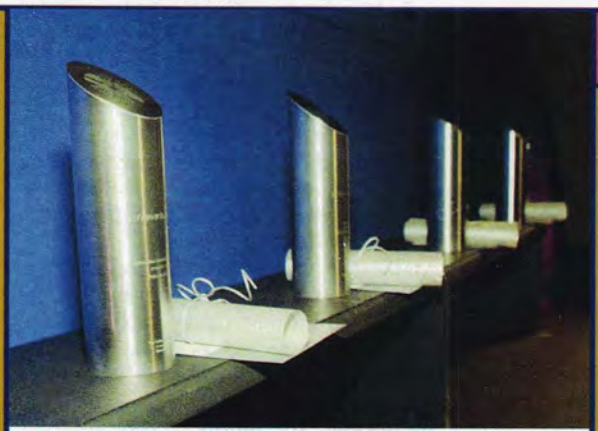

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Turkey's strategic post-war role

Turkey's strategic position between the vast natural gas reserves of the Caspian and the Middle East, and the energy hungry markets of Western Europe will come into sharp focus with the ending of hostilities in Iraq and the development of the massive Shakh Deniz field in the Caspian. Turkey already imports Iranian gas via the Eastern Anatolia Natural Gas Main Transmission Line. As the flow through this line increases, it will provide strong competition to Russian exports to Turkey, and a potential new gas supply to Europe, writes *Jeff Crook*.

The Soviet Union was the original supplier of natural gas to Turkey, when Botas, the state-owned oil and gas pipeline company, established a piped gas market during the late 1980s. This Soviet gas was transported through an overland pipeline, which runs 842 km around the west of coast of the Black Sea, through Ukraine, Romania and Bulgaria. The pipeline crosses the Bulgarian–Turkish border in the Malkoçlar area, and passes via a metering station on to Istanbul, Bursa and Ankara. Construction of this transport system started in 1986, with gas supplies reaching Ankara by 1988.

While Botas currently holds the monopoly for import, distribution, pricing and sale of natural gas in Turkey, it is due to lose this monopoly in the future as the result of the 'Natural Gas Market Law' which came into force on 2 May 2001. Meanwhile, the gas system is spreading throughout the country, with the number of cities supplied by natural gas forecast to increase from five in the late 1990s to 60 by 2004. (See **Figure 1**.)

As the system has spread, so gas consumption has grown from 500mn cm in

Figure 1: Turkey's natural gas pipeline network

Figure 2: Likely extension of gas transmission system into Greece and Italy

1987, to 16bn cm in 2001. Future gas consumption is predicted to grow to 55bn cm/y by 2010 and 82bn cm/y by 2020, according to Botas estimates carried out in 2001.

In order to meet growing demand, the original Russian gas supplies were supplemented by liquefied natural gas (LNG) imports. An LNG terminal was built on the northern coast of the Sea of Marmara and was linked into the main transmission system during 1994.

Further growth in demand has been met by uprating the Soviet-era pipeline. The capacity of this line has been increased from six to 14bn cm/y with the construction of new compressor stations and by pipeline 'loops' on the Turkish side of the border, together with construction of the Blue Stream pipeline and the East Anatolia line from Turkey's eastern border.

New Turkish gas import routes

The recently completed Blue Stream pipeline, which follows a direct route across the Black Sea, permits an additional 16bn cm/y of gas to be imported from the Russian Federation. While this was a shorter route than the Soviet-era pipeline, the laying of the offshore pipelines presented enormous technical challenges due to the 2,150 metre water depth and other factors (see *Petroleum Review*, May 2002). However, one practical benefit for this direct route is that it will not be possible for the now-independent states along the west coast of the Black Sea to draw-off gas supplies bound for Turkey at times of peak demand.

The Samsun/Ankara segment of the Blue Stream pipeline on the Turkish mainland was completed by Botas towards the end of 2001, and has since been supplying gas to towns along its path. The laying of the first deepwater pipeline was completed on 21 February 2002, with start-up of the overall pipe system achieved by the end of December 2002.

The Blue Stream pipeline is only expected to transport 2bn cm of natural gas during the current year, against its 16bn cm capacity. This low utilisation has been attributed to the over-optimistic prediction of Turkish gas consumption, which appears to have arisen due to an unexpected economic slowdown in 2002 and to the recent war in Iraq.

Looking to Turkey's eastern border where there is potential for huge gas imports from the Caspian and Middle East, Iranian gas is already flowing through the Eastern Anatolia Natural Gas Main Transmission Line. This bi-directional line extends 1,545 km from Dooubayazyt, near the Iranian border, through Erzurum, Sivas and Kayseri to the Turkish capital Ankara, where it connects to the pre-existing transmission system.

The first Iranian gas flowed into the East Anatolia line at the end of 2001. However, the supply was shut down for several months during 2002 after Turkish authorities alleged poor gas quality – an allegation strongly disputed by the Iranians. With gas now flowing again, the purchase agreement will ultimately reach a plateau of 10bn cm/y of gas.

The diameter of the Eastern Anatolia line was increased during the design stage from 40 inches to 48 inches as part of a Turkish agreement to purchase 30bn cm/y of gas from Turkmenistan (14bn cm of the Turkmen gas was intended for onward transmission to Europe). However, the planned link to Turkmenistan has yet to be built.

It is also anticipated that Iraqi gas will be conveyed through the East Anatolia line if and when this new supply is secured. Turkey signed a frame agreement with the recently-deposed Iraqi regime during December 1996, but this project was put on hold prior to the war as a result of the UN sanctions with Iraq. The agreement covered the purchase of 10bn cm/y of gas and the construction of a new gas pipeline. Any further work on this project will require the approval of the new Iraqi regime,

which could lead to considerable delay.

It was intended that the Iraqi gas pipeline would be built alongside the existing Iraq–Turkey crude oil pipeline for most of its length. Then, before reaching the marine oil terminal at Ceyhan, the gas pipeline would turn north to connect with a spur from the East Anatolia line – this spur is already planned and will run from the Eastern Anatolia line, at Sivas, to the southern town of Mersin.

Botas says that Eni-Agip was assigned as the project leader for the upstream activities of this Iraqi project while Gaz de France (GDF) was assigned as the coordinator for the midstream activities. However, the involvement of a French company in post-war Iraqi reconstruction is likely to be controversial in view of this nation's opposition to the proposed 'second' resolution at the UN. Other complications could arise due to the simmering hostility between the Turkish Government and the Kurdish separatists, many of whom live in northern Iraq.

The Shakh Deniz field, in the Caspian Sea, is a more realistic source of gas supplies for Turkey/Europe from 2006. This enormous gas and condensate field was discovered in 1999 and is estimated to contain more than 400bn cm of gas. The licensees made a decision to proceed with Phase 1 of the development during a meeting in Baku on 27 February 2003. The BP Amoco-operated upstream project will take place in water up to 600 metres deep about 100 km south of Baku.

A 690-km long export pipeline is also to be built from Baku, via Georgia, to Turkey, running alongside the Baku–Tbilisi–Ceyhan (BTC) oil pipeline. The field partners have appointed Statoil as operator of the newly-established Azerbaijan Gas Supply Company (AGSC), which will administer the sales.

Botas originally signed an agreement to purchase gas at a rate of 2bn cm/y from 2004–2005, rising to a plateau of 6.6bn cm/y from 2007. Further gas sales agreements have been signed with Azerbaijan and Georgia, with contracted gas sales currently totaling 8.4bn cm/y. Statoil also anticipates sales of 14.6mn b/y of condensate.

Export links to Europe

After placing large gas purchase contracts with its eastern neighbours, Turkey has turned its attention to developing gas export routes to Europe (see **Figure 2**), with help and support from the European Commission (EC). The signing of a Memorandum of Understanding (MOU) on 28 March 2002 was a major milestone in this respect. The MOU covers the construction of a gas pipeline from Turkey and Greece; it also covers the supply of 500mn cm of gas to Greece by the year 2005.

When built, the Turkish/Greek gas pipeline will be an important link in the proposed Southern European Gas Ring. However, a further pipeline link will be needed from Greece to Italy, where a connection would be made to the existing gas transmission grid in Western Europe, before this ring is established.

The agreement between Greece and Turkey was a particularly significant development because of the political tensions that exist between these two nations. The cross-border cooperation was fostered by the EC under its 'Inogate Programme'. The Commission's view is that with the EU's demand for natural gas firmly on the increase, the new pipeline should help guarantee a natural gas supply that is advantageous in terms of both price and quantity.

The feasibility of linking the two grids was the subject of desk studies on both sides of the border during 2001, with a joint Greek/Turkish study submitted to the European Commission on 7 August 2001. This was followed by an economic feasibility study by Société Générale, which was completed on 26 March 2002.

The proposed 285 km-long, 36-inch diameter pipeline will have a 200-km Turkish section and 85-km Greek section. The Turkish section will start at Karacabey, with a 17-km crossing of the Marmara Sea, and thence overland through the Ipsala/Kipi region to the Greek border. From there, it will link with the existing Greek system near Komotini. Various environmental impact and engineering studies are being undertaken during 2003.

A further accord was signed on this subject by Energy Ministers of Greece and Turkey at an informal EU meeting in Thessaloniki on 28 February 2003. After witnessing the signing, Loyola de Palacio, the Commission Vice-President responsible for Energy and Transport, welcomed 'the progress made by both governments, who with the support of the European Commission, have developed genuine commercial cooperation between their gas companies.'

The Greek natural gas market is currently supplied from the Russian Federation via the transmission network in Bulgaria. The high-pressure gas supply pipeline enters Greece at a border metering station near Strymonochori, in the Municipality of Sidirokastro. It then stretches 512 km south to the Attica region, with high-pressure branch lines to Eastern Macedonia, Thrace and Thessaloniki.

There are outline plans to complete the Southern European Ring by a pipeline from central Greece, across the Adriatic to Otranto, in Italy, where it will link into the Italian gas transmission grid and thence to Western Europe.

The proposed Southern European Gas Ring is likely to be the first of a number of gas transport routes from the Middle East and Caspian to the EU. Another important project in this respect is a proposed pipeline from Turkey through Bulgaria, Romania, and Hungary to Austria, where it would connect with the existing transmission systems from Russia to Western Europe.

The Hungarian oil and gas company MOL signed a cooperation agreement for a feasibility study for this proposed pipeline towards the end of 2002. The agreement was signed with Botas, Bulgargaz, OMV Erdgas and Transgaz. Work on the feasibility study is expected to commence in spring 2003 and should last approximately one and a half years.

There have also been reports of a proposal for construction of a pipeline from Bulgaria to Italy. This pipe would pass through Albania, then across the Adriatic to Otranto.

NEXT MONTH'S FEATURES...

The July 2003 issue of *Petroleum Review* will feature an update on the latest developments in the gas-to-liquids and LNG markets, including a review of plans for LNG imports to the UK. It will also look at the implications of the Auto Oil 2 requirements on the refining sector; Middle East prospects, including a closer look at Iraq; and a round-up of coal-bed methane developments. The Energy Charter Secretariat also provides an overview of how it is helping governments, particularly in eastern Europe, to develop national policies aimed at increasing energy efficiency to tackle the problems of emissions and climate change. The magazine will also review the IP's June AGM and the latest IP/InstE merger news.

Drilling deep in the Algerian desert in the Berkine Basin

Photo: Burlington Resources

Algeria's hydrocarbon reform bill frozen

The long-awaited hydrocarbon reform bill formulated to make the Algerian oil and gas sector one of the most investor-friendly and strip the parastatal Sonatrach of its monopoly position has been frozen at the request of the country's President Bouteflika, reports *Mojgan Djamarani*.

The hydrocarbon (HC) reform bill had run into widespread opposition and more than a year after being presented to the Algerian Government for review had not yet come before the Parliament. Neither President Bouteflika, who supports the liberalisation of the economy, nor his Minister of Energy and CEO of Sonatrach, Chakib Khelil, who masterminded the bill, want to raise the political stakes as presidential elections in early 2004 draw nearer. There is already tension between President Bouteflika and his Prime Minister Ali Benflis, who opposed the bill and who has a strong base within the ruling FLN Party.

Sonatrach currently acts as both the regulator and the participant in exploration and development agreements. The HC bill called for a reduction of the company's automatic right of a 51% stake in any HC discovery to 25%. According to Chakib Khelil the current 51% right by Sonatrach irrespective of the size of the field deters foreign operators from investing in smaller fields as their share would not be profitable.

The bill also called for the creation of an independent agency to take over Sonatrach's regulatory responsibilities. In the new order, Sonatrach would have had to compete for new projects and negotiate financing with banks without the state as guarantor. Sonatrach would still have been left in charge of 43% of all existing oil and gas fields and maintained control over the existing pipelines. However, it would have lost its exclusive right to market products both within and outside of Algeria, with the exception of natural gas within Algeria where it would have had to be marketed in partnership with Sonatrach.

According to Greg Saunders of BP, 'of the many provisions in the proposed bill one was to create an environment that would further increase the attractiveness of Algeria for foreign investment in the

country's energy sector. It was also understood that the bill would have grandfathered current projects.' Of the other major companies in Algeria, Anadarko and BHP Billiton believe the impact of the bill would have been on future oil and gas projects in Algeria and would not have affected the current projects. According to a spokesperson at Sonatrach, the HC bill was a law for the state and not for the Sonatrach.

Opposition to the bill

The hydrocarbon sector accounts for 35% of GDP and 90% of export revenues. The opponents of the bill argued that by privatising Sonatrach the state was giving away too much. By opening up the system on such a scale and so quickly, they countered, the government ran the risk of losing control over its pricing policy and it would have encouraged intensive exploitation of the reserves.

The Union Generale des Travailleurs Algeriens (UGTA) was the main opponent of the draft law, on the grounds that the bill would jeopardise Algeria's sovereignty over oil and gas resources. Other political parties, including the ruling National Liberation Front (FLN), had supported several protests by UGTA in recent months over the planned reforms.

Motivation for reform

The move to reform and restructure the Algerian energy sector was partly provoked by the liberalisation and regulatory changes within the European Union (EU). With large oil and gas reserves and the nearness of the European market with its growing demand, the Algerian Government has been keen to create an economic climate that would encourage investment in its oil and gas sector. According to the Energy Minister Khelil, foreign companies account for 8% of the overall output by value. By 2005, he estimates, their share will double to 16%. At the France-Maghreb 2003 Convention he said that oil exports will increase by 50% by 2005 and gas exports by 30% by 2010. Some $23bn will be invested in the energy sector over the next five years to expand oil and gas exports and to boost downstream operations.

Algeria has Africa's largest gas reserves (at 160tn cf) and the continent's third largest oil reserves (15.4bn barrels). However, despite a long history of hydrocarbon production going back to 1956, Algeria is still considered largely under explored.

The country's oil and gas reserves are all based onshore. The biggest oil field is Hassi Messaoud in the central region, which currently produces 400,000 b/d.

Company	Investment	Details
Rosneft Stroytransgaz	$1bn PSA	N245 South prospect, 350mn barrels in reserves
Repsol 55%, Woodside Petroleum 35%, Partex 10%	–	Exploration. 401-d field in Berkine Basin
Repsol, RWE DEA, Edison Gas	–	Exploration. Blocks 351c-352c in Reggane Basin
First Calgary Petroleum 100%	–	Yacoub block 406-a and Ledjmet block 405b
BHP Billiton	$190mn	ROD in Berkine Basin (oil)
Burlington Resources 65%, Talisman 35%	–	MLN field block 405a in Berkine Basin
Sinopec 75%, Sonatrach 25%	$525mn + $41mn bonus	Zaraitine field in southern Hassi Messaoud Province
TotalFinaElf 85%, Cepsa 15%	–	Exploration. Block 325a-329 in Timimoun Basin
TotalFinaElf/Sonatrach	–	Rhourde Es Sid blocks 432, 444 South, 403 North in Berkine Basin
Petrovietnam	$21mn	Exploration. Blocks 433a-416b in Touggourt in Oued Mya area
Medex Petroleum	–	Exploration. Blocks 226-229b and 242 in Illizi Basin
Amerada Hess/Sonatrach	$500mn	Enhanced oil recovery. El Gassi, El Agreb and Zotti fields.
BP	$1.2bn (last year BP wrote off $230mn for reduced reserves expectations from the field)	Enhanced oil recovery. Rhourde El Baguel
Petronas 45%, Gaz de France 25%, Sonatrach 30%	–	Ahnet gas field
Gaz de France	–	Block 352a-353 Sbaa Basin
BHP Billiton, Woodside Petroleum, Japan Ohanet Oil & Gas, ABB, Petrofac	$1bn risk service contract	Ohanet project in Illizi basin

Table 1: Major foreign participation in Algeria

The region is considered to contain 70% of the country's proven oil reserves. The other producing areas are in the east near the border with Libya, around Ain Amenas, and on the border with Tunisia at Hassi Berkine. The Berkine Basin is one of the most prolific onshore basins in Algeria, where 7bn barrels of oil have been discovered in the last 10 years.

Given the proximity to Europe, 90% of Algerian oil exports go there, with Italy as the main market followed by Germany and France. In 2002 Algeria produced on average 1.2mn b/d of liquids hydrocarbons, half of which was lease condensate and natural gas plant liquid. Domestic consumption stands at 200,000 b/d and the rest is exported. Higher exports are capped by Algeria's Opec quota of 780,000 b/d, which is well below the country's 1.1mn b/d production capacity. Algeria has been pressing for higher limits and recently has begun to openly flout its Opec quota. Plans call for oil production to rise to 1.5mn b/d by 2004 and 2mn b/d by 2010.

However, natural gas is Algeria's major export fuel. Between 1995 and 2001 pipeline transmission of gas to Europe increased by more than 70% to 30.9bn cm. Currently Algeria accounts for one-quarter of EU gas imports. As of 2002 the pipeline and LNG gas export capacity was 57bn cm/y – the government plans to raise this to 85bn cm/y by 2010.

Gas production is dominated by the Hassi R'Mel field in central Algeria, which currently produces 38mn cm/d – one-quarter of Algeria's dry gas production. The remainder of Algeria's gas reserves are located in associated and non-associated fields in the southeast of the country and non-associated reserves in the south.

With the European Union pushing for the greater use of gas in the Mediterranean countries and the use of gas instead of oil and coal in power generation on environmental grounds throughout the Union, production of

natural gas in Algeria is becoming more important than oil production – especially as there are no restraints on production levels. Rising gas demand within the EU is encouraging further investment in both the development of Algeria's gas fields and expanding its means of gas delivery to Europe.

As a consequence of increased participation by foreign oil companies recent years have seen a significant growth in oil and gas discoveries, which Djamel Eddine Khene, Vice President of Sonatrach for Exploration and Development, sees as justifying the policy of partnering with foreign operators in the upstream sector. In 2003 he expects exploration activities undertaken with foreign partners to triple compared to 2002.

Major foreign participation

One of the key partnerships in the sector has been with Anadarko. Since a PSA (production sharing agreement) was signed the Anadarko/Sonatrach association has discovered over 2bn barrels of oil. Under the PSA terms Anadarko and its partners fund Sonatrach's 51% share of exploration costs and are entitled to recover these costs out of the production phase.

Anadarko, together with its partners Maersk Olie and Lasmo-Eni, has one of the largest joint ventures in the oil sector – to develop the Hassi Berkine South oil field. Since the exploration programme resumed last October the joint venture has made two new discoveries on block 404 – Hassi Berkine North East and Sif Fatimah South West. With most of its construction projects largely completed Anadarko has earmarked $98mn to go on exploration and development drilling in 2003. In addition to the exploration wells on block 404 and 208 Anadarko expects to drill or participate in drilling 41 development wells to develop the Ourhoud and block 404 fields.

Last January Sonatrach brought the 1bn barrel Ourhoud field onstream at a cost of $1.3bn. Initial production of 75,000 b/d was forecast to reach 230,000 b/d by the end of 1Q2003. The field is divided into three blocks – Anadarko's block 404, Burlington Resources' block 405 and Cepsa's block 406a.

Lynchpin projects

The lynchpin of Algeria's gas expansion policy are the In Salah and In Amenas projects – both joint ventures with BP. The In Salah project is a $2.7bn joint venture in which BP has a 65% interest. After the drilling of 200 production wells and construction of a 48-inch diameter pipeline link to Hassi R'Mel (which is nearly complete), the In Salah project aims to produce 9bn cm/y and should increase Algeria's gas exports by 15%. The start-up date for the project has been set for 2004. According to Greg Saunders the project is 73% complete and remains on schedule for first gas delivery in 3Q2004.

The In Amenas project involves development and production of gas and gas liquids from four wet gas fields in the Illizi Basin in southeast Algeria. BP and Sonatrach will condition the gas and pipe it to Europe. Production of 20mn cm/d of gas and 50,000 b/d of condensate and LPG is set to start in 2005. A 50:50 joint venture of Kellogg Brown and Root and JGC Corporation is to develop the project in a contract valued at $745mn. The first phase of the project involves development of the Tiguentourine field. Gas, LPG and condensate will be piped 110 km for delivery to Sonatrach's pipeline grid at Ohanet.

Sonatrach has also put to tender the 0.26bn cm Gassi Touil integrated project. It is costed at $2bn, for which 10 operators have put in technical bids. It covers six fields on the western flank of the Berkine Basin and involves field development and production, gas treatment, construction of an LNG plant and pipelines to take the gas to Arzew and Skikda, and the marketing of the gas. The project aim's to produce 6–7bn cm/y of gas.

At present there are two gas pipelines to Europe:

- the 69mn cm/d, 667-mile Trans Mediterranean pipeline that runs from Hassi R'Mel via Tunisia and Sicily to mainland Italy; and
- the 1013-mile long Maghreb–Europe Gas (MEG) line with a capacity of 27mn cm/d, which runs via Morocco to Cordoba in Spain where it ties in with the Spanish and Portugese gas transmission network.

Sonatrach is raising the capacity of the MEG pipeline to 36mn cm/d by 2004 and 50mn cm/d by 2006 by adding new compressor stations along the route. It also has plans to raise the capacity of the TransMed line to more than 78mn cm/d.

Plans are also underway for the construction of two new gas lines to Europe. In 2001 Sonatrach and Cepsa agreed to the construction of the Medgaz pipeline that would directly link the two countries. In 2002 BP, TotalFinaElf, Eni, Gaz de France and Endesa acquired 12% shares in the Medgaz project. The consortium has completed a feasibility study for the line, which would have a capacity of 8–16bn cm/y and would run from Hassi R'Mel through the port of Arzew to the Almeira Province in Spain. Medgaz could become operational by 2006. TotalFinaElf and Cepsa have already agreed in principle to purchase 1bn cm/y each via Medgaz.

In 2001 Sonatrach also entered into agreement with Italy's Enel and Germany's Wintershall on a feasibility study for a second 22–27mn cm/d pipeline running under the Mediterranean to Italy and southern France.

Algeria's pipeline capacity expansion plans can be compared with the 3.5bn cm/y capacity of Turkey–Greece pipeline (see *Petroleum Review*, July 2002) which forms another potential part of the EU INOGATE project.

Markets and gas exports

It is hoped that plans to expand Algeria's already extensive and substantial domestic pipeline network, which was to be opened up to all producers under the HC bill, will provide added incentive to foreign companies to invest in the Algerian gas sector.

Algeria is also the second largest exporter of LNG in the world. Four plants at Arzew and Skikda have a capacity of 78mn cm/d to liquify gas for exports. Sonatrach is considering the construction of another 4–5mn t/y train at Arzew to further expand its LNG sales to Europe. It is also constructing a new LNG receiving utility at Ferrol in northwest Spain in addition to its three existing regassification terminals in Spain.

Although the opening up of the EU gas and power market could mean more integrated Algerian energy projects on the European mainland, the EU liberalisation policy is also raising concerns in Algeria that with the end of the take-or-pay long-term gas deals making large-scale investment decisions will become riskier.

Algeria is particularly critical of the EU's decision to do away with the destination clause in long-term contracts that prevents an offtaker from reselling the gas to a third party on the grounds that it will bring down the price of gas and, according to the Energy Minister, turn buyers into brokers who could resell Algerian gas at a profit and at the expense of the Algerian state. The Minister has been insistent that some form of profit-sharing scheme be found over the resale of Algerian gas to compensate for the loss of the destination clause. However, with both Norway and Nigeria having agreed to give up on the destination clause, and Russia reportedly close to reaching an agreement with the EU on the issue, it is unlikely that Algeria will be able to achieve more favourable terms.

Sights set on China's city gas sector

Hongkong & China Gas Company of Hong Kong has set its sights on China's fast expanding city gas sector following a recent Chinese Government announcement that foreign companies are now permitted to invest in the country's potentially huge piped gas distribution industry. The announcement follows the government's earlier policy change allowing foreign companies to own gas pipeline networks being set up to transport local and imported natural gas. *David Hayes* reports.

Photo: David Hayes

Hongkong & China Gas Company (Hong Kong Gas) is no newcomer to China's gas market, having set up joint ventures in several cities in Guangdong Province in southern China in the mid-1990s to distribute piped LPG. The joint ventures were established with the intention of converting the piped LPG networks to natural gas when it arrived in southern China. In fact, little development occurred as the central government proved unwilling to open the city gas industry to outside investors. However, a recent change in official energy policy to promote gas and other clean fuels to reduce urban airborne pollution from coal burning has caused the government to reverse its ban on foreign investment.

'We are expanding into cities where there is not any natural gas distribution but where some have coal gas made by old plants,' says Alfred Chan, Managing Director of Hong Kong Gas. 'Natural gas requires investment – but Chinese cities do not have a lot of money to spend on improving their facilities. For gas distribution and other facilities they want foreign investment. Energy is undergoing a restructuring. Utilities will want to use foreign investment.'

Hong Kong Gas believes the availability of natural gas reserves in central and western China, along with plans to import LNG, present the company with a good opportunity to expand its business activities to the mainland. With piped city gas distribution already a mature industry in Hong Kong, investment opportunities in China offer attractive long-term growth prospects.

'There are several reasons why we should go there,' Chan explains. 'GDP in China is expected to grow 7% annually, which is equivalent to 4.5% of energy demand growth. The government's environmental protection commitment depends on more clean energy. Also, gas is competitive with oil, while coal consumption growth will be forbidden.'

Growth in piped gas

Between 50 and 60 cities in China are likely to launch piped gas distribution networks within the next five years, according to Hong Kong Gas estimates. The company is already talking to numerous city governments in central and eastern China about joint venture schemes to set up piped gas networks.

In 2002 Hong Kong Gas announced it had concluded joint venture agreements to set up piped gas systems with city authorities in Nanjing, capital of Jiangsu Province, and Wuhan, capital of Hubei Province. The company has already negotiated joint venture agreements to build piped natural gas systems in 11 cities with a combined population of 21mn people.

'We are talking to 20 cities in five provinces, including Guangdong, Hubei, Jiangsu, Shandong and Zhejiang. All the projects are joint ventures,' Chan

says. 'Our plan is 20 cities because that is the number we can manage. Now we are after the bigger cities. We are in a strong cash position – we do not need to borrow. We are asking for 50 years exclusive supply right. This kind of investment is unlike funding a bridge using Build, Operate and Transfer [BOT] funding. City gas is expanding every day and needs continuous investment and maintenance.'

Hong Kong Gas is Hong Kong's sole supplier of piped city gas and the Territory's oldest public utility, having recently celebrated its 140th anniversary. The company operates a town gas plant at Taipo in Hong Kong's New Territories that supplies over 90% of the company's naphtha-based city gas. The original Hong Kong Gas town gas plant at Ma Tau Kok near Hong Kong's former Kai Tak international airport produces the remaining gas supplies and acts as a back-up gas supplier if problems occur at the Taipo plant.

Hong Kong Gas operates a 123-km long gas transmission network consisting of pipeline sections up to 750 mm in diameter, as well as a piped distribution system totalling 2,850 km in length. The company currently supplies 1.4mn customers throughout Hong Kong, compared with 1.32mn in 2000. Most are residential customers living in high-rise government and private housing estates.

Rising gas sales

Gas sales continue to rise due to the continual growth in customer numbers and greater use of gas appliances in the home. In 2001 Hong Kong Gas sales reached 26.56mn Gigajoules (GJ), representing a 2% increase compared with sales of 26mn GJ the previous year.

Gas sales growth was slower in 2002, however, due to climatic conditions, which were 1% hotter on average than in 2001. Periods of high temperatures result in lower gas sales as domestic water supply temperatures are warmer than in cooler months of the year. Gas sales are forecast to show less then 1% growth in 2002 when figures are released for the year.

While Hong Kong Gas plans to expand gas sales and operations in Hong Kong, local business opportunities are limited by the Territory's small size, the climate and the fact that piped gas distribution is already a mature industry.

Hong Kong has 2.2mn households, of which 85% could eventually be connected to piped gas supplies compared with 65% of households that are already. Customer numbers continue to grow by 60,000 to 80,000 annually. Most new customers live in newly completed high-rise housing developments.

LNG imports

Hong Kong Gas is a shareholder in China's Guangdong LNG import project, partnered by Hong Kong Electric Company and six Chinese gas companies and power utilities that will import 3mn t/y of LNG through Shenzhen LNG terminal from Australia's North West Shelf. Hong Kong Gas will convert its naphtha-based city gas system to natural gas in the future and plans to invest in developing piped gas distribution networks in various major cities in Gaungdong that will buy city gas feedstocks from Guangdong LNG import terminal.

Hong Kong Gas has already set up joint venture utilities to supply gas in Panyu, Yixing, Guangzhou and Zhongshan in Guangdong Province. Panyu, Yixing and Guangzhou will receive natural gas when the initial 200-km Shenzhen–Foshan pipeline section is completed in 2006, while Zhongshan will receive natural gas when the pipeline is extended. Discussions also are underway to invest in gas distribution in other cities.

Currently, the two largest piped gas markets in Guangdong are Shenzhen and Guangzhou, the provincial capital, which together serve about 900,000 customers.

Shenzhen Gas Company currently supplies city gas made with LPG feedstock by pipeline to an estimated 400,000 customers. The utility is expected to require about 300,000 t/y of LNG during Phase 1 as the gas system is converted to natural gas and sales are expanded. 'We are discussing investing with Shenzhen Gas, but not a joint venture,' Chan comments. 'There are a lot of factories in Shenzhen and a good commercial gas load from restaurants and shopping centres.'

Hong Kong Gas is also discussing increasing its involvement in supplying piped gas in Guangzhou. The company's existing joint ventures involve supplying gas to Panyu, a satellite city near Guangzhou, and to two industrial parks, the Guangzhou Dongyong Park and Guangzhou Science Park.

Guangzhou is expected to be the largest market for natural gas with about 400,000 t/y likely to be required during the first phase of the LNG import programme. Hong Kong Gas is talking to Guangzhou Gas Company about investing or forming a joint venture concern. Guangzhou Gas has almost 500,000 customers, which receive a piped city gas mixture of LPG, coal gas and gas from Guangzhou petroleum complex.

Meanwhile, Phase 2 of the LNG import project will involve constructing a pipeline extension of about 120 km from Foshan to Zhuhai city. Although detailed planning for the Phase 2 pipeline section is still a long way off, the Phase 1 pipeline dimensions will be designed to supply Phase 2 gas demand as well.

West–East gas pipeline

Elsewhere in China, Hong Kong Gas is one of four foreign investors backing the massive 4,000-km West–East gas pipeline project to transport natural gas from remote western China to the fast developing, energy hungry east coast region. In addition to boosting energy supplies in major cities along the pipeline route and in Shanghai, the gas transmission project is aimed at promoting pollution-free energy consumption and helping reduce China's heavy dependence on coal, which has already caused serious pollution in many major cities.

Work on the first stage of the pipeline project started soon after the signing of the West–East gas pipeline joint venture framework agreement on 4 July 2002. PetroChina, named by the government as the lead Chinese company in the West–East pipeline scheme, has taken a 50% shareholding, while Sinopec holds a 5% stake. Among the foreign investors, Shell and Hong Kong Gas hold a combined 15% share, while ExxonMobil also has taken 15% and Gazprom 15%.

Construction has started in the Ordos Basin on the Shanxi–Shanghai section, a length of 1,516 km. The second phase will run for 2,484 km. Petrochina started construction in 2002 and will complete Phase 1 by the end of 2003. West–East pipeline phases 1 and 2 combined will be capable of carrying 12bn cm of gas. Phase 1 will transmit 2.8bn cm, of which power generation will consume 60% and city gas distribution companies 40%.

'There are sufficient reserves to supply 12bn cm for 20 years,' Chan points out. 'Recently China has discovered a huge field north of the Ordos Basin, in Inner Mongolia.'

Hong Kong Gas' decision to invest in the West–East pipeline is linked to the company's plan to participate in a number of joint venture city gas companies distributing piped gas in cities that will be supplied by the pipeline. By investing in the West–East pipeline project, Hong Kong Gas will have some influence on its operational, gas pricing and other policy issues that will affect the company's city gas distribution investment plans in China.

As part of plans to develop city gas distribution along the West–East pipeline route Hong Kong Gas has taken over Shell's shareholding in Suzhou Industrial Park and Taizhou Gas Company. Apart from signing a frame-

continued on p40...

Can you replace reserves and create value?

Wood Mackenzie's most recent multi-client study – *Value Creation through Exploration* – reports that from an exploration investment of $50bn during 1996–1H2002 the 25 companies studied created $23bn of value from commercial discoveries of 45bn boe and technical reserves of 20bn boe. From this exploration investment, however, only 13 companies out of the 25 have added value through exploration and, at the same time, replaced their production with commercial reserves, writes *David Black*, Director–Energy Consulting.*

Upstream companies need to replace the reserves that they produce – and by some margin if they are to achieve a sustainable growth in production, one of the key metrics of upstream success in recent years. The reserves' replacement ratio has, therefore, traditionally been viewed as one of the headline numbers by which a company's exploration success could be measured.

The emerging shift from volume to value within the industry (see *Petroleum Review*, February 2003) has been driven largely by the failure of a number of companies to deliver the production growth that had been expected. However, Wood Mackenzie believes it is now timely to analyse companies' exploration performance on a broader range of measures.

Study basis

A group of 25 companies ranging from super-majors to smaller E&P businesses were selected and their exploration performance during the period 1996–1H2002 analysed in some detail. Exploration strategies were assessed and key drivers, such as 'elephant hunting' or satellites, focused or diverse, high-risk, high-reward or more balanced.

The traditional measures of exploration performance – reserves' replacement and finding costs – are still important, but we have also used two other metrics – value creation through exploration and the exploration margin on a $/boe basis. For each company, on a country-by-country basis, we calculated what value has been created – or destroyed – by the exploration strategy and what rate of return the exploration investment has yielded. An exploration margin was also calculated for each company – in essence, this measure shows the extent to which each barrel added through exploration is creating, or destroying, value for each company.

By combining the exploration margin and the reserves' replacement ratio, Wood Mackenzie identified companies that have been able to replace reserves and create value through exploration – and those that have not. The key factors determining exploration success or failure for each company were also highlighted.

Key findings

The 25 companies in the study group have spent over $50bn on international exploration during 1996–1H2002 [excluding onshore North America (Lower 48 and Western Canada) and the Gulf of Mexico shelf]. This is equivalent to around $75bn in net present value (NPV) terms. This exploration investment has resulted in discoveries valued at almost $100bn, with a total value creation through exploration of $23bn net of exploration expenditure.

Of the study group, 16 companies created value through exploration during the study period, on our base case assumptions, and nine companies made discoveries worth less than the cost of their exploration spend in NPV terms. This means 13 companies replaced reserves *and* created value through exploration.

We also analysed the impact on each company's value creation through exploration at different discount rates. The base case calculations use a 10% nominal discount rate, with the value creation calculated at a 5% discount rate – a rough proxy for the cost of capital for the study group – and at a 15% discount rate – in line with the return on capital employed targets that many of these companies hope to achieve.

Achieving a 15% rate of return over the full cycle, rather than from the start of development expenditure forwards, is a demanding target. Indeed, in the study only BP, BHP Billiton, EnCana and BG achieved this target. The lead times between exploration spending and revenues from any subsequent developments can be considerable. This has a significant impact on the rate of return companies can achieve from exploration.

Four companies have achieved a rate of return on their exploration investment of around 15%, and a further two are close to 14%. This is an excellent performance and will allow these companies to maintain a strong return on capital expenditure as these projects come forward for development. Nine companies failed to achieve a 10% return on their exploration expenditure, including four companies that did not even achieve a 5% return.

Reserves' replacement

Reserves' replacement has, in recent years, been one of the key metrics for the upstream industry (and its investors). It is a direct measure of a company's exploration success – by volume, if not value – and it is a prerequisite for a long-term, sustainable growth in production.

The difficulty in replacing reserves has influenced the emerging shift from volume to value metrics within the upstream industry. A growth of 5% in production requires a reserves' replacement ratio of just over 160% (assuming a typical reserves' life of 13 years).

In total, 45bn boe of commercial reserves were discovered by the 25 companies in the study group during the 1996–1H2002 study period, plus a further 20bn boe of technical reserves. This gives a commercial reserves' replacement ratio of 120%.

Nine companies failed to replace production with discoveries of commercial reserves. Five of these were supermajors and majors, illustrating the difficulty of achieving organic growth for these large companies.

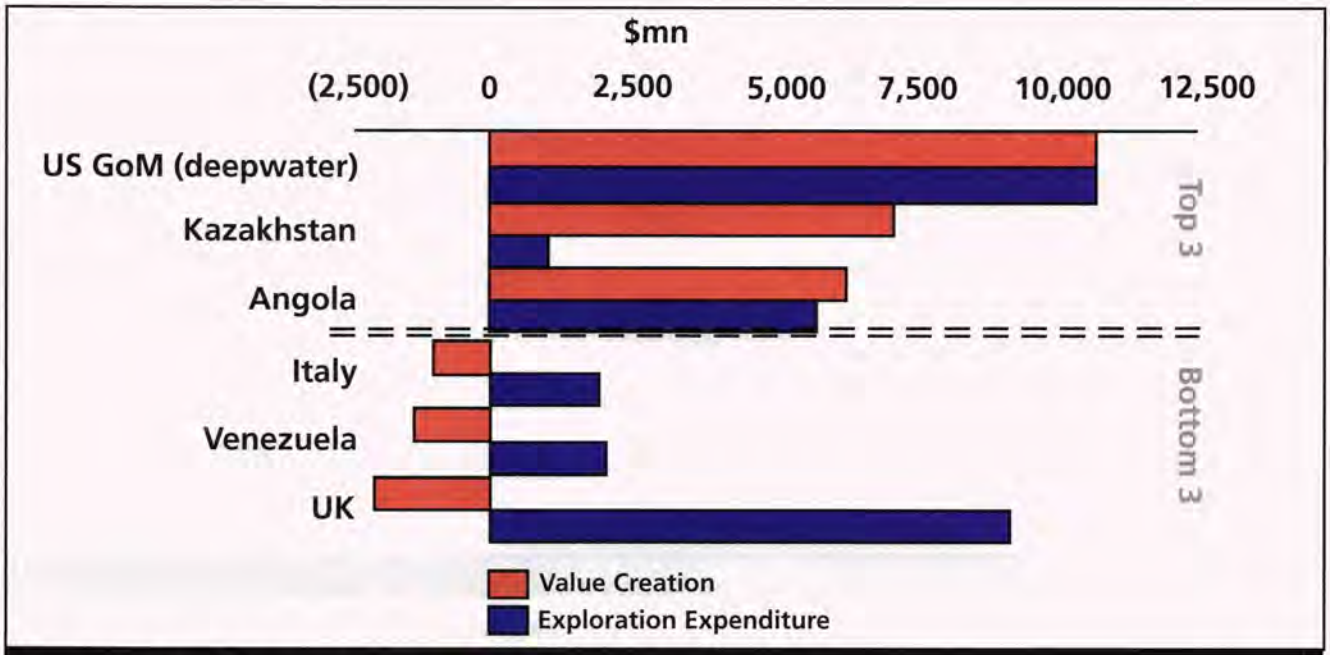

Figure 1: Value creation through exploration

Hot and cold spots

The study also highlights the key countries for value creation through exploration, which include the deepwater 'hot spots' of the US Gulf of Mexico and West Africa, and those areas where exploration has been disappointing (see **Figure 1**).

Value creation

- US Gulf of Mexico – has the highest value creation at just under $11bn, with 21 companies out of the 25 in the study attracted by the potential for significant discoveries in a benign fiscal environment. It also attracted the highest exploration investment of all the countries, at nearly $11bn in NPV terms, excluding lease payments. Of the 21 companies active in the region, 11 created value through exploration and 10 did not, including Norsk Hydro, Petrobras and Unocal.
- Kazakhstan – the super-giant Kashagan discovery in 2000 resulted in material value creation for its participants BG, Eni, ExxonMobil, Phillips (pre-merger with Conoco), Shell and TotalFinaElf (and BP and Statoil who crystallised value early by selling out of the field). Recoverable reserves are put at between 7bn and 9bn barrels of oil (potentially in excess of 10bn barrels) and some 10tn cf of gas.
- West Africa deepwater – an exploration 'hot spot' in recent years. Angola ranks third in the amount of exploration investment ($5.7bn in NPV terms) and is third for the total value creation through exploration of $6.2bn. Of the 25 companies in the study, 14 have been active in Angola and eight have created value. Six failed to create value. Nigeria is ranked fifth for value creation ($3.5bn), with 10 companies active and eight creating value through exploration.

Value destruction

- UK – ranks first for the number of companies active, with 22 out of the 25 study group. It also ranks second for the exploration investment at $9.2bn in NPV terms. However, the increasing maturity of the UK as an exploration province has, in hindsight, not justified this level of expenditure and 20 out of the 22 companies have spent more on exploration (in NPV terms) than the value of the discoveries they made. The exceptions were BG and EnCana, participants in the 500mn barrel Buzzard discovery, the largest in the UK for 13 years.
- Latin America – Venezuela, Brazil, Colombia and Argentina have also been disappointing (the exception being the significant gas discoveries in Bolivia). Brazil's deepwater attracted 15 companies of the 25 and ranks fifth for exploration investment ($4.8bn in NPV terms, including signature bonuses). But 14 companies have, so far, failed to create value. Venezuela has seen 11 companies active, spending $1.2bn on exploration (ninth highest), but only two have created value. It may be too early to judge Brazil's deepwater prospectivity, but Argentina appears to be a mature exploration play, with few discoveries, while the tough fiscal terms in Venezuela have adversely affected the returns from new fields.
- Other disappointing countries include Italy, Australia (where the significant volume of stranded gas hurts the overall value creation) and North Africa (with the exception of Egypt where there have been a number of deepwater gas finds).

Exploration margin

Finding costs are another of the key metrics for measuring exploration performance, but they give no indication of the value of the oil and/or gas discovered.

Wood Mackenzie has, therefore, analysed the exploration margin achieved by the companies in the study group. This margin is the difference between the amount spent on exploration by each company and the value of the discoveries made, divided by the volume of reserves discovered. In essence, it shows the value created (or lost) by each barrel discovered.

Volume versus value

A company's response to the lack of reserves being added could be to increase the amount it spends on exploration. There are, however, limits on whether this is a viable strategy. A company may simply not have the exploration opportunities that are worth drilling and, even if it wants to explore more marginal prospects in its portfolio, partner drag may be an issue. Of more concern would be if a company is already destroying value through exploration, when an increase in its exploration budget (without a new

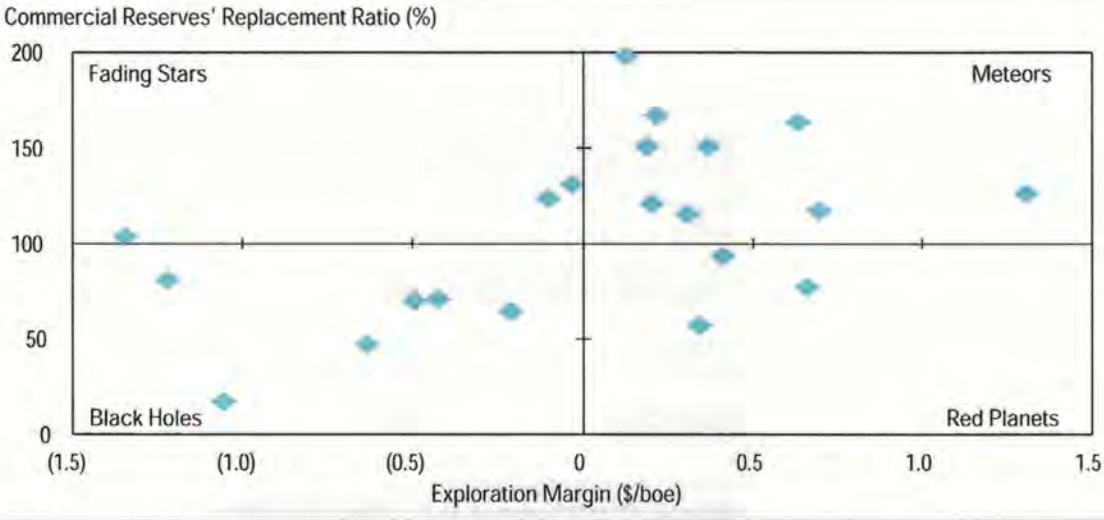

Figure 2: Volume versus value

suite of opportunities) might simply compound the problem.

The ideal exploration objective is, clearly, to be able to discover sufficient reserves and to create value through exploration in doing so. To analyse this, peer groups, the super-majors and majors, and integrated and E&P companies, were plotted on the basis of the reserves added and value created through exploration. Their commercial reserves' replacement ratios were used to assess volumes. For value, the exploration margin was used which, on a $/boe, encompasses the cost of a company's exploration and the value of the discoveries it has made.

The axes were set to cross at the reserves' replacement ratio of 100% and an exploration margin of $0/boe. This allowed the definition of a universe of four quadrants (see **Figure 2**):

- 'Fading Stars' – those companies with high reserves' replacement ratios but at the expense of negative exploration margins.
- 'Meteors' – the ideal position, with reserves being replaced and value created.
- 'Red Planets' – those companies that are failing to replace reserves but are still creating value through exploration.
- 'Black Holes' – the unhappy combination of failing to replace reserves and destroying value through exploration, a situation which, taken to its extreme, would result in the company disappearing.

The 25 companies in the study have employed a range of different exploration strategies. Some companies are diversified and others are focused – and both strategies have seen value creation and destruction. Some have used high equity interests (and often operatorships) to give a high gearing to their exploration efforts – with significant success in some cases and expensive failures for others. Strategic alliances have worked well for some companies, but for others experienced partners have proved disappointing. Leveraging skills into new regions has worked well for some but has been difficult for many.

From these strategies, 13 companies (out of 25) have added value through exploration and, at the same time, have replaced their production with discoveries of commercial reserves.

Strategy for success

There is no simple strategy for success. Exploration is an enigma – but value creation seems to be based on the ability to leverage skills (which, for some, has been harder than expected), legacy positions (to gain a competitive advantage through the best portfolio), and – not least – an element of luck.

A strategy for success is, clearly, better than the lottery of luck. This study is a significant step in assessing the exploration performance of a group of companies – and understanding the strategies that have led to success.

**The author, David Black, can be contacted at e:* david.black@woodmac.com ; www.woodmac.com *If you are interested in purchasing a copy of the* Value Creation through Exploration *report, contact Barbara Hagen, T: +44 (0)131 243 4391; e:* barbara.hagen@woodmac.com

... continued from P37

work agreement with Nanjing Gas Company in Jiangsu, with which a joint venture agreement is being finalised, Hong Kong Gas is negotiating with 10 other cities and their gas companies along the West–East pipeline route.

'If we are going to invest in cities along the pipeline route it is better for us to invest in transmission as well in order to know pricing and other information,' explains Chan. 'It will be better to be vertically integrated. But we do not want to go upstream at the moment. We are a city gas company.'

Investment sources

Meanwhile, Hong Kong Gas is not the only source of investment funds in Hong Kong for China's fledgling city gas industry. Zhengzhou Gas Company of Henan Province has listed on the Hong Kong Stock Exchange, while three other companies – Panva, Wahsang and Xinao – have obtained Hong Kong listings to raise capital to invest in China's city gas industry.

Whether western and Japanese companies invest in China's gas industry remains to be seen. Gaz de France and several Japanese city gas companies, for example, have been active in China for many years but have not revealed their investment plans.

No foreign companies have shown any strong interest in investing in China's gas industry so far. However, this is expected to change when Shanghai Gas Company begins seeking foreign investment.

'Shanghai Gas Company will be the test,' predicts Chan. 'When they open bidding they will see big competition arrive. Other cities have not attracted foreign interest so far'

Technology, politics and sustainability

The annual Offshore Technology Conference (OTC) in Houston, the world's largest such event, offers an opportunity to gauge how the oil and gas sector sees the future. The problem, however, is that there is no such entity as 'the industry', as there are many diverse sectors, each with their own perceptions. *Philip Algar* reports that the 2003 show was well received, with most visitors and exhibitors upbeat about future prospects.

This year's focus was 'Envision, Enable and Enact' and there was every confidence that the continued development of new technology would allow exploration and production at new depths at relatively low costs. Additionally, anxious politicians were keen to publicise their own attractive acreage that would offer yet more new opportunities to an industry that is keen to diversify sources of supply. Meanwhile, some suppliers sensing that, for example, major investment in the UK North Sea had ended, were bullish as they sought new markets, not least in the deepwater of the Gulf of Mexico.

Despite the obvious enthusiasm of most of the participants and the reported comments from cab drivers and restauranteurs that the visitors were happier and spending more than last year, it was clear that the industry still faces many problems. One such unresolved difficulty, for example, is that the infrastructure and the personnel are ageing.

Industry innovation

Manifestly, if the industry is to meet future demand and to replace depleted reserves, it will have to rely on technical innovation. But who will pay for these developments? Will the necessary technology be available at the right place and cost when the industry ends what some observers maintain is a period of inadequate investment, notwithstanding high recent oil company profits?

Satish Pai, Vice President for oilfield technology for Schlumberger, repeated comments heard frequently over recent years. He was disappointed at the amount of money allocated for upstream research and argued that service companies, which were spending substantially more than the operators on research and development, should have a 'commensurate price' for their innovations. He was not alone in maintaining that innovation can be delayed by operators intent on reducing costs, to the possible detriment of the longer term. Many attendees told *Petroleum Review* that they were concerned by the industry's apparent preoccupation with the short term, which was serious in a long-lead time, capital intensive industry.

The potential problem and the increasingly urgent need for innovation was highlighted by Matt Simmons, of Simmons & Co. International, in his keynote address at the panel discussion on 'Technology Commercialisation'. Unless more hydrocarbon research projects were initiated soon, the industry would suffer, he stated. The era of cheap oil and gas was over, reservoirs were becoming smaller and harder to reach whilst giant fields were in decline.

UK open for business

Unlike recent years, Oil Ministers were conspicuous by their presence. Making his first appearance at OTC, and the first by a UK Minister since John Battle, Brian Wilson was keen to emphasise that the UK North Sea sector was evolving. He disliked the idea that it was a mature basin as this implied that it was fully developed or fully worked out. In this context, government needed to be open to new ideas and new players with new skills, he said. Although the major oil companies were still significant and valued investors, there was an important change in the size and type of company now 'entering the fray'. The UK Government believed that new, innovative and often smaller companies would be the key to extending the life of North Sea production. There were up to 300 undeveloped discoveries in the UK sector that, potentially, offered much. Thus far, some 30bn boe had been extracted from the UKCS and the consensus was that at least another 20bn boe could be produced. Indeed, the figure could be as high as 35bn boe.

The Minister conceded that current exploration levels were low, but contended that the government-industry initiative to stimulate more seismic and drilling on blocks and discoveries where there had been no activity for four years or more should result in these fallow assets passing to companies who would be keen to take advantage of the new opportunities. 'The underlying priority is to ensure that licensed assets are in the hands of those companies best placed to exploit them,' said Wilson. He also pointed out that the administration was keen to attract independent oil companies able to drill wildcats, niche developers and brown field investment like that recently seen when Apache took over the Forties field from BP.

Latin American production

The newly-appointed Minister of Mines and Energy for Brazil, Dilma Roussef,

argued that, notwithstanding international nervousness about the new government led by President Lula, the overall national economy and the indigenous oil industry were both doing well. 'We have every intention of honouring the contracts in the energy and other sectors and also intend to remain an actively participating part of the oil industry and international financial community.' She told *Petroleum Review* that self-sufficiency in oil was expected in about 2006, when demand might be between 2mn and 2.5mn b/d. This implied an increase in consumption of about 200,000–700,000 b/d over current levels.

Meanwhile, senior officials from the Venezuelan administration and from PdVSA said that the country's current output exceeded 3mn b/d and that the level could rise to some 5mn b/d by 2008. The necessary investment over the next five years would be about $43bn, of which 54% would be provided by PdVSA, with the balance coming from the domestic and international private sector. The President of PdVSA, Ali Rodriguez Araque, said that production, refining and international trade operations were 'fully normalised' following the recent political disturbances. He then concluded that Venezuela was 'back on track and fully able to fulfill our commitments to the US and other markets'.

Increasing GoM output

According to the US Minerals Management Service (MMS), Gulf of Mexico oil production could move up to more than 2mn b/d by 2005. However, Chris Oynes, who described the Gulf as 'a vibrant, growing and developing area', was less bullish on the prospects for gas, which would do well to sustain current levels. It would take 'a lot of drilling, not just 50 or 60 wells' to sustain supplies at the required rate.

At present one-quarter of US gas production comes from the Gulf, and four-fifths of this is extracted from shallow waters. The deeper parts of the Gulf are predominantly oil rich.

Need for more acreage

Dr David Loughman, Vice President of Shell Exploration and Production Company, reminded many seasoned OTC attendees of a long-standing obstacle that has confronted the US industry for many years. He pointed out that the federal Offshore Continental Shelf comprised 1.76bn submerged acres, of which only 40mn were currently leased through a total of 7,500 active leases. Most of the OCS was 'off limits' to the year 2012 by Presidential moratoria and the US Congress, and the denying of funds to the Minerals Management Service for activities related to these areas effectively supports the policy of inactivity. Loughman estimated that by adhering to this moratoria the US was denying itself 28tn cf of gas and 2.3bn barrels of oil in the Atlantic, 18.9tn cf of gas and 10.7bn barrels of oil in the Pacific, and 24tn cf and 4bn barrels in the eastern Gulf of Mexico.

Why was there no growth in OCS leasing? It was a complex blend of factors, including a negative image of the oil and gas industry, a lack of public knowledge about the industry, opposition by non-governmental organisations, a view of 'not in my back yard' from many coastal states and inadequate political support. Loughman also cited environmental concerns and accepted that more new measures could be implemented.

He also advocated 'proactively working sustainability issues' but stated that the 'bottom line' was the need for the industry to help itself and to work together to change public opinion to support additional responsible continental shelf development. However, talking to *Petroleum Review*, Loughman accepted that the integrated companies suffered in the upstream sector because of the public's unfavourable perception of downstream operations. On a more positive note, he stated that one relevant factor was that many of the industry's newly emerging leaders were passionately involved in environmental issues in their earlier lives and that this would influence their stance.

Sustainability issue

Tom Knudson, Senior Vice President of ConocoPhillips, maintained that sustainability was not new, optional or complicated but did need some ingredients to allow some real progress towards operating in a more sustainable fashion. The United Nations World Commission on Sustainable Development defines this concept as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. Adam Smith in 1776 warned that 'no society can surely be flourishing and happy of which the far greater part of the members are poor and miserable'.

Currently, the world population is six billion, of whom five billion are living in developing economies. Knudson quoted Queen Rania of Jordan, who observed recently that what divided the world was not politics or religion but hope, and he argued that sustainable development may not be concerned with ensuring that dwindling resources are divided equitably. The real issue was 'finding creative ways of stretching, even multiplying the world's resources. I think that we dwell way too much on the resource side and not nearly enough on the "waste side" thinking about how to better emulate nature and turn waste into resource,' he commented.

Sustainable development was about social responsibility, business ethics, transparency, respect for different cultures and making a better life for all the world's people – so it was very ambitious in the 'interrelatedness of its scope'. There were three keys to a more sustainable future, according to Knudson – namely, commitment, creativity and co-operation. He noted that there were many good environmental impact studies correlating industry activities in the Gulf with the environment of the region. However, there were few studies correlating oil and gas activity with the total economic and social impact.

He then discussed creativity and noted that most of the very pessimistic forecasts about resources had assumed that present trends would continue. The industry had made significant advances, but the biggest threat might not be its ability to operate sustainably offshore but rather the inability of the ultimate customers to use oil products sustainably. However, progress had been made. For example, according to the Environmental Protection Agency (EPA), the number of vehicles driven in the US over the past 30 years had increased by over 140% whilst emissions had declined by nearly 30%.

Finally, Knudson stated that while cooperation in the business community was important, 'our industry cannot achieve sustainable development alone' – governments, business, academics, communities and non-governmental organisations had to work together to find the most practical, most equitable solutions. 'Our industry needs to participate much more actively in the public dialogue on these issues than in the past. We need to be seen by society as part of the solution, not as the source of the problem.'

Innovation without limits

Next year's OTC theme is 'Innovation without limits'. As depletion advances, often scarcely noted by some 'experts', this will surely increase the need for innovation.

Building the digital markets of the future

As an entrepreneur in the energy markets in California, ICE founder, Chairman and CEO *Jeffrey Sprecher* conceived of a digital, transparent energy marketplace that would be accessible to all market participants. After working to warn regulators that the now-defunct California Power Exchange model was not sustainable, Sprecher set out to create what would quickly become the leading digital platform for energy products. Today, despite industry turbulence, the ICE platform has prevailed among more than a dozen companies attempting to claim leadership in the OTC (over-the-counter) energy markets.

When IntercontinentalExchange (ICE) acquired the International Petroleum Exchange (IPE) on 18 June 2001, two trends were taking shape that would converge and impact the future of energy trading. The first was the continued emergence of the Internet as a venue for accessible, global marketplaces, as seen by the success of eBay. The second trend was the continued move of the financial markets from open outcry or telephone markets to digital trading and ECNs (electronic communications networks) – a move which began its sweep through Europe and the US in the 1990s.

Today, a growing number of the world's derivatives markets are traded electronically due to process efficiency that provides substantially lower costs of trading to market participants, straight through processing into back office and settlement, and the impartiality of a neutral digital venue that is accessible to more participants, in turn increasing liquidity.

ICE has invested approximately $40mn since its founding in 2000 to develop and expand its digital execution platform. In 2001, with the rapid failure of Enron, ICE facilitated an orderly transition of the North American OTC markets as billions of dollars of trade moved fluidly from the flawed and failed one-to-many Enron Online model to ICE's many-to-many model that prevails today. On any given day, more than 5,000 market participants in North America, Europe and Asia rely on ICE to provide transparent, efficient and liquid markets. The ICE platform operates around the clock, with 24-hour help desk assistance and two fully redundant disaster recovery facilities on two continents. An average day on ICE sees more than $2bn in notional value of commodities trade on its OTC platform. The reliability of the platform is enhanced by real-time credit management capabilities, cleared trades through the London Clearinghouse (LCH), and electronic market surveillance. ICE operates its platform under the Commodity Exchange Act, under which ICE's marketplace is subject to anti-fraud and anti-manipulation regulations.

Figure 1: IPE Natural Gas Futures – monthly volumes
Note: Darker bars indicate electronic trading of futures on ICE

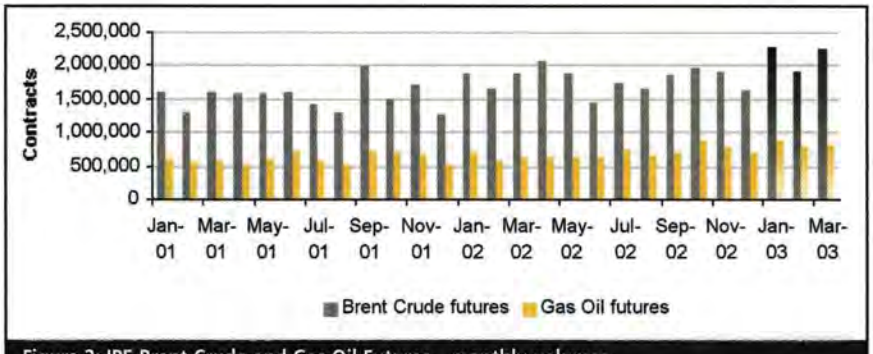

Figure 2: IPE Brent Crude and Gas Oil Futures – monthly volumes
Note: Darker bars indicate electronic trading of futures on ICE

Product launches

In the past year, in addition to the launch of cleared OTC products and an electronic confirmations platform (eConfirm), ICE launched its market date business – the 10x group. 10x was formed to meet demand in the North American power and gas markets for transparent, auditable and timely market data. Today, it provides among the most transparent market data services in the industry, ranging from real-time view-only access to the ICE platform 10x reports that include same-day price indicies, and time and sales reports listing every trade, bid and offer and associated volume intra-day on ICE. 10x also recently launched its Market Price Validation Service for forward price curve validation. Participants send month-end mark-to-market curves for forwards, swaps and options for validatoin according to its published methodology. 10x then generates a single

consensus mark for each market and provides these to the participating firms for use in marking their books with independent marks in compliance with FASB 133.

With a solid and growing base of OTC customers, ICE and IPE began the launch of futures trading on ICE's digital platform to provide a broad range of energy risk management products on a common electronic platform. From a trading perspective an inherent benefit exists in bringing futures and OTC products together in a common platform and clearing process (creating a more efficient use of capital) and provides the ability to view and execute in both OTC and futures markets on one screen in real time. As demonstrated in other markets that have undergone electronic transformations, the benefits of access and transparency were seen immediately in the volumes following the rollout of digital futures contracts.

In October 2002 the IPE's Natural Gas futures contract was launched on ICE and began setting volume records in the proceeding months in a market that had not seen record volume in over two years. The digital contract drew new participants to the markets where participants accessing both futures and OTC markets on the same screen drove volumes 30% above the comparable prior year period. (See **Figure 1.**)

'The successful migration was the result of many months' joint planning between IPE, ICE and market participants. This marks the completion of the first phase of moving all IPE contracts to the ICE platform,' says Jason Pegley, IPE Strategy Development Manager. 'The continuing growth we are witnessing is evidence of the industry's support and need for risk management and trading tools. The exposure which the Nat Gas futures contract is achieving through the extensive coverage of the ICE platform is undoubtedly contributing to the volume increase.'

Extended hours

While continuing to be referred to as 'IPE ETS' for contractual purposes, the ICE platform replaced the old ETS network for all electronic trading sessions in 2003. Electronic trading was launched in the Brent Crude and Gas Oil futures markets in February 2003 in extended hours sessions. These 'out of hours sessions' were recently lengthened, permitting electronic futures trading to occur nearly 10 hours daily in the Brent Crude market and 11 hours in the Gas Oil market.

The IPE has now increased the hours for IPE Brent Crude and Gas Oil futures – members and customers can now trade both products from 2 am in the morning until 10 pm in the evening (UK times) through a mix of open outcry and electronic trading sessions. (See **Figure 2.**) The number of traders on the platform has also been significantly expanded and, following regulatory approval from the US authorities, have a number of trading screens in the US for the trading of IPE products. Finally, ICE is currently in the process of increasing the distribution of its trading screens in other parts of the world, including the rest of Europe and the Far East.

The Natural Gas futures contract is traded electronically only. With the recent success of the digital futures contract, the IPE continues to pursue its goal of going completely electronic. The electronic trading sessions are now (London Time):

- IPE Brent: 2 am –9:45 pm; 8 pm–10 pm
- IPE Gas Oil: 2 am–9 am; 6 pm–10 pm
- IPE Nat Gas: 8 am–5 pm

NEWS Technology

Thermal mass flow transmitter

Magnetrol has released its new TA2 thermal dispersion mass flow transmitter for air and gas flow applications, the latest addition to the company's Thermatel product line.

The TA2 unit is claimed to offer new levels of performance using compact, integral explosion-proof electronics. Designed to meet the needs of the process industry, the instrument displays mass flow, temperature and totalised flow values.

A wide range of process connections are claimed to provide installation flexibility.

The probe is constructed of Hastelloy C for corrosive applications and the unit is fully approved to ATEX and FM/CSA standards for use in hazardous areas.

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www.magnetrol.com

Wet gas sampling system cuts costs

Jiskoot had developed what it claims is a 'unique system for wet gas sampling' for the Juno project in the North Sea that 'allows the operator to determine the liquid/gas ratio in a wet gas stream, and thereby improve profitability by correcting measurement errors'.

The manufacturer describes this as 'a crucial development as the liquid in a gas stream causes DP meters to "over-read", with resultant taxation and accounting errors, and because the liquid content has a much higher value than the equivalent amount of gas.'

Used in conjunction with existing flow measurement, the Jiskoot dual sampling system takes liquid and gas samples of the fluids produced by the two gas fields. These are used to determine the high value liquid content of the wet gas and to compensate the allocation metering systems for any measurement error. The company claims that: 'Until now, liquid content of 1% to 3% has proved extremely difficult to measure or sample using existing technology.'

The system measures liquid and gas mass ratios using a completely new 'molecular sieve' product, explains Jiskoot Marketing Manager Jon Moreau. 'This is a real breakthrough for operators, particularly if they are using a shared or multi-field pipeline with allocation measurement. Oil companies will now be able to accurately compensate their allocation and production measurement using this sampling technology.

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ATEX goes live

On 30 June 2003 manufacturers and suppliers will no longer be able use 'old approach' EC directives for equipment and protective systems to be used in potentially explosive atmospheres in the European Union (EU).

From that date the transitional period under Directive 94/9/EC expires such that equipment needs to comply with its requirements. A harmonisation directive to encourage free trade, the provisions included in 94/9/EC replace the existing divergent national and European legislation that covers the same subject.

The directive has been transposed into UK law as 'The Equipment and Protective Systems for Use in Potentially Explosive Atmospheres Regulations 1996'. It sets out essential health and safety requirements for both electrical and non-electrical equipment intended for use in potentially explosive atmospheres.

More detail is available on the EU's Europa web site at www.europa.eu.int

Filter protection

The flow-through design of Parker's latest Balston-branded range of 'fast loop' filter housings is reported to ensure increased filter element life when compared to traditional filters as the filter cartridge is continually flushed by the process stream, which carries bulk contaminants away with it.

The design is enhanced with identical inlet and outlet ports for the process stream. According to the manufacturer, this eliminates backpressure from this part of the system.

The clean side of the sample filter has also been designed with a very low volume in order to ensure that any lag time is minimised and changes in the sample are seen quickly at the analyser.

It is claimed that filtration of the sample, depending on application, can go down to 0.01 micron.

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NEW Publications

The Essence of Oil & Gas Depletion*

C J Campbell (Multi-Science Publishing, 5 Wates Way, Brentwood, Essex CM15 9TB, UK. T: +44 (0)1277 224632; F: +44 (0)1277 223453; e: **mscience@globalnet.co.uk**; **www.multi-science.co.uk**). *ISBN 0 906522 196. 348 pages. Price: £33; $48.*

The author is a leading member of the growing number of experts whose models of depletion show that the world will reach peak oil and gas production within about 10 years, after which will come increasing scarcity as production can no longer meet demand. Public data on production and reserves are often unreliable and this collection of papers and excerpts aims to present 'more realistic estimates and definitions than are available elsewhere'. The book includes contributions from experts at the Association for the Study of Peak Oil (ASPO), the graphs of oil analyst Jean Laherrere and ASPO's statistical review of world oil and gas.

A Survey of European Gasoline Exposures for the Period 1999–2001*

(Concawe, Boulevard du Souverain 165, B-1160 Brussels, Belgium. T: +32 2 566 91 60; F: +32 2 566 91 81; e: **info@concawe.be**). *60 pages. Price: free download from* **www.concawe.be**

This report presents data on measured occupational exposures to gasoline vapour in European Union countries during 1999–2001. The exposure measurements were taken in order to complement an earlier review of recent exposure data for the period 1993–1998. The surveyed operations were selected on the basis of past high exposures, newly implemented vapour recovery measures, or a general lack of information. In addition to inhalation exposures, analytical data are presented on composition of the gasolines handled during the monitored work activities. Most of the surveyed operations covered gasoline according to product specifications in force after 1 January 2000, when the maximum content of benzene in gasoline was reduced to 1% by volume.

Chemistry in the Oil Industry VII

(Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge CB4 0WF, UK. T: +44 (0)1223 432360; F: +44 (0)1223 423429; e: **sales@rsc.org**). *ISBN 0 85404 861 8. 292 pages. Price: £69.50.*

This book presents the latest information on developments in some of the major chemistry topics related to the oil industry that will have an impact on future cost-effectiveness and efficiency. It looks in turn at the latest developments in environmental issues, new technology, applications and flow assurance. Regulatory strategies are also discussed, from both the governmental and operational perspective.

Transport Fuels Technology*

Eric M Goodger (Published by Landfall Press. Available from the Institute of Petroleum, 61 New Cavendish Street, London W1G 7AR, UK. T: +44 (0)20 7467 7157; e: **sfm@petroleum.co.uk**) *ISBN 0 9520186 2 4. 444 pages. Price: £125. LIMITED SPECIAL OFFER: £75 to subscribers of the IP's* Transport Fuels Technology (TFT) Update Service *(see p2).*

This book (published in 2000) covers the relevant basic sciences of fuel chemistry, engine thermodynamics and combustion. It looks at current and possible future applications of these sciences via conventional and alternative fuels used for transport in the aerospace, road, rail and marine sectors.

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YOUR OFFICE AWAY FROM HOME

Intellectual Property – IFEG Seminar

The presentations given at the 8 May 2003 IFEG Seminar on 'Intellectual Property' by Dr Janita Good and her colleagues at Barlow Lyde & Gilbert (**www.blg.co.uk**), as well as Caroline Moss-Gibbons from the Royal College of Physicians Library, are now available on the IFEG Members' section of the IP website at **www.petroleum.co.uk**

Attendees can also obtain copies of the presentations given by Dr Good by e-mailing her at **jgood@blg.co.uk**

This well-received seminar was sponsored by Crown Bio Systems (**www.crownbiosystems.com**)

New Editions to Library Stock

- *Handbook of Electrical Engineering for Practitioners in the Oil, Gas and Petrochemical Industry.* Alan L Sheldrake. John Wiley & Sons, Chichester, UK, 2003. ISBN 0471496316.
- *The Impact in Northern Ireland of Cross-border Road Fuel Price Differentials: Three Years On. First Report of Session 2002—03: Volume II: Minutes of Evidence and Appendices.* House of Commons; Northern Ireland Affairs Committee. HC105-II. HMSO, London, UK, 2002. ISBN 0215006402.
- *New Energy Security Threats: Interactive Proceedings of the Round Table on the Security of Energy Supplies: UNECE Committee on Sustainable Energy, 2 November 2002, United Nations eBook.* ECE Energy Series No. 19, CD-Rom. Economic Commission for Europe (EC); United Nations (UN), 2002. ISBN 9211010535 1014-7225.
- *Oil and Gas Map of Asia.* Petroleum Economist, London, UK, 2003.
- *Pegasus Oil & Gas Directory 2003.* Including Internet directory. 16th edition. Pegasus Handguides, Great Yarmouth, UK, 2003.
- *South American Gas: Daring to Tap the Bounty.* International Energy Agency (IEA); Organisation for Economic Co-operation and Development (OECD), Paris, France, 2003. ISBN 9264196633.
- *Transporting Britain's Energy 2002: Development of Investment Scenarios. Transco, Hinckley, UK, 2002.*

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Membership News

NEW MEMBERS

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Mr E Ezomo, Nigeria
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Mr M D Hartnack, KPMG
Mr N Iduozee, Octopus Systems World-Wide
Mr L S Ilaboya, Nigeria
Ms K Johnson, Accenture
Mr G P Lourantos, International Energy & Environmental Consultants
Eur Ing D J Miles, Abergavenny
Mr G M Newman, St Neots
Mr C M C Paesen, SGS Belgium NV
Mr M M L Rees, London
Mr G Shaban-Ali, London
Mr J R Stewart III, Stewart Environmental
Mr C R Taylor, Honeywell Hi-spec Solutions
Mr D Thasarathar, Emsys Consulting

STUDENTS

Mr S Abere, Dundee
Mr Q Bashir, Loughborough University
Mr E G Ikomi, Dundee
Ms E S Ocheja, Aberdeen
Mr E Tebepah, Manchester
Mr E H Yap, Morden

STUDENT PRIZEWINNER

Mr S S J Wong, Shell Malaysia-EP

NEW FELLOW

Mr C E Henderson CB, MA, FIA, FInstPet
Charles Henderson worked for the Department of Energy/DTI from 1973 to 1996. He joined the IP in 1998 when he also became Chairman of TotalFinaElf Holdings UK. He has also been involved with the Competition Commission from 1998 to present. He has been a member of the IP Council as President of the IP from 2000–2002, and Past President since June 2002. Since 2000, Charles has also been a member of the IP Management Committee and has been a Senior Adviser to the Oxford Institute for Energy Studies since 1996.

DEATHS

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

	Born
Mr W J Baker	1906
Mr I E Burrows	1934
Mr B A Faulkner	1924
Mr M V Gauntlett	1942
Mr T T Hudson	1944
Dr R B Shearn	1926
Mr H P Warriner	1930

Discussion Group

ENERGY, ECONOMICS, ENVIRONMENT

BP Statistical Review of World Energy

Tuesday 10 June 14.00 for 14.30
BP Auditorium, 1 St James's Square, London SW1
Refreshments provided *BIEE members only*
IP members invited

Speaker: **Professor Peter A Davies, Chief Economist, BP plc**

Contact: **Administration Office, 37 Woodville Gardens, Ealing, London W5, UK**
T: +44 (0)20 8997 3707 F: +44 (0)20 8566 7674
e: biee@btopenworld.com

The e-Field – Wise Decisions in Real Time: From Reservoirs to Markets

Tuesday 17 June 17.00 for 17.30–19.00
Institute of Petroleum, 61 New Cavendish Street, London W1G 7AR, UK *Refreshments provided*

Speaker: **Wolfgang Schollnberger, Technology Vice President, BP plc**

Contact: **Laura Viscione**
T: +44 (0)20 7467 7174 F: +44 (0)20 7580 2230
e: lviscione@petroleum.co.uk www.petroleum.co.uk

Oil Scenarios for Iraq and Iran

Thursday 26 June 17.00 for 17.30–19.00
Institute of Petroleum, 61 New Cavendish Street, London W1G 7AR, UK *Refreshments provided*

Speaker: **Simon Wardell, Senior Energy Analyst, World Markets Research Centre**

Contact: **Laura Viscione**
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EnCana – The Progress of a New Entrant to the UK

Wednesday 2 July 17.00 for 17.30–19.00
Institute of Petroleum, 61 New Cavendish Street, London W1G 7AR, UK *Refreshments provided*

Speaker: **Alan Booth, Managing Director, EnCana (UK) Ltd**

Contact: **Laura Viscione**
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e: lviscione@petroleum.co.uk www.petroleum.co.uk

IP THE INSTITUTE OF PETROLEUM

in association with

PETROLEUM ECONOMIST ENERGY TRAINING

Course Dates:
23 - 25 June, 2003

Course Venue:
London, UK

IP Member:
£1400.00
(£1645.00 inc VAT)

Non-Member:
£1600.00
(£1880.00 inc VAT)

Introduction to Oil Industry Operations

This well-established, **three-day course** provides a concise and informed introduction to operations, from the search for oil and gas to the delivery of products to different customers. Participants will gain an appreciation of the principal activities of the international upstream and downstream petroleum industry and an understanding of how these inter-relate, as well as an awareness of the impact of external influences and the ways in which the industry is adapting to increase its competitiveness and to meet new challenges.

This Intensive Course Will Cover:

- Exploration for Oil and Gas
- Basic Concepts of Drilling
- Petroleum Production
- Field Development
- Crude Oil and Characteristics of Supply
- Oil Trading and Supply Operations
- Marine Transportation
- Basic Processes of Refining
- Marketing
- Logistics and Distribution
- Retail Marketing
- Natural Gas
- Exercises

Who should attend?

Those employed by financial, commercial, legal, insurance, governmental or advisory organisations requiring an introduction to the economic and commercial background and general trends of the oil industry It will also benefit graduate trainees, who require a concise introduction to the industry and participants from within the industry who require a broader perspective of the oil and gas industry's activities and the economic factors affecting its development.

Introduction to Petroleum Economics

This intensive, **three-day course** concentrates on the structure of the oil industry, the geopolitics of oil and the workings of the principal markets. It provides an informed introduction to the economic and commercial background and general trends of the oil industry, underpinning an understanding of oil and its markets, with an awareness of global and strategic issues.

The Economic Structure of the Oil Industry

- An Overview of Petroleum Economics
- The Economics of Exploration
- Upstream Economics
- Downstream Economics

The Geopolitics of Oil

- Former Soviet Union
- America
- Asia
- Middle East
- North Sea Basin
- Africa

The Oil Markets

- Crude Oil Markets
- Product Markets
- Oil Futures Market
- Oil Supply and Price -The Outlook
- Oil Company Perspectives

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For more information, see enclosed inserts or contact Nick Wilkinson at IP Training or visit: www.petroleum.co.uk/training

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