# Petroleum review August 2001

#### Independent bulk storage

Round-up of European developments

#### **North America**

Canadian boom creating new problems
 Prospects for the Bush energy plan
 US markets are working

#### Reserves

Enhanced oil recovery – ten years on

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MW = megawatts (106)

GW = gigawatts (109)

sq km = square kilometres

kWh = kilowatt hour

km = kilometre

b/d = barrels/day

t/d = tonnes/day

#### ABBREVIATIONS

- The following are used throughout Petroleum Review: mn = million (10<sup>6</sup>) kW = kilowatts (10<sup>3</sup>)
  - $mn = million (10^6)$  $bn = billion (10^9)$
  - tn = trillion  $(10^{12})$
  - cf = cubic feet
  - cm = cubic metres
  - boe = barrels of oil
  - equivalent
  - t/y = tonnes/year

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

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Front cover: Courtesy of Simon Storage









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# **ROUNFrom the Editor**

#### Learning from the numbers

Every year BP publishes the latest issue of the industry bible – the *BP Statistical Review of World Energy*. For those who write and comment on the energy industries it is a treasure trove; but more important it is the acid test – do the facts correspond to the theory or idea.

It never fails to amaze how resilient are the prejudices such as the idea that gasoline demand is soaring and pollution rising. Not in Europe. This year's statistics show that for the 15 members of the European Union gasoline sales in 2000 were actually 2mn tonnes lower than they were in 1990. If you don't burn it, you can't pollute. Physics and chemistry are very rigid on this point.

In addition to the publishing of the 50th edition of the *World Statistical Review*, BP has also just produced the first edition of the *BP Statistical Review* of US Energy, June 2001 (see p44).

Of particular interest are the following. In the US:

- Rigs drilling for oil peaked at around 650 in 1990/1991, but by end-2000 were down to 200.
- Rigs drilling for gas started the 1990s at just under 500 but ended 2000 with nearly 850 active.
- Gas prices reached over \$4/mn BTU in 2000, double the decade average.
- Coal production and consumption rose steadily through the 1990s.
- Oil production held fairly steady from 1975 to 1985, with Alaska offsetting declines elsewhere. But from 1985 onwards US production has fallen steadily in all areas.
- US oil products consumption hit a peak in 1978, a level which was not exceeded until 1998 – 20 years later.
- Total US oil products demand grew by just 0.6% in 2000 over 1999 levels.

However, the greatest surprise of all comes from the US Gulf of Mexico (GoM). Production from the federal offshore in PADDII (basically all but the shallowest water GoM) rose from 739,000 b/d in 1990 (ie just before the deepwater fields came onstream) to 1.408mn b/d in 2000, a gain of just 669,000 b/d.

Reserves are probably the least enlightening part of BP statistical reviews. In the main global review, BP figures are predominantly based on estimates generated by the *Oil and Gas Journal's* annual review. In this tabulation reserves for individual countries often remain unchanged for extended periods.

Anyone who has ever conducted a

magazine survey (usually the job for the junior) knows the problems. Asking national energy departments to reveal what half of them regard as state secrets is a pretty tough assignment. In literature the genre is known as 'faction', when it is statistics the optimists call it 'useful indications', the cynics call it 'useful obfuscation.' Either way, it hasn't stopped a number of academics and commentators building spectacular extrapolations on the shakiest of foundations.

Now a very strange thing has happened – one to crack the composure of even the most hardened cynic. The Statistical Review numbers may actually be right. For this useful insight we have to thank Jean Laherrere's analysis of reserves – see www.iiasa.ac.at/Research/ECS/IEW200 1/pdffiles/Papers/Laherrere-short.pdf reveals all in the clearest and most direct manner. It has long been known that the oil companies helped maintain an industry database which it was generally believed showed reserves way ahead of levels reported in any public database.

Jean Laherrere's Figure 2 on page 5 of the web paper clearly shows that in 1980 the industry database had reserves double those in the public databases. Since that date the public databases have climbed together in suspicious synchronicity while the industry database reserves have declined steadily. By end-2000 both series coincided at a little over 1tn barrels.

A recent press release from the IHS Energy Group (previously known as Petroconsultants) collates and compiles the industry database, more or less confirms Jean Laherrere's Figure 2. To quote from the press release: 'Remaining liquid reserves now stand at 1,100bn barrels compared with 1,207bn barrels at the end of 1991. During this period the reservesto-production ratio (R/P) has decreased from 48 years to 41 years, which indicates the world's demand for oil continues to outpace its supply.' As their table of reserves replacement shows the world replacing no more than 40% of production by new discoveries, we now have a very clear handle on the problem.

The world has 1.1tn barrels of remaining reserves. It is using around 26bn b/y and finding around 10bn b/y. Just one unknown remains. Of the remaining reserves how much is in underdeveloped or undeveloped fields – 250bn barrels? 200bn barrels? 150bn barrels? The answer to that determines whether we have a problem or a crisis. *Chris Skrebowski*  world

Smartbunkers, the online exchange for marine fuels, has launched a new, enhanced version of its website at www.smartbunkers.com New features on the site include a tool that allows buyers and sellers to negotiate bunker transactions directly online.

Centrica is reported to be planning to invest £20mn in a new Internet portal that will offer users a full range of home-related services, such as arranging a mortgage, selling a house and finding tradesmen, in addition to paying utility bills online.

The UK Engineering Construction Industry Association (ECIA) has recently unveiled its new website at www.ecia.co.uk

Customers of German gas transmission company Wingas can obtain information at **www.wingas.de** on the principles of the freely negotiable access to the Rehden natural gas storage of Wingas and details of the tariff model.

IBC Global Conferences has just launched a new energy website at www.ibcenergy.com that provides users with up to date details of events within the energy and safety fields.

PDI reports that it is in the process of improving the company website at www.pdieurope.com to make available far more information about what PDI has to offer the forecourt business in terms of systems and solutions.

FAME Information Services has announced the global release of energySCOPETM 2.2, a powerful webenabled analytical and decisionsupport tool built for energy trading groups of all sizes. The tool's new visualisation module is reported to allow for forward curves charting. The tool also provides the ability to evaluate weather-driven AGA natural gas storage and seasonality trends. An online demonstration can be viewed at www.fame-energy.com /energySCOPE.htm

The Oxford Institute for Energy Studies has changed its website address to www.oxford energy.org

A new online safety database has been launched by the UK's Step Change in Safety campaign. SADIE – the Safety Alert Database and Information Exchange – is a free webbased service jointly sponsored by the UK Health and Safety Executive (HSE), together with the UK Offshore Operators Association (UKOOA).

Contributions to the database are voluntary, with 29 companies and organisations so far providing information on more than 95 different incidents. A search engine allows users to find specific information to help them plan tasks safely. The SADIE database can be accessed at www.stepchangeinsafety.net

### In Brief

UK

BG is reported to have discovered gas at its Rose R2 prospect in block 47/15b in the southern sector of UK North Sea. The well tested at 90 b/d of condensate and 30mn cf/d of gas.

Statoil has been given the green light by the Faroese Ministry of Petroleum to drill the first exploration well on the Faroe Shelf. In addition to Statoil, BP and the Faroes Partnership, with Amerada Hess as operator, will also drill on the Shelf this summer. Shell is reported to have farmed into BP's 004 exploration licence offshore the Faroe Islands, taking a one-third interest.

Amerada Hess and Ranger Oil have agreed a joint programme of further exploration and appraisal of the Beechnut area in North Sea blocks 29/9a and 29/9b.

PanCanadian is understood to have increased its reserves estimate for the Buzzard field in block 20/6 in the North Sea to between 200mn and 300mn barrels of oil.

**Brovig/RDS has been selected by** Amerada Hess and co-venturers, under Logic's Satellite Accelerator initiative, to carry out the scope of work for Phase 3 of the Solan/Strathmore field west of Shetlands.

BG's Blake oil field, in North Sea blocks 13/14 and 13/29b, is reported to have come onstream two months ahead of schedule. Oil is carried via pipeline to the nearby Bleo Holm floating production vessel located on Talisman Energy's Ross field. Production from Ross had been temporarily suspended in March 2001 to allow onshore topsides modifications to the FPSO. Initial combined production from the fields of 65,000 b/d is expected to peak at around 85,000 b/d.

Phillips Petroleum is understood to have swapped a 62.74% stake in North Sea block 22/28a (which contains the Kate/Tornado discovery) for BP's 21.38% interest in block 30/2a as well as its 100% holding in block 30/1b (excluding the Kessog discovery) and 0.45% stake in the Britannia field, together with an undisclosed cash sum.

BHP Petroleum has been given the green light to develop the Hamilton East gas field as a satellite to the Liverpool Bay project. First gas is targeted by the end of the year.

# **NEW**<sub>Stream</sub>

### Maureen platform successfully refloated



Phillips Petroleum and partners Agip UK, BG, Pentex and Fina Exploration report that the Maureen platform in North Sea block 16/29a was successfully refloated on 26 June 2001. The operation took 60 hours to complete and the platform is now being towed to Stord in Norway where it will be moored at a deepwater location pending decision on its final full/partial reuse or deconstruction and recycling.

The refloat methodology involved releasing the 110,000-tonne steel gravity platform from the seabed by injecting water under the bases of the platform to create upward force, while at the same time deballasting the seawater in three tanks which form the base of the structure. As the water was pumped out of the tanks, an inert gas – nitrogen – was simultaneously introduced into them in order to maintain internal pressure. The seawater displaced from the tanks was pumped into a dedicated tanker and will be taken to an accredited onshore facility at Sture, Norway, for cleaning and disposal.



#### Go-ahead for Phase IIII of CMS project

Conoco and partners GDF Britain and Tullow Exploration have been given the go-ahead by the UK Government to develop five natural gas discoveries adjacent to the Caister and Murdoch fields in the southern North Sea. The £207mn CMS III project is expected to produce first gas in 4Q2002.

A potential 500bn cf of natural gas from the Hawksley, McAdam, Murdoch K, Boulton H and Watt reservoirs will be produced through subsea wellheads and flowlines to the adjacent Murdoch production platform. From there, the existing Caister Murdoch System (CMS) pipeline will transport it 115 miles to the Conoco-operated Theddlethorpe gas terminal in LincoInshire.

In order to facilitate development and simplify the ownership profile, Conoco and its co-venturers have unitised their respective interests in the five reservoirs into agreed holdings in a single project.



### Major UK offshore recruitment drive

The UK Offshore Operators Association (UKOOA) is launching a major recruitment drive with UK Government backing via the Pilot initiative to address concerns that the sector is heading for a shortage of skilled technicians over the next five to ten years. Some £1.5mn is to be made available over the next three years to boost the number of technician apprenticeships in a bid to reverse ageing trends in the current workforce.

According to the Managing Director of TotalFinaElf, Michel Contie, who has coordinated this issue on behalf of the operators for the Industry Leadership Team (ILT), 'almost half of all production technicians employed in the [UK] offshore oil and gas industry today are over 45 years of age. This figure is expected to rise to some 60% by 2005.'

He reports that the industry needs to train approximately 150 new technicians each year to replace those leaving the sector, either to retire or to take up jobs elsewhere.

The funding will allow the ECITB (the Engineering and Construction Industries Training Board), which had originally agreed to train 42 production technicians for the offshore industry this year, to provide an extra 38 apprenticeship places, bringing the total to 80.

These apprenticeships are in addition to 72 technician training places that oil and gas companies have already committed to fund this year through schemes managed on behalf of the industry by the National Training Organisation for oil and gas extraction, OPITO, or by individual companies. The additional ECITB apprenticeships will make up the shortfall to deliver the 150 training places required for 2001. The total cost of these schemes alone over the next three to four years is expected to amount to some \$7.8mn.

#### Enterprise Oil acquires Petrobras UK

Enterprise Oil has acquired Petrobras UK, whose E&P assets have been valued at \$157mn. The exploration portfolio comprises interests in 17 blocks and two West of Britain tranches. It includes four discoveries – Fiddich (block 22/19a), Millburn (22/22b), Selkirk (22/22b) and Conival (204/22a). Potential developments are: Beta/Orca (44/24a; 7.62% stake; CalEnergy Gas operator); Blane (30/3a; 28.96%; Petrobras operator); Enoch (16/13a; 27%; Petrobras operator); J1 (16/13a; 23.11%; Petrobras operator); Ettrick (20/2a and 20/3a; 23.51%; Petrobras operator); Magnus NW (211/7a; 2.5%; BP operator); Johnston Gamma (43/27a; 10%; Consort operator); and Caledonia (16/26e; 2.83%; Chevron operator).

Current production from the existing producing fields is between 9,000 and 10,000 boe/d from Alba (2.25%), Anglia (32.8%), Banff (1.8%), East Foinaven (10%), Hudson (0.46%), Hutton (including Q-West) (9.53%), NW Hutton (28.46%), Johnston (7.37%), Magnus (2.5%), South Magnus (2.5%) and Pierce (2.93%).

#### Venezuelan gas seeking foreign funds

TotalFinaElf (69.5%), in partnership with Repsol YPF (15%) and Venezuelan companies Inelectra (100.2%) and Otepi (5.3%), has been awarded the Yucal Placer Norte and Yucal Placer Sur blocks within the framework of the opening of the Venezuelan gas sector to private investment.

Yucal Placer is reported to be a 'significant' gas field, which was partially exploited at a low production rate up to 1989. The redevelopment of the field is planned to take place in two phases, the second of which will increase production to 300mn cf/d of gas. The project includes a drilling programme, the installation of a gas collection and treatment system, as well as connection to the national gas transportation network. The exploration and production/development licences have been awarded for a 35-year period.

TotalFinaElf states that award secures the company a 'strategic place at the forefront of the Venezuelan gas market as it opens up to the private sector.' The company is already the largest foreign investor in Venezuela, holding a 47% stake as lead-partner in the Sincor joint venture – investing \$4bn in the valorisation of extra heavy crude oil on the Orinoco Belt – and the development of the Jusepin field that is currently producing 37,000 b/d of light oil.

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In B	Rrief	
	Europe	

FMC Energy Systems of the US has secured a \$19mn contract from Statoil to provide equipment and technology solutions for the Sigyn field in the Norwegian sector of the North Sea. The field is to be developed as a tie-back to the Sleipner A platform. FMC has signed a similar \$40mn contract with Statoil for the Mikkel field, also in the North Sea, which is to be developed as a tie-back to the Åsgard B platform.

Statoil is reported to have agreed to supply BP with 1.6bn cm/y of Norwegian gas to 2016. The bulk of the deliveries will be made via the new Vesterled trunk pipeline.

The Maltese authorities are understood to have handed out seismic data recently acquired by TGS-Nopec to oil companies ahead of a planned licensing round.

Shell and ExxonMobil are reported to have discovered an 11bn cm gas field in block K15 in the Dutch sector of the North Sea. It is understood to be the largest find in this sector in the past 15 years.

Spanish fabricator Izar has secured a contract to build a 900,000 barrel capacity FPSO for Exmar Offshore of Belgium. The vessel is to be delivered at the end of January 2003 and is destined for use on the Aquitaine field, in the Mediterranean Sea offshore Libya.

Norsk Hydro's Snorre B field is reported to have come onstream two months ahead of schedule. It is producing 70,000 b/d of oil.

The Norwegian Government is reported to have allocated gas sales contacts to Statoil's Kristin field and ExxonMobil's Sigyn field. The fields are forecast to supply a total of 33.5bn cm of gas in the period 2002–2016.

Kvaerner has secured a contract to upgrade Statoil's Sleipner Vest installations. The \$27mn contract also includes an option for a further contract to connect the Alpha Nord reservoir to the Sleipner T platform. Work will be carried out at Kvaerner Oil & Gas' Stavanger yard and is due for completion by the end of 2004.

Ramco Energy has confirmed that it has awarded a contract to Pride Foramer for the Pride North Sea drilling rig to appraise gas reservoirs in

### In Brief

the Seven Heads oil and gas accumulation offshore Ireland. The rig is to drill one firm well and one optional well on block 48/24 this summer.

The Spanish fabricator Dragados is reported to have secured a \$179mn contract to construct a 15,000-tonne gas platform for Mexican state-owned company Pemex. The platform is destined for use in the Gulf of Mexico.

#### North America

TotalFinaElf (operator) has reported the go-ahead for development of the Matterhorn oil field in Mississippi Canyon block 243 in the deepwater Gulf of Mexico. The development plan calls for the field to come onstream in 2H2003, reaching a production rate of 40,000 boe/d by the end of that year. Matterhorn is to be developed via a floating production system (FPS) with a throughput capacity of 33,000 b/d of oil and more than 55mn cf/d of gas.

**PanCanadian and Eni have joined a** joint industry project researching and developing carbon dioxide (CO<sub>2</sub>) capture and geological storage technology aimed at reducing greenhouse gas emissions. The \$28mn CO<sub>2</sub> Capture Project (CCP) was established in May 2000 by BP, Chevron, Norsk Hydro, Shell, Statoil, Suncor Energy and Texaco.

The US Minerals Management Service (MMS) is reported to have launched an offshore lease sale for the eastern Gulf of Mexico. Sale 181 includes 256 blocks estimated to contain up to 1.25tn cf of gas and 185mn barrels of oil.

US independent Mariner Energy is reported to be planning to develop its Yosemite well in Green Canyon block 516 in the Gulf of Mexico as a subsea tie-back, together with two King Kong wells, to Agip's Allegheny mini-tension leg platform. First production is expected in December 2001.

Forest Oil Corporation is understood to have made a new oil discovery in Cook Inlet in southern Alaska that is claimed to double estimated remaining recoverable reserves in the mature Cook Inlet region. The Redoubt Shoal prospect is estimated to hold in excess of 50mn barrels of recoverable reserves.

Shell is understood to be planning to bring its Einset gas field in Viosca Knoll block 872 of the Gulf of Mexico

# **NEW**<sub>Stream</sub>

### Marginal falls in monthly output

Monthly oil and gas production fell slightly during April, according to the latest Oil and Gas Index from the Royal Bank of Scotland. There continue to be concerns that the industry will be unable to fully capitalise on increased investment levels, reports Tony Wood, Oil and Gas Economist with the Bank.

'Levels of operator investment are increasing in the North Sea. However, we remain concerned that the industry may be constrained in terms of skills and equipment, which could reduce its ability to deliver on additional investment. In turn, this could impact on the long-term competitiveness of the North Sea by increasing its costs of production relative to other locations,' he said.

April 2001 oil production fell to 2.2mn b/d, 3.4% down on the month and 10.4% below April last year. Average daily production in the 12 months to April 2001 fell by 11% compared with the 12 months to April 2000. The value of oil production in April averaged £40.2mn/d, an increase of 3.1% on the month and 11.9% on the year. Gas production also fell slightly in April. Monthly output dropped by 4.4%. Yearly output also fell by 1.9%, or 231mn cf/d. Nevertheless, average daily output in the 12 months to April 2001 was 3.5% higher than the 12 months to April 2000. Estimated gas revenues fell by 4% on the month, but were up 4.4% on the year.

Combined average daily production in the 12 months to April fell by 5.1%. Combined revenues are provisionally estimated to have increased by 0.8% to stand at £56.5mn/d. Revenues are estimated to have increased by 6.8% since this time last year.

Year Month	Oil production (av. b/d)	Gas production (av. mn cf/d)	Av. oil price (\$/b)
Apr 2000	2,480,945	12,149	23.15
May	2,222,686	9,089	24.15
Jun	2,436,450	8,609	30.50
Jul	2,383,944	7,531	28.90
Aug	2,339,363	7,464	31.60
Sep	2,281,516	8,080	33.70
Oct	2,247,307	10,172	30.90
Nov	2,322,296	11,621	32.80
Dec	2,399,038	11,439	26.30
Jan 2001	2,274,671	13,061	25.80
Feb	2,206,542	12,293	27.50
Mar	2,301,409	12,465	24.50
Apr	2,223,924	11,918	25.95
Sector Sector			

Source: The Royal Bank of Scotland Oil and Gas Index

North Sea oil and gas production

#### Wind farm proposed offshore Belgium

TotalFinaElf, through its subsidiary Fina Eolia, has recently applied to the Belgian Electricity and Gas Regulatory Commission for a concession to build and operate a 100 MW wind farm in Belgian waters. The project calls for the installation of 40 wind turbines located between eight and 17 km from shore, in two lines perpendicular to the coast to minimise the visual impact. The turbines will be connected to the onshore power transmission grid by a subsea cable that will make landfall near the port of Zeebrugge. According to TotalFinaElf, the proximity of the proposed route to existing undersea pipelines and cables will minimise the project's impact on the seabed and existing fishing zones.

The wind farm would be installed and commissioned in two 50 MW phases in 2003 and 2004, respectively. The installed capacity will be sufficient to supply electricity to around 150,000 people.

The concession application is the first stage in a one-year authorisation process that will include further studies to assess the environmental impact of the wind farm on the sea, as well as on fishing, shipping and tourism.

# **NEW**<sub>Stream</sub>

### Statistical review of world energy

Energy markets were put to the test in 2000, with crude oil prices reaching levels not seen since the early 1980s as supplies remained tight for most of the year. Natural gas prices lagged oil prices, but followed upwards, reflecting the impact of contractual links and competition between fuels, according to the 50th edition of BP's Statistical Review of World Energy.

Tracking the response of markets, the report shows that oil demand growth was weak in 2000 as high prices encouraged conservatism and substitution into alternative fuels – coal consumption rose for the first time since 1996. This demand growth weakness appears to have carried into 2001. With oil production from both Opec and non-Opec growing strongly, global oil capacity appears to be increasing faster than demand.

World primary energy consumption grew by 2.1% in 2000, following two years of virtually no growth in 1998 and 1999. Natural gas retained its position as the fastest growing fossil fuel. Energy consumption rose by 2.7% in North America (thanks in part to colder winter weather), but more slowly in the European Union and Japan, where consumption increased by a modest 1.1%. The emerging economies of Asia (excluding China) saw consumption continuing to bounce back from 1998 lows consumption grew by 5.1% in 2000. The picture in China was very different total energy consumption fell for the fourth consecutive year as a decline in coal use of more than 6% was only partially offset by increased oil and gas use.

Oil prices rose dramatically over the period, averaging 58% higher than in 1999 at \$28.98/b for Brent crude oil - the highest price since 1983. Opec production rose by 5.6% compared with 1999 as the organisation reversed the quota cuts of that year. Increases in production in Saudi Arabia, Iran and Kuwait took the Middle East's share of global production to 31%. Non-Opec supply recovered after falling in 1999, rising by 2.1% as investment and production began to respond to higher prices. Oil consumption growth was relatively weak, growing by only 1%, as consumers reacted to high prices.

Gas was the fastest growing fuel in 2000, with global consumption rising by 4.8% – the highest rate since 1996. Gas demand increased in all regions, but grew especially fast in Asia-Pacific where it rose by almost 8%. Chinese consumption was exceptionally strong, rising by 16%. The US and Canada also outstripped the global average, with a 5.1%

rise. In the Former Soviet Union, gas consumption increased for the second year running, increasing by 2.9% and reversing a trend of near continuous decline since the early 1990s.

Globally, natural gas production increased by 4.1%. The biggest increases occurred in countries tapping into the even faster growing international trade in natural gas – output grew by more than 50% in Nigeria and Oman as new LNG projects began building towards capacity. Production in Turkmenistan more than doubled as Russia pulled in additional Turkmen gas to compensate for declining domestic production.

Global coal consumption increased for the first time since 1996 as coal prices lagged well behind rapidly increasing oil and natural gas prices. A fourth consecutive annual fall in Chinese demand was more than offset by vigorous growth in the rest of Asia, Europe and the US. Nuclear power generation increased in all regions, averaging 2.7% at the global level, in line with the 10-year average. Hydroelectric generation increased by 1.7% as a 14.1% decline in US generation was counteracted by strong gains in Africa, Latin America and Asia-Pacific.

For the first time in its 50-year history, a companion edition to the Statistical Review has been published to focus on energy markets and production in the US. The *Statistical Review of US Energy* provides data on a period when energy markets were characterised by high prices, low inventories, increased capacity utilisation, and increased dependence on net energy imports (see p44). Energy consumption growth in 2000, at 2.3%, was somewhat above the 10-year average of 1.8%, but well above the rate of growth in production at 0.5%.

Copies of the BP Statistical Review of World Energy 2001 and the BP Statistical Review of US Energy 2001 can be viewed at, and downloaded from, www.bp.com/centres/energy

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### In Brief

onstream in February 2002. Recoverable reserves are put at more than 30bn cf of gas. It is thought peak production could reach 60mn cf/d.

**Pioneer Natural Resources and** Dominion E&P are reported to be planning to develop their Devils Tower field in the Gulf of Mexico via a truss spar. Reserves are put at between 50mn and 75mn barrels of oil. First oil is slated for 2003.

PanCanadian is understood to have secured a ten-year gas sales agreement with Maritimes & Northeast Pipelines that will push forward the development of the Deep Panuke gas field and expansion of the Nova Scotia–US pipeline link. First production from Deep Panuke is currently slated for 1Q2005.



KCA Drilling has secured a three-year, \$50mn contract for development drilling on TotalFinaElf's Douroud field in Iran.

BHP Billiton of Australia is reported to be planning to redevelop the Foroozan-Esfayandar oil field offshore Iran, boosting production from 50,000 b/d of oil to 150,000 b/d by 2005.

Eni is reported to be planning to invest \$550mn on development of Iran's Darkhovin oil field. It will hold a 60% stake in the project.



Clough of Australia and Hyundai Heavey Industries of South Korea are reported to have secured a \$80mn contract to develop the Lakshmi field in the Gulf of Cambay offshore India on behalf of joint venture partners Cairn Energy India, Oil & Natural Gas Corporation (ONGC) and Tata Petrodyne. First gas is expected in June 2002.



Norsk Hydro is reported to have farmed into block 34 in the Congo Basin, taking a 30% stake, and into block 25 in the Kwanza Basin of Angola, taking a 10% interest.

Repsol YPF has discovered oil in block NC-186 in Libya's Murzuq Basin, reports Stella Zenkovich.

### In Brief

# NE Vpstream/Industry

#### UK

Amerada Hess is reported to have sold its 26% interest in Danish independent Denerco Energy.

Enron is reported to have sold its 19% stake in UK independent Paladin Resources.

US energy company Dynegy is understood to have acquired BG Storage for \$590mn.

Amerada Hess is to acquire Triton Energy for \$2.7bn plus the assumption of \$500mn in Triton debt. The deal will increase Amerada Hess' reserves from 1.1bn boe to 1.4 boe and increase its production portfolio from 425,000 boeld to 535,000 boeld in 2002.

Centrica has acquired the UK operation of One.Tel in a £58mn deal that is said to make it the largest provider of indirect telecoms services in the UK with around 1mn active customers.

Shell Chairman Sir Mark Moody-Stuart is to be honoured as the 2001 Petroleum Executive of the Year, Energy Intelligence Group has announced.

UK Energy Minister Brian Wilson is to Chair a group leading a review by the Performance and Innovation Unit of the options for meeting the UK's longterm energy objectives. The group is to examine all aspects of energy policy, including how to meet the challenge of global warming. It will consider the role of coal, gas, oil and renewables in the future energy balance.

Stolt Offshore has posted a net loss of \$6.3mn on net operating revenue of \$282mn for 2Q2001, compared with a net loss of \$16.7mn on \$211.8mn for the same period last year.



Stolt Offshore, together with the Paragon group of companies, has acquired French engineering company Ingerop Litwin for an undisclosed sum. The Paris-based company will merge with the newly formed affiliate of Stolt Offshore, Paragon Europe, which will be renamed Paragon-Litwin.

**BP has reached agreement with** Cinven, one of Europe's leading private equity firms, for the sale of

### LNG-fuelled supply ships for North Sea

In the first positive move to reduce emissions of nitrogen oxide  $(NO_{\chi})$  discharges from ocean-going ships, Statoil has contracted for two LNG fuelled supply ships, reports *Brian Warshaw*. The ships will operate within the Norwegian Continental Shelf from 2003, providing support for oil and gas installations in the Tampen area.

It is claimed that substituting LNG for diesel fuel will reduce the ships' NO<sub>x</sub> emissions by 85%, eliminating an annual 420 tonnes of vapour that would have reached the atmosphere. Nitrogen oxide reacts with sunlight to create ground-level ozone which not only affects human health and the ecosystem but also, through oxidation, can increase the acidity of rain. The use of the alternative fuel is expected to increase Statoil's operating costs by more than NKr10mn. It will, however, enable the NO<sub>x</sub> savings to be credited to the company's land-based operations, where emission control techniques would make similar reductions several times more expensive.

combustion engines, will be constructed in Norway and chartered from Eidesvik and Møkster Shipping. Naturgass Vest will supply the LNG from its production plant at Kollsnes, and will invest in a distribution and refuelling system at the coastal base near Bergen, from where the ships will operate.

Since they were introduced in 1964, LNG carriers have commonly used the cargo boil-off gas as fuel to raise steam for the turbines. However, this initiative by Statoil puts Norway firmly in the lead for general purpose ships designed to operate on LNG. It follows the introduction of a LNG-fuelled ferry that went into service near the Norwegian city of Molde in February 2000.

Statoil is also the leading oil company in a Norwegian initiative to use recovered non-methane volatile organic compound vapours (VOCs) onboard crude oil shuttle tankers as an alternative fuel to diesel The second series of sea trials which began in June of this year, could lead to a 30% reduction in NO<sub>x</sub> emissions.

The supply ships, with gas internal 30% red

#### Dana more than trebles Goosander stake

Dana Petroleum has acquired further interests in UK central North Sea blocks 21/12 and 21/13a from Burlington Resources, including Burlington's 25.9864% stake in the Shell-operated Goosander oil field. The deal more than trebles Dana's stake in the Goosander project and significantly boosts its position in the surrounding acreage of 21/12 and 21/13a to 30.4409% and 24.99% respectively. The acquisitions were made for a cash consideration of \$4mn, with further payments contingent upon development of Goosander of up to \$10mn.

Drilling and other activities leading to development of the Goosander field as a subsea tie-back to Shell's Kittiwake platform have already commenced, with a view to achieving first production by mid-2002 at rates of around 15,000 b/d. Recoverable reserves are put at 16mn barrels, but may prove much larger as no oil/water contact has yet been encountered in the reservoir, comments Dana.

#### Redevelopment of onshore Whisby field

UK independent Europa Oil & Gas is to redevelop Blackland Park Exploration's Whisby oil field onshore the UK. Plans are to drill a new horizontal production well from existing Whisby production site to drain the northern part of the field. Europa is entitled to between 65% and 75% of any production from the well – anticipated to initially be more than 500 b/d – and has a three-year option to drill further wells on the field under the same terms.

Whisby is Europa's first oil field development project outside Central Europe.

#### IP and IGE in alliance/merger discussions

An exploratory meeting was held on 11 July 2001 to investigate how the Institution of Gas Engineers (IGE) and the Institute of Petroleum (IP) might work more closely together, up to and including the possibility of merging. The conclusion was that there may be significantly enhanced benefits to the joint memberships of both organisations by working more closely together and it was agreed that there are sufficient grounds to proceed with a more detailed investigation. The intent is to develop a proposal to take to both Councils for their meetings in September 2001. Jeff Pym, Director General, IP

# **NEW**industry

#### EC and EU news update

There have been a number of announcements from the European Commission and European Union in recent weeks. *Keith Nuthall* reports.

Although petrol and diesel consumption rose by 45% in the European Union between 1985 and 1998, technological improvements meant pollution actually fell during this time, a study from Eurostat has claimed. Between 1980 and 1998, the EU witnessed a 25% drop in nitrogen oxides (NO<sub>x</sub>) and nonmethane volatile organic compound (VOC) emissions, for which road transport is largely responsible. There were wide variations nationally, with NO<sub>x</sub> pollution actually growing by 1% in Ireland, compared with a drop of 49% in Germany. There were wide national variations in the increase of fuel consumption too, from 139% in Portugal, to 21% in Sweden. Eurostat concluded that 75% of the general growth was due to an increase in diesel consumption.

- Germany has been warned that it may be taken to the European Court of Justice unless it brings in national legislation to implement the EU's gas liberalisation directive. The European Commission has given Germany two months to respond to a 'reasoned opinion' over its failure to incorporate the directive within its national laws.
- The EU Council of Ministers has approved the expansion of the European directive setting emission limits for vehicles undertaking cold starts to new types of light commercial vehicles weighing more than 1,305 kg and passenger cars designed to carry more than six occupants and those with a maximum mass greater than 2,500 kg.

#### Technip proposes Coflexip takeover

Technip is making a friendly cash and share takeover bid for Coflexip to create what it claims will be 'a world class leader in oil and gas engineering, products and solutions.' Technip already holds a 29.7% stake in Coflexip, acquired in April this year. Technip expects the merger to facilitate annual cost savings of euro 50mn in 2002 and euro 85mn in 2003. It plans to increase its stake in Coflexip to 47% through the acquisition of state holding company Isis in an all-share bid. However, it plans to retain just 17% of Isis' stake in Coflexip and sell back Isis' other assets, including a 12.3% interest in oil exploration company Compagnie Generale de Geophysique, to the Institut Francais du Petrole (IFP). Technip will acquire the remaining shares in Coflexip through a share bid and optional cash offer.

#### Sibneft to 'radically increase' future spend

Sibneft has more than doubled its net profits in 2000 to \$674.8mn. The company reports that its succeeded in capping rises in operating expenses to just 15%, despite rising costs, and that direct production costs totalled \$1.75/b. Crude production in the period rose by 5.4% to 338,000 b/d and output is expected to grow twice as fast in 2001, rising 10.5% to a target of 375,000 b/d.

The company also unveiled plans to 'radically increase' investment in exploration and production to \$595mn in 2001, with investment in refining to increase nearly five times to \$52mn. Some \$20mn is to be invested in the retail sector.

#### Extension of oil-for-food programme

The United Nations' increasingly misnamed oil-for-food scheme has been extended until 30 November, with the Iraqi Government and the UN Security Council agreeing to break the deadlock that led to the agreement being suspended since June, reports *Keith Nuthall*.

Diplomats agreed that any changes to the programme should be put off in the meantime, although the American and British Governments have released statements saying that they intend to continue with discussions focused on reforming the system.

At the same time, UN oil overseers approved one new purchase contract for 2mn barrels of Kirkuk crude. Currently, there are 178 agreed oil contracts, covering 580mn barrels of oil, 356mn of which are for Basrah Light and 224mn for Kirkuk. Also released from hold are five contracts worth \$7.56mn, while 50 new contracts valued at \$93.3mn were placed on hold. The total value of existing mothballed orders now stands at over \$3.4bn, covering 1,373 contracts.

### In Brief

Burmah Castrol's metallurgical chemicals and releasants business divisions for £204mn (in cash and the assumption of debt), to be held by a newly established company funded by Cinven.

IBM and Shell have signed a five-year strategic alliance – valued at more than \$100mn – to support Shell's creation of three worldwide hubs to standardise and consolidate its IT applications infrastructure. The hubs will be in Kuala Lumpur, The Hague and Houston and will initially provide infrastructure for SAP and e-business solutions.

Gaz de France and bank Societe Generale are reported to have established a 51%:49% joint venture to trade physical and financial energy products in Europe. The joint venture, based in Paris, will be called Gaselys.

Fortum has ordered two 25,000 dwt product/chemical tankers from the Chinese Jinling shipyard, to be delivered in 2003.

Fortum of Finland has doubled its share of the Swedish gas company Vattenfall Naturgas to 20%.

North America

**Privately held Nexant, a technology** and consulting firm in the energy field is to acquire all of IBM's Chem Systems business unit assets.

Talisman Energy of Alberta, Canada, has acquired Swedish company Lundin Oil for C\$529mn, reports Monica Dobie. The deal will bring Talisman exploitable land in Malaysia and Lundin's interests in the North Sea, Vietnam and Papua New Guinea. Lundin's current interests in Sudan and Russia will be spun off in the form of a new company called Newco.

Dallas-based Hunt Oil has taken over Canadian company Chieftain International for C\$915mn, reports Monica Dobie. Hunt is offering \$29 in cash for each Chieftain share and is to assume \$15mn of debt. Chieftain holds a number of assets in the Gulf of Mexico, currently producing 105mn cf/d of natural gas.

Natural gas compression services company Hanover Compressor is understood to be planning to buy Schlumberger's natural gas compres-



sion business, ownership in certain Latin American natural gas compression and gas-handling assets, and certain other assets in a \$761mn deal that will give Schlumberger a 10% shareholding in Hanover.

Canadian company Husky Oil is understood to have acquired Avid Oil & Gas for an undisclosed sum.

Anadarko Petroleum is understood to have acquired Gulfstream Resources for \$137mn. It was previously thought that Roc Oil would buy the company.

US oil independent Cabot Oil and Gas is understood to be acquiring Cody Energy for \$230mn.

#### **Russia & Central Asia**

Lukoil is reported to have acquired Canadian company Bitech Petroleum for C\$123mn (\$80mn). Bitech holds assets in the Komi Republic and Sakhalin, as well as in North Africa and Latin America, and has proven and probable reserves of 105mn barrels.

Russian Minister for State Property, Alexander Braverman, has announced that the privatisation of Rosneft has been delayed indefinitely, reports UFG.

**Russian Prime Minister Mikhail** Kasyanov has announced that the ultimate goal of Gazprom restructuring will be the spin-off of the gas transportation business and the splitting up of the company's upstream operations into separate entities, reports UFG.

The Romanian authorities are understood to be planning to privatise state oil company SNP Petrom in 2002.

Dutch investment holding company CAIH (which holds a 35% stake in Nelson Resources/Hurricane Hydrocarbons), in association with leading Kazahk private bank Kazkommertsbank, has lodged an unsolicited bid for Hurricane Hydrocarbons, reports Stella Zenkovich. CAIH is bidding \$C10.25 per share in an attempt to secure a 50%-plus controlling stake in the company.

#### Asia-Pacific

US energy company GPU is reported to be planning to sell its Victoria state, Australia, gas pipeline operation GasNet through a A\$250mn initial public offering (IPO).

# **NEW** European supplies are secure, says OGP

Security of oil and gas supplies for Europe for at least the next 20 years and beyond can be maintained - even with reliance on those fuels projected to grow from 63% of consumption to 67%, according to Dr Wolfgang Schollnberger, Chairman of the International Association of Oil & Gas Producers (OGP), recently speaking to the European Parliament's Industry Committee hearing on EU security of energy supply. Dr Schollnberger, elected as a Member of IP Council in June, was also speaking on behalf of the European Petroleum Industry Association (EUROPIA).

To attract Europe's share of the estimated \$1tn global investment needed to meet growing demand for oil and gas in the decade ahead, he called for a sustained period of fiscal and regulatory stability within the EU. This would encourage further discovery, development and production of indigenous supplies of oil and gas.

Also needed, he claimed, will be diplomacy on the part of the Community to secure appropriate fiscal and legal conditions to encourage investment in diverse, additional sources of oil and gas supplies from outside the EU in areas such as Russia, the Caspian and North Africa.

Some of the policies explored in the EU Green Paper could have the opposite impact, he cautioned. For that reason, the industry counselled against the Commission's proposal to use EU strategic oil stocks – intended to provide supply security in an emergency – simply to mitigate price increases. 'This would be commercially perilous and ultimately unworkable,' he stated. 'What would the costs be and who would bear them?

Another Green Paper measure that the industry deems counterproductive was the suggestion to impose new taxes on hydrocarbons to fuel renewables. Such taxes would not only hamper vital investment but would also fall on an industry that is making a significant contribution to developing renewable sources of energy – several of the major oil and gas companies are also investing in fuel cell technology and are market leaders in such promising areas as solar power.

Looking downstream, Dr Schollnberger addressed the security of supply implications of the increasing tendency to promote product specifications unique to Europe. 'The industry will continue to improve specifications as we strive for cleaner fuels. However, the combination of tighter specifications, strong seasonal demand and refining and distribution incidents may cause temporary shortages and product/fuel price escalation – as has recently occurred in the US. Tightened or unique specifications will reduce the possibility of offsetting short-term local supply problems by importing products,' he told the Committee.

Looking at the global picture, oil supplies will be sufficient for at least another 40 years and supplies of gas could last for 60 years, according to Alan Grant, Director General of OGP. Also representing EUROPIA, he was speaking to Members of the European Parliament and the European Energy Foundation in Strasbourg on 3 July 2001, 'And, if the history of exploration and production is anything to go by, ample reserves of hydrocarbons could be available in the second half of the 21st century,' he said. 'This can be achieved through the implementation of new technology and improvements to the distribution network."

He stated that improved recovery techniques such as 3D and 4D seismic imaging, reservoir modelling and simulation, horizontal wells and integrated planning are helping to maintain supply. '

He also stressed the advances in deepwater developments: 'In the early 1980s, we were proud of a North Sea platform standing in waters less than 200 metres deep. Today, we're working in the Gulf of Mexico and west of Africa in waters as deep as 2,000 metres that could accommodate a stack of six Eiffel Towers.'

Estimates for investment in the decade ahead are put at \$1tn. 'The areas most likely to attract their share of that investment are those that will offer fiscal and regulatory stability,' Grant added.

The joint OGP/EUROPIA response to the European Commission Green Paper 'Towards a European Strategy for the Security of Energy Supply' is available on the OGP website at www.ogp.org.uk and the EUROPIA website at www.europia.com

# **NEW**<sub>Swnstream</sub>

#### BP makes moves on German market

BP has announced that it is to take a majority stake in Veba Oil which owns Aral, Germany's biggest fuel retailer. Subject to regulatory approvals, the deal – in the form of a joint venture between BP and Veba Oil's owner E.ON – involves BP taking 51% and operational control of Veba Oil and offers the prospect of full ownership as early as the 2Q2002.

In return, E.ON will receive 51% of Gelsenberg – which holds BP's 25.5% stake in Ruhrgas, Germany's leading gas distributor – plus a balancing cash payment of \$1.63bn, subject to adjustments and an assumption by BP of \$950mn of debt. Terms have also been agreed which could result in BP transferring its remaining Ruhrgas stake and paying a further \$340mn for the remainder of Veba Oil.

The cash cost to BP of acquiring all of Veba Oil could be significantly offset by proceeds from a re-sale of Veba Oil's upstream business that produces 160,000 boe/d, claims BP. These proceeds would be shared with E.ON but with the bulk accruing to BP. Should BP acquire all of Veba Oil, it should deliver annual synergies and savings of at least \$200mn.

Aral's domestic network of 2,560 service stations has daily fuel sales of 170,000 barrels and 1.7mn customers per day in Germany. Adding BP's existing German retail business would boost fuel sales to 230,000 b/d and shop revenues to over \$2bn/y. Aral also operates 450 retail sites in adjacent countries, primarily Austria and Poland where BP also has key positions.

As well as its retail sites, Veba Oil owns the Lingen refinery and has interests in four other refineries in Germany with a total net capacity of over 300,000 b/d. BP states that the addition of these plants would significantly enhance its supply logistics and boost its clean fuels capacity in central Europe. Veba Oil's petrochemicals business, with an ethylene capacity of 1.3mn t/y, would help meet BP's future chemical feedstock needs in the region.

#### Meeting growing Mexican gas demand

Shell Gas & Power and El Paso Global LNG have unveiled plans to jointly develop a LNG re-gasification terminal at Altamira, Tamaulipas State on Mexico's East Coast. The terminal will target fast growing gas demand in northeastern Mexico, which is largely driven by electric power demand growth. Overall Mexican gas demand is growing strongly, and LNG supplies will complement domestic gas production to meet this growth. In addition, LNG imports at Altamira will provide a new diversified source of imported gas for Mexico.

The terminal will have an initial capacity sufficient to meet demand in the immediate region of Altamira, with the potential to expand up to 1.3bn cf/d of gas (10mn t/y of LNG). Initial investment costs are put at \$300mn and the facility is expected to be commissioned in 1H2004.

The Shell–El Paso project will market gas directly to Pemex, the Mexican state energy company, industrial users and power producers.

#### UK fuel prices hit 2001 peak level

The newly re-elected UK Government is 'in danger of presiding over an economic tailspin due to the highest fuel prices seen so far in 2001,' reports Arval PHH, the fleet and fuel management company behind the AllStar fuel card. The average price of unleaded petrol in the UK is currently [June] 79 p/l, the highest it has been since the 80 p/l days of last November,' states the company, who is calling for 'more to be done to help the motorists who contribute over £21bn to the Treasury in fuel taxes alone (according to the most recent government figures).'

'A large proportion of that taxation comes from business motorists, both company car drivers and hauliers, and they are the ones suffering most. While their European competitors have been paying an average 59 p/l for unleaded petrol, the average price of unleaded in the UK is now 20 p/l higher.'

Fuel type	Pence per litre May 2001
Diesel	
Lowest: Southend	76.05
Highest: Oban	79.53
National average	77.33
Unleaded	
Lowest: Southend	76.72
Highest: Belfast	79.77
National average	78.04
Super Unleaded	
Lowest: Halifax	77.67
Highest: Oban	88.48
National average	81.64

Source: PHH Allstar Fuel Report

In Brief

US independent power company Calpine Corporation has entered the UK power market with its acquisition of a 1,200 MW gas-fired power station at Saltend, near Hull, from Entergy for £560mn.

Enron is reported to have launched a new service – EnCap – that will enable companies to supply gas in the UK from offshore without having to secure access rights to the national gas pipeline network.



Wingas has unveiled plans to extend its existing long-distance pipeline system by building a natural gas pipeline – SUDAL – across Southern Germany. The high-pressure pipeline will have a capacity of between 10bn and 12bn cm/y.

Tosco Corporation has completed its purchase of the operating assets of the Irish National Petroleum Corporation for \$100mn plus the value of the crude oil and products inventory. Assets include the 75,000 b/d Whitegate refinery located in Cork, Ireland, and an 8.5mn barrel, deepwater crude oil and oil products storage at Bantry Bay.

Kvaerner has secured a \$69mn engineering, procurement and construction contract for the upgrade of the Statoil refinery at Mongstad in Norway to comply with European fuel specifications applicable from 2005 under the Auto Oil II Programme.

The Greek Government is reported to be planning to sell a 30% interest in Hellenic Petroleum.

Vopak has sold its four dry cargo terminals located along the east cost of the US in the states of Florida and Virginia to Kinder Morgan Energy Partners based in Houston, Texas, for \$44mn. Meanwhile, in Australia, Vopak has sold its 77,000 cm capacity petroleum terminal in Hastings, Melbourne. The buyer is Trafigura Fuels Australia.

TotalFinaElf is to sell 74 Total and Elfbranded forecourts in eastern and southeastern France to Agip Francaise. It has also finalised an agreement to acquire 40 Agip and IP-branded motorway service stations in Italy.

### In Brief

## **NEV**Swnstream

Texaco is reported to have bought Infineum's blending facility in Ghent, Belgium, for an undisclosed sum.

The EU Council of Ministers has approved regulations that speed up the phasing out of single hull oil tankers of the type that ran aground in the Erika disaster, writes Keith Nuthall. The new rules – which have to be approved by the European Parliament – would ban single hull oil tankers without segregated ballasts tanks by 2005.

Dong of Denmark and Polish gas monopoly PGNiG are understood to have signed an agreement under which Dong will supply 16bn cm of Danish gas to Poland from 2003/4 to 2011 via the proposed 8bn cm capacity Baltic pipeline.

Eni is understood to have agreed to sell 900,000 t/y of Agip Petroli's refining capacity and 217 of its Italian service station network to Tamoil.

#### North America

Tesoro Petroleum Corporation is to acquire BP's 60,000 b/d Mandan refinery in North Dakota and its 55,000 b/d Salt Lake City, Utah, refinery as well as associated storage and gasoline marketing operations for \$677mn, excluding working capital.

#### Asia-Pacific

Occidental Petroleum is reported to have sold its stake in the Tangguh LNG project in Indonesia to Mitsubishi for \$480mn, bringing the Japanese oil company's interest to 16.3%.

### Centrica moves on Belgian energy market

Centrica reports that it has acquired for £52mnn a 50% stake in Luminus, a newly created energy supply business in Belgium. This represents its first step into the liberalising energy markets of Continental Europe. The joint venture has been established with a consortium of five Flemish municipal utilities, led by Interelectra and WVEM. The partners expect that Luminus will be the main alternative to Electrabel in the Belgian retail energy market.

The Flemish Government has also approved the phased opening of the electricity market, with household competition starting on 1 July 2003. The market for the largest electricity customers in Belgium, above 100 GWh, has already opened to competition. In Flanders, the market above 20 GWh opened on 1 July 2001, with the above 1 GWh market to open on 1 January 2002. The opening dates for the electricity market in the other regions of Belgium and the gas market are to be announced in due course, but are expected to follow close behind the timescales for Flanders.

#### Taking marine fuel testing onboard

Over one-third (35%) of ship owners and operators do not use any form of marine fuel testing service to ensure the consistent and appropriate quality of the marine fuels they purchase, according to a recent study commissioned by Smartbunkers, the online exchange for marine fuels.

The telephone poll, conducted by independent research house Golley Slater Group, questioned senior managers and directors from around the world. The research suggests a strong correlation between the size of a fleet and the use of a fuel testing service. Among owners and operators of smaller fleets – those with 20 vessels or less – some 61% reported using a testing service. This compares with 76% for those companies operating between 21 and 50 vessels and 78% for organisations operating the largest fleets (51+ vessels). The research also found that use of

marine fuel testing services was proportionally the same across most regions, varying from 60% for owners and operators based in the Middle East to 67% for those headquartered in North America. The only region with a significant difference in the use of such a service is South America, where just one-third (33%) of operators test their marine fuel. According to Smartbunkers, the response from South American ship owners and operators is most likely explained by the low proportion of companies in the region that operate fleets beyond their continent and are thus less exposed to the consequences of poor marine fuel than operators with vessels travelling between continents.

According to the study, over half (56%) of those testing fuel, do so for 100% of their marine fuel purchases. This compares with just 9% of respondents who report that they test up to a guarter of all fuel purchases.

#### **UK Deliveries into Consumption (tonnes)**

and the second					
Products	+May 2000	May 2001	†Jan–May 2000	Jan-May 2001	% Change
Naphtha/LDF	115,704	135,284	1.017.346	750,540	-26
ATF – Kerosene	852,020	997,608	3,833,225	4,241,756	11
Petrol	1,781,692	1,890,995	8,689,232	8,675,314	0
of which unleaded	1,641,947	1,796,429	7,955,135	7,722,018	-3
of which Super unleaded	31,259	36,801	170,383	177,654	4
of which Premium unleaded	1,610,688	434,918	7,784,752	4,289,871	-45
ULSP (ultra low sulfur petrol)	e de la competencia d	1,324,710	-	3,694,068	(÷ 1
Lead Replacement Petrol (LRP)	139,745	94,566	734,097	443,836	-40
Burning Oil	238,186	243,785	1,823,612	2,052,787	13
Automotive Diesel	1,293,877	1,379,254	6,364,066	6,646,510	4.4
Gas/Diesel Oil	537,325	531,442	3,011,000	2,738,298	-9
Fuel Oil	120,079	205,902	716,175	969,842	35
Lubricating Oil	65,917	67,978	332,213	351,692	6
Other Products	728,494	698,480	3,490,052	3,482,788	0
Total above	5,733,294	6,150,728	29,276,921	29,909,527	2
Refinery Consumption	444,559	370,553	2,206,871	1,828,037	-17
Total all products	6,177,853	6,521,281	31,483,792	31,737,564	1
† Revised with adjustments			All figures provided by the	UK Department of Trade a	nd Industry (DTI)

### <u>Canada</u>

### Industry boom creating new problems

oil

Strong commodity prices have pushed the Canadian oilpatch into high gear, but the boom in the sector is creating problems of its own, writes *Gordon Cope*.

The Canadian petroleum industry reported excellent results in 2000. Overall gross production revenues jumped to C\$51.6bn, up from C\$36.3bn in 1999. Revenues from natural gas exports alone almost doubled from C\$11bn in 1999 to C\$20.7bn thanks to higher yearly average prices and volumes. ARC Financial Corporation, a Calgary-based investment consultancy, noted that petroleum producers hauled away a record C\$20bn in profits, as after-tax cash flow doubled to C\$36.1bn.

And 2001 is shaping up to be an even better year. Oil prices remain in the \$28/b range, and January/February 2001 natural gas (NG) contracts averaged C\$8.53/GJ. First quarter 2001 export revenues stand at C\$11.6bn, more than triple the amount for the same time last year. ARC Financial predicts the sector could make C\$21.5bn profit this year on after-tax cash flow of C\$38.9bn.

According to the Petroleum Services Association of Canada (PSAC), much of that money – over C\$8bn – is going back into punching hole. The Canadian Association of Oilwell Drilling Contractors (CAODC) predicts that 19,455 wells will be drilled in Canada this year. In order to meet that target the fleet size has expanded to 640, and utilisation rates are hitting astounding heights. 'We were operating at 95% capacity [during the winter drilling season], which is essentially full-out,' says Richard Seto, Director of Strategic Communications at Precision Drilling.

But keeping up with the boom has put a strain on drilling personnel. 'The single biggest problem is getting enough experienced workers,' comments Roger Soucy, President of PSAC. 'The busiest part of the year is the winter, and we've managed to survive, primarily through a lot of overtime, but we can't continue indefinitely. In the two years of downturn (1998–1999) we lost 10,000 to 15,000 people, and there's been no time to ease into the new activity.'

#### Arctic remains hot

After exciting natural gas discoveries in the Fort Liard area just north of the 60th parallel last year, interest in the Canadian Arctic continues unabated. PetroCanada and Anderson Exploration spudded Kurk I-15, the first exploration well in the Mackenzie Delta in almost 20 years. PetroCanada also shot 700 sq km of 3D seismic and expects to drill two wells per year over the next five years. In all, oil and gas companies are expected to spend C\$400mn in the region this year. Political clouds are gathering over the development of Arctic resources, however. Alaska's North Slope contains proven gas reserves of 31tn cf with an estimated 68tn cf still to be discovered. The Mackenzie Beaufort Sea region has 6tn cf, with a further estimated 60tn cf yet to be found.

#### **Pipeline proposals**

No pipeline currently exists, although two projects are currently competing to deliver natural gas to market. The 3,000-km Alaska Highway route was first offered by Foothills Pipeline of Calgary as the Alaska Natural Gas Transportation System (ANGTS) and has received approvals from US FERC (Federal Energy Regulatory Commission) and the National Energy Board (NEB). A completion date for the line is placed at 2007–2008.

A shorter line is being proposed by Houston-based Arctic Resources Company (ARC). Its 2,300-km route would start at Prudhoe Bay and follow offshore Beaufort Sea, then down the Mackenzie Delta into Northern Alberta.

ExxonMobil, BP and Phillips have formed the North American Natural Gas Pipeline Group to evaluate the best way to move North Slope gas to market. They envision a 48-inch diameter pipeline carrying between 3bn and 5bn cf/d in a 2,500 psi, high-strength steel line. They estimate that the overthe-top route would cost \$7bn, compared with \$10bn for the Alaska route to Northern Alberta.

The state of Alaska recently passed legislation that would outlaw the offshore link under the Beaufort Sea. The rationalisation – an onshore route would guarantee jobs, sizeable investment opportunities within the state, natural gas availability to state communities, and fiscal impacts of development. If the move stands up in court, it might delay or strand natural gas deposits in the Mackenzie Delta.

Both routes, however, will eventually have to be approved by the NEB of Canada, an independent federal agency. A Mackenzie Valley route would guarantee similar benefits to the NWT (North West Territories). There have also been calls for Ottawa to use energy as leverage in other trade disputes such as lumber, but the Canadian Government says it will not connect the two issues, and will allow the marketplace to decide the route. Similarly, the Exxon/BP/Phillips group maintains they will make their decision based upon economics, and calls the legislation premature.

#### **Developing reserves**

The urgency to bring Arctic gas online is underscored by the parlous state of reserves in the Western Canada sedimentary basin. Decades of exploitation in the mature basin has reduced conventional crude production to 410,000 b/d, and natural gas producers must drill in excess of 10,000 wells per year just to keep annual production of 24tn cf steady in the face of annual decline rates approaching 40% in some fields.

Production on the East Coast of Canada has also been disappointing. The Hibernia field, primarily owned by Mobil, Chevron Canada together with PetroCanada, reached 150,000 b/d in 2000 and is expected to remain at that level for all of 2001. The Terra Nova field, which was scheduled to come onstream at 125,000 b/d in 1Q2001, is now behind schedule due to pre-installation modifications to its FPSO vessel. Operator PetroCanada hopes to have the vessel in place by late 2001, and producing at its target of 129,000 b/d by 2Q2002. Likewise, Husky's White Rose development, which was originally slated to add 100,000 b/d in late 2001, has been pushed back several years by concerns over rising offshore development costs.

Natural gas prospects off the Nova Scotian shelf are somewhat better.

Production from Sable Island hit the 500mn cf/d mark late last year, and major players in the region believe that there is great potential to increase reserve levels well beyond the official estimates of 18tn cf. PanCanadian recently contracted a semi-submersible deepwater drilling rig to aid in the commercialisation of its 1tn cf Deep Panuke discovery in the region. Shell, Marathon, Chevron and Kerr-McGee also have drilling programmes. This summer, Canadian Superior is shooting 1,100 km of high resolution seismic in the region to help pinpoint two drill sites. The Nova Scotia Petroleum Directorate predicts a total of 40 offshore wells over the next four years, with more than C\$1bn spent.

Heavy oil and oil sands production have also proven to be bright spots in petroleum's production firmament. Heavy oil, at 850,000 b/d, now accounts for the largest single component of Canadian output, and another 790,000 b/d now comes from oil sands and insitu bitumen.

And with C\$20bn of new investments targeted over the next decade for exploitation of the 300bn barrels of oil sands and 8bn barrels of heavy oil in place, their importance to the Canadian oilpatch will continue to grow. Syncrude hit record production in 1Q2001, when output totalled 237,000 b/d, versus 178,000 b/d in the same period last year. Suncor, which produced an average of 113,400 b/d of synthetic oil in 2000, is nearing completion of its C\$2.2bn Millenium expansion, and expects production to double to 220,000 b/d when it comes onstream in 4Q2001.

But oil sands and heavy oil require more energy to produce than conventional oil, and the costs of electricity (to run lifting pumps) and natural gas (to heat oil sands and insitu heavy oil) have risen dramatically. At Cold Lake, direct lifting costs. per barrel of bitumen produced rose from approximately C\$6 in January 2000 (when energy represented 30% of lifting costs) to C\$14 in January 2001 (when the energy component rose to 80% of lifting costs). Syncrude saw its long-term outlook for a barrel of synthetic crude rise from \$13 to \$17, primarily as a result of increased energy costs. While synthetic crude commands a price premium, and heavy oil differentials are narrowing as the summer asphalt season commences, producers are still concerned about the price rises and are taking steps to ameliorate them. Both Syncrude and Suncor are pursuing energy efficiency programmes at their facilities, and heavy oil producers are investing in bitumen fuel burners to heat their injection steam.

#### Mergers and acquisitions

Canadian petroleum companies are facing a further problem – an embarrassment of riches. The unprecedented flood of profits into the sector has left oil and gas executives scrambling to reinvest their capital into new exploration and production; but some industry experts believe that as much as C\$10bn this year alone will be left without a home.

Some of that money is being used to purchase production assets. Several billion dollars worth of unwanted oil fields have been placed on the market after last year's C\$15.7bn corporate acquisition splurge, but the number of potential buyers, including US utility companies (vying to tie up natural gas supplies), and royalty income trusts (RITs, which buy producing properties and distribute most of the proceeds pre-tax), have also grown exponentially. Peters & Co, an investment consultancy, reported that transaction prices have topped C\$50,000 boe production, double last year's figures.

In light of such inflation, publiclylisted Canadian companies have become a relative bargain. Low investor interest in small and mediumsized companies has led to price-to-cash flow ratios as low as three, half the valuation of comparable American firms. Magin Energy, who are a Calgary-based resources company producing 10,000 boe/d, is worth C\$155mn on the stock market, or 60% of net asset value. Earlier this spring, the company's shareholder's placed it up for sale, and Petrofund, a Calgary-based RIT, then acquired the company for C\$266mn.

American firms are also snapping up bargains. Anadarko Petroleum of Houston acquired Calgary-based Berkley Petroleum for \$1bn. Calpine Corporation, an electrical utility based in San Jose, California, purchased Encal Energy of Calgary for \$1.2bn. By April 2001, the tally of US companies acquiring Canadian firms had exceeded C\$4bn, approximately half of the C\$8bn in mergers and acquisition activity in the oilpatch for that period.

And activity is expected to continue unabated through the rest of the year. As many small and intermediate companies disappear (almost 40% of the petroleum companies on the TSE oil and gas index have been delisted since 1998), attention is turning to the 'super-independents,' publicly listed companies with more than C\$5bn in assets, such as Talisman, AEC and PanCanadian. In May, Houston-based Conoco paid C\$9.9bn to buy Gulf Canada Resources. 'The Americans can pay a lot of money and can also deliver, if they want, their stock, which has a higher premium, or a higher trading

Canada

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value than Canadian stock, states Talisman Chief Executive Jim Buckee.

#### **Refineries running hard**

After almost a decade of anaemic financial returns, Canada's 18 refineries are having a banner year. 'They are all running as hard as they can right now to make gasoline,' says Bill Levy, Vice President of the Canadian Petroleum Products Institute.

The reason is US demand. Canada produces approximately 110mn I/d of petrol and consumes 100mn I/d. The surplus is shipped to the US, which is suffering from a shortage due to winter production stream diversions into heating fuel and longer than expected refinery shut-downs for maintenance.

While Canada's 10mn I/d exports are a drop in the ocean compared with US consumption of approximately 1bn I/d, the price received for those exports sets the rates for the rest of the country. Since April, retail prices for petrol in Canada have risen by almost 25%, to approximately 75 cents (32 pence) per litre. In the US, prices have similarly risen to \$1.70 per US gallon. There are, however, increasing signs that increased supplies and rising stocks will presage price declines from the recent peak.

Needless to say, profits have been healthy. PetroCanada has reported downstream earnings of C\$91mn in 1Q2001, results mirrored by Shell and Imperial Oil.

Even with healthy demand and margins, however, few refiners are contemplating new facilities. 'The last refinery was built in 1980, and we won't see any new ones,' says Levy. The culprit is reduced demand. 'In the long term, consumption should go down as vehicles get more fuel-efficient and alternative-fuel vehicles become more prevalent. Right now, the regulatory process and payout period is in excess of 20 years, and I'd be very surprised if someone were to invest \$5bn for a new refinery.' Most refiners are happy to divert increased cash flow toward the C\$2bn capital investments needed to meet federal legislation that dictates 30 ppm/l of sulfur by 2005.

#### **Crude politics**

One of the most significant developments in Canada's petroleum sector over the last year has taken place in Washington, far from oil fields and exploration frontiers. Thanks to recent high natural gas prices and related electricity shortages in California, energy has become a political football in the US. President George W Bush has announced a far-reaching energy initiative, in which Canada, the US and Mexico would work together to ensure



#### Terra Nova FPSO

a continental solution to energy woes. His plan includes a pipeline from the Arctic to ship natural gas south, the reduction in transportation as well as refining bottlenecks, and, controversially, the opening up of federal wildlife refuge areas to petroleum exploration.

The Canadian Government welcomes the plan to expand exports, but sees a need for more environmental caution. 'We are going to be making the case very clearly that, from the Canadian point of view, energy efficiency and conservation are important,' states Ralph Goodale, Natural Resources Minister.

So far, much of the oil industry in Canada has responded well to the proposals. 'It's been a long time since energy received such attention from public policy makers,' comments Pierre Alvarez, President of the Canadian Association of Petroleum Producers (CAPP).

But petroleum producers are also wary of political interference in their sector. The last time energy shortages motivated Canadian politicians to become involved in oil, the Federal Government initiated the National Energy Program, or NEP, effectively derailing the industry. Already, California legislators are calling for price caps on natural gas, a move that could have repercussions in Canada. 'When the politicians have been involved in the energy business, our experience out here in Alberta certainly has been less than positive,' notes Dick Auchinleck, Chief Executive of Gulf Canada Resources.

In the near future, however, the outlook is rosy. Gilbert Laustsen Jung Associates, an energy consultancy, predicts it will be three years before the average Alberta natural gas price dips below C\$5/mn BTU, and not until 2008 until its stabilises in the C\$3.65 range in today's dollars. 'What we see over the next little while is a continuing increase in Canadian production to serve both domestic and foreign markets,' says Alvarez. 'Our expectation is that we will continue to grow our export sales to the US, but because the market is growing, we will probably hold at 15%-16% of the US natural gas market.'

### Bulk storage industry review



Europe's terminal operators have enjoyed good earnings for the past three years and some of this is now being reinvested in upgrade and expansion projects. There is also a growing focus on the provision of storage and logistics services, with many companies investing in ancillary services such as warehousing, blending, drumming and road tanker services. While there is, as yet, no full-service bulk liquids handling operation to rival the breadth of Vopak's assets, there are indications that a number of companies are heading in that direction. When Celanese switched its main European receiving location from Rotterdam to Antwerp a couple of months ago, it was a clear indication of the growing level of competition between northern Europe's leading bulk liquids ports. The Port of Antwerp has done a good job in recent years to promote its hinterland connections and stress the congestion that shippers can often encounter in Rotterdam.

Celanese's move was good news for ADPO (Antwerp Distribution & Product Operations), which has landed itself a contract involving up to 0.5mm t/y of chemical intermediates. On the other hand, terminal operators in Rotterdam have all the business they can handle at present and the loss of even such a large volume of business will go almost unremarked.

The decision by Celanese to move its product into Europe through the Scheldt rather than the Maas is not the only indicator of Antwerp's rising importance to bulk liquids shippers – particularly those involved in the bulk chemicals sector. Oiltanking, for example, is currently busy with the construction of a greenfield terminal at De Mosselbanken, Dow Chemical's major production site downstream from Antwerp at Terneuzen. This facility, which will eventually grow to 220,000 cm, will handle all of Dow's local storage requirements while also being offered to third parties in the region.

### Bulk storage industry review

The one thing these two pieces of news have in common also reflects almost every major development in the European storage business over the last year - they relate to chemicals, not petroleum. Indeed, the only significant development in the petroleum business has been ST Services' reopening of its Eastham site in northwest England to gasoline business. This move, which involved the installation of vapour control equipment and new jetty facilities, was undertaken specifically to handle a new contract from Emir8 Petroleum that will bring much-needed competition from the independent sector to the gasoline retailing sector in this part of the country.

#### Concentration of ownership

Another reason for the growing competitiveness in the European terminalling sector is the increasing concentration of ownership. The pattern in the UK is particularly noticeable, with much of the independent storage capacity now in the hands of just three operators: Vopak UK, Simon Storage and ST Services (which operates most of the former GATX sites). It is also notable that most of Simon's terminals are coowned in a joint venture between Simon and Vopak.

Some users have expressed disquiet that such a concentration of ownership is not good for the market; indeed, at a conference held in March by the UK Independent Tank Storage Association (ITSA – now renamed the Tank Storage Association), one speaker compared the position to the neck-lock the four major food retailers have over the food industry in the UK.

If this is the case, it does not appear to have been reflected in lease rates. In the petroleum sector, demand for capacity has fallen from the very high levels of the last two or three years and rates have followed suit, although both utilisation and rates are still at reasonable levels from the operators' point of view. It is in the chemicals sector where terminal operators are still investing money in new facilities and reaping the benefits of firm demand. It is noticeable, for example, that since acquiring the immense Botlek terminal from Vopak as part of that company's conditions for merger, Odfjell has put money into replacing mild steel tanks with stainless steel capacity, in order to better to service chemical clients.

#### **Increased competition**

The departure of GATX Terminals from Europe and the few divestments forced on Vopak have, in fact, allowed some other operators to expand their capacities and, effectively, increased competition in some areas. LBC is one such operator; it has recently completed a 16,000 cm expansion at Rotterdam and is now starting on another phase of growth - more tanks are going in at its Antwerp site and there are plans for expansions at Bayonne, Santander and Lisbon. In addition, and once more reflecting the predominance in the current market of the chemicals business, the company is building dedicated warehousing space at both Rotterdam and Antwerp for the storage of packaged dangerous goods.

#### **Changing strategies**

Other operators to have taken advantage of the change in the structure of the European oil and chemical industry, as well as the growing concentration in the provision of storage and logistics services, include some whose interests are to a greater or lesser extent geared to their own requirements. These include



Petroplus, which describes itself as a 'midstream' oil company and is involved in refining and marketing as well as the provision of third-party storage capacity.

Oiltanking is an affiliate of trader Mabanaft and, until recently, had concentrated almost exclusively in the offering of petroleum storage. Lately, however, it has switched the focus of its development towards chemicals and, in addition to the Terneuzen terminal currently under construction and a joint venture terminal with Odfjell being built in Singapore, it acquired the small Baltic terminal chain Sonmarin in 1999. Earlier this year, it added Neftefinn's chemical and oil terminal in Kotka, Finland.

Also in the Baltic, Nordic Storage is busy assembling a network of strategically located terminals, aimed at providing a service for distillate exporters in the region. Its latest addition was the Gulfhavn terminal in Denmark, which it is marketing under an agreement with Kuwait Petroleum.

#### **Targeting third-parties**

Another class of emerging operators includes those chemical companies who have begun marketing their terminal



#### **BTL Whiddy Island**

capacity to third parties. One of these is Altintel Melamin Sanayii, which operates a 32,000 cm terminal primarily to handle imports of methanol into Turkey for its own processes. It has, however, recently entered into a contract with Nissho Iwai and is installing six additional tanks at the site at Gebze, near Istanbul. This is unlikely to be an isolated contract, the company says, although it is in competition with the nearby Solventas terminal, which has recently been expanded to 142,000 cm and adapted to handle some difficult chemical products.

A further example of this trend is ACIdEKA, which has 20,500 cm of

storage capacity, much of it in stainless steel, at Bilbao in northern Spain. The company was originally formed to receive and distribute acids for the local market but has developed a niche as a producer of water and paper treatment chemicals and has recently seen a significant increase in third-party throughput at its terminal.

#### Terminal upgrades and expansions

As this partial list of current projects should indicate, there is a lot of money being poured into terminal

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Bulk storage industry review



upgrades and expansions at present. Operators have enjoyed good earnings for three years now and some of this is being reinvested.

Also, recent regulatory impositions have, by and large, been dealt with although some air quality control measures are still being implemented, most terminals that require vapour control equipment have already been equipped. The next big bill came in the shape of the Seveso II Directive, which was implemented in the UK as the COMAH Regulations and brought many terminals within the scope of the provisions for the first time. Many have had to develop safety management systems and emergency response plans, often at the same time as they implemented the dangerous goods safety adviser (DGSA) requirement.

#### What lies ahead

At the ITSA conference in Coventry, representatives of the UK Health & Safety Executive (HSE) explained to their audience of terminal operators and customers what Europe has in store for them next. Delegates were clearly unimpressed and feel that the UK is too ready to do Brussels' bidding whereas their counterparts in other EU countries are given an easier ride. Indeed, the fact that France delayed implementation of the DGSA Directive by a year gives this argument some weight.

Terminal operators are now concerned that HSE is concentrating on the guestion of falls from road tankers and tank containers and is demanding that the storage sector plays a role in reducing the number of injuries and fatalities occurring from tank-top operations. Terminal companies point out that the number of such incidents is very low and that the large investment that will be necessary to install safety walkways and cages is by no means certain to reduce the number any further. In addition, it is hard for them to install standardised gantry equipment for this purpose when the design and layout of road tankers and tank containers is not standardised.

HSE sees the work it is doing in this area as falling within a broad remit to improve the quality of working conditions. It is not alone among European enforcement agencies in feeling that there is now enough regulation and what is needed is a greater concentration of effort on ensuring that the regulations in place are observed and are seen to be working.

#### **Self-regulation**

The chemical industry has extended its self-regulation to the terminals sector over the last few years. The Chemical

Distribution Institute (CDI) initiative to establish a standardised audit procedure and data service for charterers was extended to the terminals sector and, as CDI-T, has seen many European sites undergo independent inspections.

The system has also been used in Singapore and the Brazilian chemical industry association Abiquim has also expressed an interest in applying it. The CDI-T database has been available to users online since March 2000 and, according to General Manager Martin Whittle, has proved successful with users, particularly since an upgrade implemented earlier this year.

There are more plans to tie the CDI-T database in more closely with the CDI and SIRE ship inspection report systems. Both users and asset owners, initially wary, are now beginning to find that there are benefits to having such information readily available and that it helps differentiate between quality operators and those who seek to undercut the market by failing to maintain their assets to the required standard.

#### Expanding role

The independent storage sector in Europe – and, increasingly, elsewhere in the world – has succeeded in positioning itself as a highly professional provider of logistics services to the oil and chemicals industries. As those industries retreat even further from their non-core activities and hand over an increasing number of functions to specialist operators, storage specialists are well placed to expand their role.

This has been reflected in numerous investments in ancillary activities such as warehousing, blending, drumming and – as will Simon's acquisition of Norman Lewis Tankers – road transport services.

While there is as yet no full-service bulk liquids handling operation to rival the breadth of Vopak's assets, there are indications that a number of companies are heading in that direction. While they may not be coming from a history in the storage sector – viz Odfjell – they will find that the storage function is fundamental to the logistics supply chain.

#### European bulk storage directory

Petroleum Review's European Bulk Storage Directory, which provides a comprehensive listing of terminal facilities/services and contact details, is soon to appear on the Institute of Petroleum's website at www.petroleum.co.uk

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Bulk storage UK

# New terminal for UK's largest independent storage company



In a recent interview some of the senior management at Simon Storage told *Chris Skrebowksi* about the challenges facing the independent storage sector.

Simon Storage is currently the largest independent tank storage company in the UK, operating seven terminals, the largest of which is the Immingham facility on the Humber. The other facilities are the two terminals on the Tees – Riverside and Seal Sands; the Tyne terminal; the Cumbrian terminal at Workington; and the Foynes terminal on the Shannon in Eire.

According to Peter Rendall, Marketing Director, the company is now planning to construct an eighth terminal at Grangemouth, starting next year. The company has an option on 20 acres of land owned by the Forth Ports Authority and current plans are for between 60,000 and 70,000 cm of storage for the chemicals industry. Rendall states that, providing all the permissions are received in time, building work could commence as early as March 2002.

Simon Storage is a joint venture (50%:50%) with Vopak in all its terminals, except the two on the Tees (Riverside and Seal Sands) which are 100% owned by Simon Storage. The new Grangemouth terminal will developed by Simon Group plc.

#### **Unique evolution**

According to the Immingham Terminal Manager Keith Jackson (East Terminal) and Roy Frith (West Terminal), the company is probably unique in the way that it has evolved and developed, and the way in which it has adapted to changing circumstances. It started in the 1960s by acquiring a series of oil company storage terminals and linking these together into a single operation. This broadly coincided with the building of the two Humber refineries - TotalFinaElf's Lindsey refinery at Killingholme as well as Conoco's refinery at South Killingholme. Initially, some of the crude for the refineries was imported through the Simon Storage jetties. However, the completion of the refineries and their associated jetties and refinery tankage reduced the use of third-party storage companies.

During the 1970s Simon Storage adapted to this loss of business by moving into the storage of chemicals and the storage of oil products for the major distributors such as Charringtons. Over time the distributor business declined and in 1985 changes to HM Customs & Excise rules meant that 'in-bond' storage was no longer an option, which further reduced distributor and speculative storage requirements.

Other business was developed to replace these declining sectors:

- support for the refiners in terms of holding speciality products;
- railhead and storage of UK onshore crude brought by rail and road from the East Midlands oil fields;
- the holding of lubricant, base oils and aviation fuels; and
- the import of North Sea condensates.

Jackson and Frith confirmed that the direct pipeline links into the two refineries, links across the harbour (between the two Simon terminals) and across the Humber, as well as links from the refineries to the UK oil pipeline system, gave enormous flexibility to operations. This, in turn, gave Simon opportunities to help with the peaks and troughs of refinery production as well as offering an effective fourth jetty.

#### **Terminal reduction**

Jackson and Frith also commented that the rationalisation and consolidation in the oil business was leading to a reduction in the number of terminals as the multi-majors progressively disappear. This, in turn, impacts back on the storage companies' ambitions to integrate forward into terminals management.

Over recent years Simon Storage has been awarded contracts to run Texaco's Cardiff, Brighton as well as Pembroke refinery terminals. According to Rendall, the company believes that other companies will follow the US pattern of outsourcing their terminal operations. In the short term, however, the rapid recovery in profits and oil prices, coupled with logistics reviews following mergers, has brought the outsourcing process to a (temporary?) halt.

In as far as a UK pattern has emerged, it is that the oil companies are prepared to outsource away from their refinery terminalling operation bases. Rendall claimed, however, that the oil companies 'were listening' to its proposals and recognised that companies such as Simon Storage were large enough to have the required skills and competencies in areas such as safety and environmental health which are so important in terms of oil industry reputation.

#### The road ahead

The executives all felt that the immediate opportunities lay in chemical storage where there was a natural fit between chemical companies who had no interest in running small stores of chemicals in strategic locations and storage companies who, with a spread of locations, could provide competitive storage and supply.

In contrast, oil storage would be more difficult until companies made strategic decisions about their involvement in supply logistics. Simon currently has successful into-plane jet kerosene service support for major oil companies at seven major UK airports. Other recent business developments include utility supply operations and pipeline operations.

#### **Future threats**

In terms of significant threats to future operations, the executives' major area of concern is the recent 'COMA' green paper containing plans by the European Union for tighter rules and regulations governing chemicals handling and storage. If applied literally, Rendall, Jackson and Frith fear an export of contracts to less restrictive areas such as Eastern Europe or North Africa.

Their other major development in the market place is that 'everyone is trying to control the supply chain.' Oil companies are trying to hold on to the supply chain, storage companies are trying to integrate along it, and tanker companies are trying to integrate both forward and back while shipping companies have acquired storage and distribution. Simon Storage, for example, has relatively recently acquired the European chemicals haulier Lewis Tankers as well as upgrading its rail loading operations at Immingham for petroleum products. The company also has close involvement in the operation of UK oil pipelines.

Over the next few years it should become rather clearer how the oil products and chemicals distribution chain is to be controlled. For chemicals, the independent storage companies clearly have a role. For oil products, they are fighting hard for a larger share.

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### **China**

gas



China's plans to develop natural gas consumption have taken an important step forward with the recent announcement that BP has been chosen to take an equity stake in China's first imported LNG terminal to be built in Shenzhen in southern Guangdong Province which borders Hong Kong. *David Hayes* takes a closer look at the project and provides an overview of the country's developing gas market.

Project, which is estimated at about \$600mn, has been chased by most of the world's oil majors and various foreign gas utilities since the early 1990s. BP (30%) will partner China National Offshore Oil Corporation (CNOOC) (31%) in building the LNG terminal and is expected to win a 20-year LNG contract worth about \$10bn. Other partners ae Hong Kong & China Gas Company (3%), Hong Kong Electric (3%) and a consortium of five local Chinese companies (31%).

Securing the supply contract for about 3mn t/y following the terminal's completion in 2005 has been the target of intense government lobbying from countries with LNG resources including Australia, Malaysia and Indonesia. BP holds an equity stake in Western Australia's North West Shelf gas field project which could supply part of the LNG requirement. However, CNOOC is reported to be keen on receiving LNG imports from two or more sources that could present opportunities for Asian LNG suppliers.

The Guangdong LNG scheme marks an important stage in the development of gas use in China. Although the primary use of LNG will be for power generation, plans also call for the development of piped gas distribution grids in a number of cities in Guangdong Province as part of plans to reduce urban airborne pollution caused by burning coal.

### Developing domestic reserves

While the import of LNG has been approved to meet specific energy needs in Guangdong – one of China's fastest

developing provinces - the government is keen to see sizeable domestic gas reserves developed as well. According to official figures, China has gas reserves totalling 38tn cf, of which almost 30tn cf is onshore and 8tn cf offshore. At the end of 1999 developed gas reserves totalled 2tn cf, of which developed recoverable gas reserves amounted to 1.3tn cf. Most of the gas reserves belong to PetroChina which has recoverable gas reserves totalling 1.2tn cf. Some 83% of the proven reserves lie onshore in basins such as Sichuan, Shanganning, Tarim, Chaidam, Zhunger, Tuha and various others, while offshore reserves lie mainly in the Sea of Yingge, Gulf of Bohai and the Sea of Qiong.

In 1999 China produced 24.1bn cm of gas, compared with 22.1bn cm in 1998. Natural gas production in 1999 totalled 17.8bn cm and condensate gas 6.3bn cm. PetroChina produced 16.3bn cm of gas (11.2bn cm natural gas and 5.3bn cm gas condensate) in 1999, accounting for 70% of China's total gas production that year.

The country's gas transmission facilities include 6,873 km of transmission pipeline with a diameter of 42 cm (16 inches) or larger. Most large pipelines have been built in Sichuan Province where gas utilisation is most developed, although pipelines also have been built to transport gas to Beijing, Shanghai and Xi'an.

About one-third of all gas produced in China is actually used at the production site in oil fields. The associated gas is used mainly for power generation to help in oil recovery. The volume of gas transmitted from gas fields in 1999 for sale for other uses totalled 13bn cm.

#### Gas consumption

Fertiliser production historically has consumed a major proportion of China's gas production to support the government's agricultural production policies and because the fertiliser plants could be sited close to the gas fields. About 40% of natural gas produced currently is used for fertiliser production, while a further 17% is used by the industrial sector.

Households use about 11% of the country's natural gas output. Prior to 1985 household gas use was insignificant. However, residential use grew in the 1990s after gas distribution systems were built in several large cities in Sichuan Province and northeast China. Currently most household gas use relies on LPG and manufactured gas as the availability of piped natural gas supplies remains limited.

Gas use for commercial power generation is still very small as a proportion of total gas production, accounting for only 3% of natural gas production. However, the volume is growing as more gas-fired power plants are built. Recently several small size peaking power gas plants of 50 MW to 100 MW capacity have been built in cities including Beijing, Tianjin and Chengdu in Sichuan Province, and Sanya in Hainan Province.

The only large natural gas development scheme for power generation completed so far is the submarine gas pipeline linking the Yacheng field in the South China Sea which supplies gas to Black Point power station in Hong Kong. More gas will be used for power generation in the future as China begins developing large gas reserves in the far-flung western regions for which a large power generation market is planned in Shanghai and eastern China.

#### **Forecast growth**

While gas utilisation is limited at present, the government expects a large increase in gas consumption in the future. Demand for natural gas is forecast to grow between three to fourfold to between 60bn cm and 90bn cm by 2010.

Although estimates of future gas demand growth vary, research by various Chinese institutions suggests that about 39% of natural gas demand in 2010 will be for electricity generation. Consumption of gas by industry, petrochemicals and other uses will account for about 41% of demand, while the remaining 20% of natural gas demand will be for residential use.

Gas use in urban areas has strong growth potential following recently launched government initiatives to reduce urban airborne pollution. In Beijing, for example, natural gas has been in use since 1988, mainly for residential use. In 1997, 550,000 customers used 165mn cm. Beijing now plans to expand gas use for heating and for vehicle fuel. Construction was completed last year of four CNG filling stations in Beijing where 300 CNG fuelled buses are in service. Beijing municipal government plans to convert 1,500 of the 9,000 buses in the city to CNG within the next few years.

Gas consumption also is growing in Shanghai where over 2.5mn families receive piped gas supplies exceeding 1.5bn cm a year. Shanghai Gas Co started supplying natural gas last year after previously supplying coal gas and LPG.

Government plans call for other major cities to use gas in the future. Lacking existing gas distribution networks, the investment in establishing piped networks will be huge and will require government support unless end users are to pay for the cost through relatively high connection fees.

Energy analysts believe that natural gas demand for residential use could grow at about 12% to 15% annually for the next 10 to 20 years if government support is provided. Until now, LPG use has grown faster as the distribution of bottled gas has been easier to organise than constructing piped gas distribution networks.

Natural gas use by industry may be more difficult to develop in China as natural gas prices are higher than coal and heavy fuel oil and act as a disincentive to potential users. Industrial use of natural gas consequently is unlikely to grow in urban areas unless government regulations limiting or banning coal and oil use in certain zones forces industry to convert to natural gas as a clean fuel alternative.

In contrast, the use of natural gas for power generation offers a large potential for gas use in the future. Gas-fired generation is likely to grow in urban areas where the government wants to replace dirty coal-fired plants.

#### **Electricity generation**

Gas-fired power generation using gas turbine and combined cycle units offers a more efficient solution to meet China's large peak load electricity demand than coal-fired plants. The size of China's power grid and the pattern of electricity consumption in major urban centres takes on characteristics typical of a more mature economy requiring greater variation in generation technology to meet the evolving modulation of electricity demand.

The use of natural gas to fuel private co-generation and tri-generation plants also is possible if the government permits power generators to sell surplus electricity to their local electricity grid. This is not allowed at present, although some opening of the power generation market is expected eventually.

#### **Guangdong LNG**

Meanwhile, the Guangdong LNG terminal project will provide China with its first opportunity to develop natural gas use for power generation while supplying major cities from a provincial transmission grid. Guangdong LNG terminal project will involve constructing a receiving terminal at Chentou Cape near Shenzhen on the border with Hong Kong and a high pressure transmission pipeline across Guangdong Province. The pipeline will run from Shenzhen to Guangzhou, capital city of Guangdong Province, and continue to the nearby industrial city of Foshan. The pipeline eventually will be extended to Zhuhai near the mouth of the Pearl River.

Plans call for Guangdong LNG import terminal and the gas transmission pipeline to be built in two stages. Phase 1, which is expected to be completed in 2005, will involve the construction of facilities capable of importing 3mn t/y of LNG and a 300-km gas transmission pipeline from Shenzhen to Foshan.

A major customer for the Phase 1 gas supplies will be a planned 3,000 MW combined cycle power plant. In addition, a pipeline spur will be built to Nanya Island in Hong Kong where Hongkong Electric Power Co plans to build a gas-fired power plant that will use about 800,000 t/y eventually.

Phase 2 of the project, due for completion by 2009, is expected to involve expanding the terminal to handle 5mn t/y of LNG, while the high pressure transmission pipeline grid will be extended a further 240 km. A 3,960 MW gas-fired power plant will use some of the additional LNG supplies while five existing power plants will be converted to use gas.

By 2010 the Guangdong gas pipeline will carry 7.7bn cm/y of gas. Some 6.2bn cm will produced from LNG feedstocks while an additional 1.5bn cm will be supplied from the South China Sea. The South China Sea gas will enter the Guangdong pipeline at Zhuhai where a pipeline spur will reach landfall from the existing submarine pipeline supplying gas from the Yacheng 13-1 gas field to China Light & Power Co's Black Point power station in Hong Kong.

China

To promote gas use in Guangdong pipeline spurs are expected to be constructed along the transmission route to provide piped natural gas supplies to a number of important cities. Apart from Shenzhen, Guangzhou and Foshan which lie along the main transmission route, other cities due to receive piped natural gas supplies include Huizhou, Zhaoqing, Jiangmen, Zhongshan and Zhuhai. Small piped LPG schemes already have been installed in a number of cities, mainly supplying factories and residential complexes. Most schemes have been designed to use LPG until piped natural gas supplies become available.

At least three other LNG projects also are currently under planning in China, in Shanghai, Fujian Province and Qingdao in Shandong Province. However, the government appears keener to encourage development of indigenous gas resources than pay for LNG imports.

#### **Pipeline projects**

Among plans to develop domestic gas resources is a scheme to construct northwest China's first large natural gas pipeline in an effort to accelerate economic development in the impoverished region. The 953-km gas pipeline will run from western Qinghai Province east to Lanzhou, capital of Gansu Province, allowing the city's 2mn population to burn clean natural gas rather than coal gas.

Due to be built at a cost of about Yuan 4.4bn by China National Petroleum Corporation (CNPC), the Lanzhou to Qinghai pipeline initially will carry 2bn cm/y of gas, but will be designed with an ultimate transport capacity of 4bn cm/y.

Elsewhere, gas reserves in the Ordos Basin overlapping Ningxia and Gansu Provinces are due to be developed by Shell which will pump the gas through the existing under-utilised gas pipeline to Beijing and possibly the nearby industrial port city of Tianjin. Natural gas in Beijing is already supplied from Gansu and Ningxia Provinces and accounts for 20% of the capital's city gas supplies.

Natural gas use is due to grow in central China with the planned construction of an 800-km gas pipeline scheme from southwest Sichuan Province to Wuhan, capital of Hebei Province in south-central China. This pipeline also will be operated by CNPC.

Other pipeline schemes include an ambitious 4,212-km natural gas pipeline from southern Xinjiang Province's Tarim oil and gas field to Shanghai. The pipeline is expected to cost about \$6.6bn and will be operated by CNPC. Likely to take about 10 years to build, the pipeline will transport gas from large gas fields in the north of the Tarim Basin to industrial and residential customers in Shanghai and other east coast provinces.

'To bring gas from the Tarim Basin to Shanghai CNPC will need to bring 12bn cm to 15bn cm to be worthwhile in the first place and then 20bn cm or more later on,' comments Didier Usclat, Gaz de France (GdF) general representative in China. 'Long distance transmission must be 20bn cm a year or bigger to have an acceptable transmission cost. Currently 20bn cm is 2% of primary energy use in China so it is easy to find a market for the gas. The problem is the market for 20bn cm does not exist unless the government decides to assist. The only market that can accept 20bn cm is power generation, so it depends on the government. In the city consumers are willing to pay for gas but outside cities there is no market for gas unless the government gives an incentive to use gas."

The Tarim–Shanghai pipeline is expected to transport gas long after the Tarim gas reserves are finished. China is expected to use the pipeline to transport gas from central Asia or other nearby gas reserves to Shanghai. Because the Tarim–Shanghai pipeline is a domestic pipeline, the project is likely to be completed quite quickly compared with a transnational gas pipeline project which would be slower as more partners are usually involved.

Plans to transport Tarim gas to Shanghai have caused the proposed Shanghai LNG terminal project to be put on hold as Tarim gas is due to arrive in Shanghai in 2003. However, should any delay occur to the Tarim–Shanghai pipeline then the Shanghai LNG import programme could come back into the running to meet the city's fast growing energy needs.

#### Import schemes

Due to be built near Shanghai to supply the fast-developing east China coastal region, the 3mn t/y LNG import scheme will involve supplying LNG to two power stations and for piped distribution in various cities along the Yangtze River. City governments are keen to use natural gas to reduce environmental pollution problems caused by burning coal. Although gas is more expensive than coal, fitting desulferisation facilities for coal-fired power generation means the cost of coal-fired power generation is nearly the same as using gas.

Two 2,400 MW combined cycle power plants are due to be built – one in Shanghai, the other in neighbouring Zhejiang Province. In addition, gas will be supplied for piped distribution to various cities in east China including Shanghai, Hangzhou, Jiaxing, Ningbo and other cities in Zhejiang Province, as well as Nanjing, Suzhou and Changzhou in Jiangsu Province.

Plans call for the Shanghai LNG import terminal to be completed in 2005, with the power plant construction programme and development of city gas distribution facilities being timed to match the terminal completion schedule. Several city gas companies in Shanghai and neighbouring provinces already are upgrading their gas distribution systems in anticipation of the eventual arrival of natural gas.

Further south, along the coast, a 3mn t/y LNG import scheme for power generation also is planned in Fujian Province where the provincial electricity grid is self sufficient and separate from other provincial and regional power grids. However, government plans to interconnect power grids may mean that Fujian and other grids will not need to be self sufficient in the future and will import electricity from other grids.

Elsewhere, a 3mn t/y LNG import terminal scheme has been prepared for the industrial port city of Qingdao in Shandong Province. The terminal also would supply most of its LNG for power generation, although supplying gas for residential and industrial use is possible in the fast developing surrounding region.

#### **Foreign interest**

Gaz de France (GdF) is one of many foreign companies interested in helping China develop its gas industry. China's gas industry is still in its infancy but could develop substantially in the next decade or two if government backing is given. 'GdF is involved in a lot of engineering business in China, but the laws today prevent foreign companies from investing in gas distribution,' says GdF China general representative Usclat. 'China realises that to speed up gas business they need money, technology and expertise; so they have started to open to foreign investment. But the economics of gas projects are difficult today under present conditions, so the conditions have to change."

'This is a huge market with rapid growth potential. China needs finance, technology and know how. We are signing some consultancy projects as a way to meet and know people. It is necessary to build links with the local authorities. You cannot do that in a few days. Consultancy is not our target but it is a way to contact people. We do not lose money but we do not earn money from consultancy in China.' Currently of all the various types of gas which available including natural gas, methane, coal gas, LPG and others, LPG use is growing the fastest and has enjoyed rapid development, particularly in south and southwest China since 1993 when the government liberalised the LPG market. The three largest LPG consuming provinces are Guangdong, Fujian and Hainan; all in southern China.

#### LPG sales

Previously LPG sales and prices were controlled by the government. Now LPG is controlled by a number of companies. LPG consumption has reached about 12mn t/y, of which about half is imported.

LPG is supplied mostly in bottles. Between 70% to 80% is supplied to residential users for cooking and water heating, while commercial premises, restaurants and hotels use LPG for cooking. LPG also is supplied to industrial customers, although the volume used is limited by the relatively high price of LPG compared with cheaper fuels such as coal and oil.

Since the early 1990s a number of cities in southern China have tried to develop piped LPG gas grids for safety and convenience. Small piped distribution systems supplied with an LPG/air mix have been established, while some apartment blocks receive piped LPG supplies from a nearby LPG tank. The idea is to develop piped LPG networks using LPG or an LPG/air mix until natural gas supplies become available and the networks can be converted to natural gas.

LPG is controlled by petroleum companies and not local government which has a tradition of developing local coal mines, coal gas and power stations on an ad hoc basis. Consequently there still are a large number of small and large coal gas plants in operation.

'Coal gas came before LPG in China. Most piped gas in China today is coal gas or town gas,' Usclat says. 'China has a lot of coal so it started to produce coal gas long ago. The first piped coal gas was supplied in Shanghai by the British in the concessions. Later town governments used to try and get LPG and coal gas supplies. Piped natural gas became available later in the 1980s.'

#### **Coal pollution**

At present, coal accounts for 70% of China's total energy consumption. The proportion of gas in the total energy mix is still very small, although the potential for gas is good if sufficient reasonably priced supplies become available.

'Until a few years ago the government did not recognise the pollution problem, saying they must develop the



The streets of Beijing

economy and that pollution is a rich country's problem,' Usclat comments. 'But now pollution is not acceptable in downtown cities.

'The problem is that it is difficult for natural gas to be competitive in market conditions as gas has to compete with coal which is cheap. There is no fiscal policy to favour natural gas. The residential market can accept natural gas but there is not enough residential demand to boost gas use.'

Although China's plans for gas development include developing large reserves in western China and building pipelines to transmit the gas to the fast developing eastern region, the gas industry will depend on power plant use of gas to create sufficient initial gas demand to ensure a gas pipeline is economically viable to build.

'To bring in long distance gas you must build up a gas market of 20bn cm to 30bn cm which has to be a power plant,' Usclat says. 'A peak load power plant only runs 3,000 to 4,000 hours a year, but a gas pipeline needs baseload demand and coal is more competitive.'

#### **Government backing**

In spite of China's large gas industry potential relatively few foreign gas companies are active in China. GdF is one of the few European gas utilities active in China. Tokyo Gas, Osaka Gas and other Japanese city gas companies have signed various cooperation agreements while Hong Kong & China Gas Co has set up several LPG-based piped gas networks in southern China which the company hopes later to convert to natural gas.

According to Usclat, GdF is interested in turnkey engineering, procurement aa well as construction (EPC) projects. However, in China the local party usually wants to do procurement and construction themselves to keep control of the project while costs, by western standards, are not kept under tight control as yet.

'China has a need for technology and marketing for gas,' Usclat states. 'Now they just think of hot water and cooking. China's main gas use and expertise is fertiliser production and cooking. There is a lot of work to be done developing other gas uses which is not easy.'

While foreign companies see a lot of opportunity to develop gas use in China, gas consumption is unlikely to develop substantially unless government support is given. Legislation favouring gas use in city areas and the removal of subsidies on coal would both help encourage greater gas use.

'The Chinese Government should give the end user a good reason to use gas. Oil products are virtually non-subsidised while coal prices are estimated to be subsidised by about 10%,' Usclat remarks. 'However, coal deliveries in Guangdong and Shanghai are estimated to be arriving at about international market prices.'

'In most cities gas companies buy in gas and sell at a price linked to LPG. The distribution company's margin just pays for the cost. Investment in new equipment is paid for by the government or by new customers who have to pay a connection fee.'



# Energy trends – the next 20 years

Provoked by the new US Government's declaration of an 'energy crisis,' *Fred Thackeray* takes a look at the US and world energy scenarios up to 2020 which are set forth by the US EIA (Energy Information Administration) in its recently published annual report *International Energy Outlook 2001*. The report is presumed to be the basis on which a new US energy policy will be founded when the hype of California's electricity fiasco and higher gasoline prices subsidies.

	- 1	999	2	020
US	10.5	(54%)	16.5	(64%)
Western Europe	6.9	(49.6%)	8.8	(57%)
Japan	5.6	(100%)	5.9	(100%)
China*	1.1	(26%)	7.4	(71%)

Source: Derived from estimates in US EIA's International Energy Outlook 2001

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\* EIA's estimates of China's production and consumption in 2020 imply imports of 7.4 mn b/d. This differs from EIA's estimate of imports in a separate tabulation on oil trade which is 6.7mn b/d as shown in Table 2.

s shown in the accompanying tables, the EIA forecasts are largely an extension of past trends. The most relevant to the US Government's present concerns are the trends illustrated in **Tables 1** and **2**. The EIA's reference case forecast (**Table 1**) expects the US to increase its dependence on imports for its oil supplies to 64% by 2020 against what was already 54% in 1999. **Table 2** shows that North America

Table 1. Dependence on oil imports, reference case, in mn b/d (percentage share in these countries' consumption)

Exports from:		Opec	FSU	Caribbean	Other	Total
Imports into:-	P.Guff	Other				(100%)
1998						
Industrialised						
N America	2.2 (2	0) 3.0 (27.3)	0.0 (0)	24 (218)	2 / (20 0)	11.0
W Europe	4.0 (33.	8) 2.7 (23.0)	26 (22 0)	0.5 (4.2)	3.4 (30.9)	11.0
Japan & Australasia	4.1 (74.	5) 0.9 (16.5)	0.0 (0)	0.0 (0)	2.0 (17.0)	11.0
Total	10,3 (36.	4) 6.6 (23.3)	2.6 (9.3)	2.9 (10.2)	5.9 (20.8)	28.3
Non-Industrialised						
Pacific Rim	4.2 (33.	3) 0.4 (3.2)	01 (0.8)	0.2 (1.6)	77 (61 1)	17.6
China	0.4 (44.	4) 0.0 (0)	0.0 (0)	0.5 (0)	0.0 (0)	12.0
Other	1.3 (22.	0) 1.1 (18.6)	0.1 (1.7)	2 1 (35 6)	1 2 (22 0)	0.9
Total	5.9 (30.	4) 1.5 (7.7)	0.2 (1.0)	23 (11 9)	9.5 (49.0)	10.4
Overall Total	16.2 (34.	0) 8.1 (17.0)	2.8 (5.9)	5.2 (10.9)	15.4 (32.2)	47.7
2020						
Industrialised						
N America	4.7 (26.	1) 4.7 (26.1)	04 (22)	1 3 (22 0)	20/216)	10.0
N Europe	3.7 (25	2) 4.2 (28.6)	4.4 (30.0)	04 (27)	2.9 (21.0)	14.7
Asia	4.8 (81.	3) 0.6 (10.2)	0.2 (3.4)	01 (17)	0.2 (3.5)	5.0
fotal	13.2 (34.)	2) 9.5 (24.6)	5.0 (13.0)	4.8 (12.4)	6.1 (15.8)	38.6
Von-Industrialised						
Pacific Rim	8.2 (40.)	2) 0.7 (3.4)	3.6 (17.6)	0.2 (1.1)	77 (377)	20.4
China	5.3 (79.	1) 0.0 (0)	0.6 (9.0)	0.0 (0)	0.8 (11.9)	67
Other	8.3 (52.	9) 3.6 (22.9)	0.2 (1.3)	2.1 (13.4)	15 (95)	15.7
lotal	21.8 (50.9	9) 4.3 (10.0)	4.4 (10.3)	2.3 (5.4)	10.0 (23.4)	42.8
Overall Total	35.0 (43.4	1) 13.8(17.1)	9.4 (11.6)	7.1 (8.8)	15.4 (19.1)	80.7

Source: Derived from estimates in the US EIA's International Energy Outlook 2001

Table 2. Changing emphasis of oil trade, 1998 and forecast 2020, in mn b/d (percentage share in these countries' imports)

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as a whole (mainly the US but also Canada and Mexico) is expected to draw over 52% of its oil supplies in 2020 from Opec countries, against 47% in 1998.

In one of his recent policy speeches, US President Bush warned of the threat that 'our country will become more reliant on foreign crude oil, putting our national energy security into the hands of foreign nations, some of whom do not share our interests.' This, it seemed, was a development to be prevented by more drilling, including the opening of the Arctic National Wildlife Refuge (ANWR) in Alaska to exploration. Such measures will, of course, increase US indigenous energy supplies; but they can do no more than slow the inexorable growth of US dependence on energy imports.

The trend is part and parcel of a broader trend, illustrated in **Table 2**. This is a forecast increase of the world's inter-regional oil trade to over 80mm b/d by 2020 – tanker owners please note! But does this matter? The concept of energy supply security has often attracted policy makers as a fruitful field for their endeavours. But despite their efforts, world energy inter-dependency has continued to grow. Perhaps this should be welcomed as it imposes a powerful bond ensuring long-term cooperation in lieu of conflict.

#### China leads thirst for oil

A significant new factor will be the growing role of China as an oil importer and a competitor with the US and Western Europe for international oil supplies. The EIA's reference forecast (**Table 1**) expects a seven-fold increase in China's oil imports in the next 20 years to meet over two-thirds of the country's oil demand by 2020. At a predicted 7.4mn b/d, China's oil imports would be virtually equal to those forecast for Western Europe and equivalent to almost half the 16.5mn b/d forecast for the US.

This development in China will form part of the expected overall increase in the share of the world's oil consumption by developing countries, both in Asia and in the rest of the world. This is foreseen on the basis of forecast growth of the developing countries' aggregate real GDP at an average 5.3% annually 1999–2020, or twice the forecast growth of real GDP by 2.6% annually in the industrialised world.

#### Restraining Opec oil dominance

The other principal change in the world's energy pattern anticipated by the EIA is the continuation of the

				_
and the second second	1	999	2020	
Industrialised countries				
Natural gas			and a state of	
North America	26.8	(23.2)	42.0 (27.0)	
W Europe	14.3	(21.6)	26.9 (33.3)	
Japan & Australasia	3.8	(13.6)	5.7 (16.8)	
Total	44.8	(21.4)	74.6 (27.6)	
Oil				
North America	45.8	(39.6)	63.5 (40.8)	
W Europe	28.7	(43.6)	31.8 (39.4)	
Japan & Australasia	13.9	(49.8)	15.6 (45.9)	
Total	88.4	(42.2)	110.9 (41.0)	
Fastern Europe and FSU				
Natural Gas	22.9	(45.3)	38.1 (52.7)	
Oil	10.8	(21.4)	19.8 (27.4)	
Developing countries Natural Gas				
Asia	6.4	(9.0)	23.0 (14.2)	
Total	19.2	(15.8)	55.9 (21.1)	
Oil				
Asia	27.7	(39.1)	61.8 (38.1)	
Total	52.9	(43.4)	113.6 (43.0)	
Total World				
Natural Gas	86.9	(22.8)	168.6 (27.8)	
Oil	152.2	(39.9)	244.4 (40.3)	
Coal	84 8	(22.2)	117.1 (19.3)	
All commercial energy	381.8	(100.0)	607.1 (100.0)	

Source: Derived from estimates in the US EIA's International Energy Outlook 2001

Table 3. Consumption of commercial fuels, in quadrillion BTU (percentage of total commercial fuels)

worldwide rapid growth of natural gas demand. For the world as a whole, this is expected to almost double by 2020. Oil demand over the same period is forecast to increase by 60% and coal demand by 38%.(**Table 2**).

Remarkably, this prospective growth of natural gas when converted to oil equivalence is seen to account for almost half of the expected total increase of 86mn b/d in the world's oil and natural gas production.

No less remarkable is the expectation that, in flat contradiction to the past consensus, non-Opec oil supply is estimated in the EIA's reference case to account still for half of total oil production in 20 years' time. In detailed justification of this expectation, the report mentions all today's principal known prospects for sustained or expanded production.

In the North Sea, it estimates that production – far from being exhausted – could still be as much as much as 5.8mn b/d in 2020. This would comprise 3.1mn b/d in Norway and 2.7mn in the UK, close to this year's historic peak rates. Offshore West Africa, the report predicts that Angola could produce up to 2mn b/d, Nigeria will expand production by 2.5mn b/d to 4.7mn, and 'other West African producers with offshore tracts' will increase their combined output by some 300,000 b/d.

In South America, production in Brazil, currently running at about 1.6mn b/d 'could top' 2.5mn b/d by 2020.

The report does not venture, however, on a specific forecast for the Caspian region, beyond saying that it expects output to reach 2.8mn b/d by 2005 and to increase steadily thereafter. But industry sources close to the scene claim that the region could be equivalent to between one-and-a-half and two North Seas. If that means oil, it indicates up to 12mn b/d. At that level it would be equivalent to about 30% of total Persian Gulf Opec production of 42mn b/d forecast for 2020. The inclusion of such a figure would certainly raise the total forecast for the FSU above the 14.8mn b/d forecast for 2020 in the EIA's reference case, and thus also the total forecast for non-Opec production.

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World

#### energy

and the second se	1999	2020	Increase	
Opec oil	29.3	59.3	30.0	
Non-Opec oil	44.6	60.0	15.4	
Natural gas*	43.2	83.8	40.6	
Total oil and gas	117.1	203.1	86.0	

\*Natural gas converted to oil equivalence on assumption of average 5,500 BTU/b Source: Derived from reference case estimates in the US EIA's International Energy Outlook 2001

#### Table 4. Opec oil versus the rest, in mn b/d and equivalent

#### Oil price scenario

A key factor in the EIA's reference forecasts is its oil price scenario. Its assessment is that 'as Opec production cutbacks are relaxed and non-Opec production increases over the next few years, oil prices are expected to fall back slightly from the 2000 level and then to increase gradually out to 2020,' reaching \$36/b (\$22/b in 1999 money) in that year.

'Non-Opec supply,' it maintains, 'is expected to remain highly competitive.' Under a high oil price scenario, with prices in 1999 money close to \$30/b by 2020, non-Opec production is forecast at 62mn b/d against 60mn b/d in the reference case. Under a low oil price scenario of about \$12/b in 1999 money, non-Opec production is forecast at about 57mn b/d in 2020.

However, the report points out that there are other important factors besides the oil price in determining the prospects for non-Opec production. It therefore also estimates higher and lower growth scenarios for reference case prices taking these other factors into account. For the higher growth it assumes that:

- Undiscovered oil will prove to be 15% greater in the offshore regions of the FSU, Latin America, West Africa and the South China Sea.
- One-third of the world's non-Opec, non-US undiscovered oil will be considered economic to develop during the period to 2020.
- Technology improvements are transferable worldwide.
- A slightly reduced reserves/production ratio of 15 years is used for production estimates.
- On this basis, it estimates that non-Opec production could be as much as 10% higher at 66mn b/d in 2020.

	199	19	202	10
	mn b/d	%	mn b/d	%
Industrialised countries			1	
US	19.5	26.0	25.8	21.6
W Europe	13.9	18.6	15.4	12.9
Japan	5.6	7.5	5.9	4.9
Total	44.2	59.0	55.4	46.3
FSU & E Europe				
FSU	3.7	4.9	7.8	6.5
E Europe	1.5	2.0	1.7	1.4
Developing countries				
China	4.3	5.7	10.4	87
India	1.9	2.5	5.8	4.8
Rest of dev'g Asia	7.1	9.5	13.5	11.3
Total dev'g Asia	13.3	17.7	29.7	24.8
Brazil	2.0	2.7	4.5	3.8
Rest of Central				
& 5 America	2.7	3.6	4.9	4.1
Total Central		2.2		
& S America	4.7	6.3	9.4	7.9
Total dev'g countries	25.5	34.0	54.8	45.8
TOTAL WORLD	74.9	100	119.6	100

Source: Derived from estimates in the US EIA's International Energy Outlook 2001

Table 5: Forecast changes in competition for the world's oil, consumption in mn b/d and percentage of total

#### Nuclear trend

One highly important feature of the US Government's new energy thinking which is not an extension of past trends, is its encouragement for nuclear power. If one assumes that, somehow, means will be developed to handle nuclear waste, nuclear power offers not only an environmentally acceptable technology but also enhanced security of national energy supply. A similar renewal of interest in the potential for nuclear power has recently begun to appear in the energy policy thinking of the Commission of the European Union. In Asia also there is a surge of nuclear power ventures.

The EIA's report, however, relying on past trends and perceptions, anticipates that nuclear energy production will decline in both the US and Western Europe. For the world as a whole, it foresees only a small increase of about 8% to 2,582bn kWh by 2020.

#### A different picture

The EIA recognises, however, that despite its detailed analysis 'the risk of near-term political and policy discontinuities could lead to oil market behaviour quite different from that portrayed in the projections.' It seems reasonable to add to this warning that in the longterm there exists possibilities of even greater discontinuities. In as long a period as 20 years, it is virtually certain that developments in energy supply and demand will differ radically from what can be predicted today.

Who would have forecast in 1980, for example, the impact of CCGT (combined cycle gas turbine) technology on the worldwide growth of natural gas demand for electricity generation? Who would have predicted the big increases in production potential made possible by extraordinary developments in the industry's ability to explore and produce in hitherto inaccessible ocean depths? Who could then have anticipated the collapse of the Soviet Union with its profound effects on the consumption, production and export potential of the FSU's oil and natural gas industries?

Technological progress and further political upheavals will undoubtedly deflect energy supply and demand from past trends. On the technology front some of these prospects are already emerging as industry continues to push research and development in new directions which will yield profits as well as meeting environmental objectives. Such, for instance, will be the fast-emerging technologies to convert natural gas to liquid fuels; and beyond that the fuel cell revolution. presents

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### Helping plan the oil industry's future

Over recent years, the oil and gas industry has focused heavily on cost reduction. But now there is an emerging consensus that the priority for the industry is expansion – growth is back on the boardroom agenda. Chris Skrebowski recently met Sean Tipping, Vice President of Celerant Consulting's Energy Sector team, to hear his views on the future for the industry.

ean Tipping started by explaining what Celerant Consulting does in the energy sector. 'We see companies in the energy industry facing a number of issues - consolidation, asset optimisation, post-merger integration; the impact of the Internet; minimising operational costs; and sustaining revenue growth through "Old Economy" businesses.' He claims rebranding of the company (previously called Cambridge Management Consulting, CMC) will enable Celerant Consulting to better communicate its strength as an operational strategy and implementation specialist with deep expertise in the energy sector, noting that those companies that master implementation of change successfully will 'thrive in today's environment.

The consultancy was started up 14 years ago, moving into the energy sector in 1994/1995. Consulting in the energy sector now accounts for over one-third of Celerant Consulting's business globally.

#### Challenges for managers

The financial community is continually expecting oil companies to turn in impressive profits and stock market expectations continue to escalate. Costcutting to maintain profits is no longer enough. What the markets now want to see is the organic growth that oil companies have been promising.

Tipping believes that such demands are placing immense pressure on existing management structures. Add to this the 'brain drain' the industry has experienced over the last few years and the need to constantly cut costs,

and it's clear to see why managers are faced with an unprecedented set of challenges.

He is convinced that the oil manager of the twenty-first century will need to master cross-functional working skills. To achieve this, a new skill-set is required - the ability to share best practices and other forms of knowledge, and to empower individuals to interpret strategy and make sense of it in their day-to-day work. It calls for leaders who can inspire teams - not managers who merely control operations.

The problem, however, lies not just in a shortage of the appropriate skills there's also a shortage of managers. In the 1990s, the oil industry lost a whole generation of recruits who rejected its old-fashioned, environmentally questionable image in favour of careers in the more 'dynamic' media and hightechnology sectors.

Those managers that are still in the industry face a growing volume of increasingly complex data from which they have to extract management information, enabling them to make the decisions to ensure projects are brought in on time and to budget.

#### The solution

According to Tipping, tackling the primary problem - the lack of management to actually apply knowledge and experience across a company - will do much to take the industry forward. The key issue to address is how to get 'functional' people to work across functional barriers. Previously, many companies had up to five levels of management, so a first imperative was to put into place robust and effective communications to provide a focus on specific tasks and develop a unified team approach to issues. Today, the concept has been taken one step further, with self-managed teams in place in the North Sea, for example, operating as part of the late-life operations of many facilities. Today, smaller teams with increased responsibility 'self-manage' themselves to meet the same goals and targets as larger groups had done previously.

Similar moves are being taken in the Netherlands, where major cost issues are driving the need for guick and effective implementation. One such project was for Shell's operations in The Netherlands (on and offshore), where notable gains have been achieved by spreading management expertise and applying key learnings from the North Sea to the local working environment. Planning for operations and developments for one major have moved from seeing 80% of the activity completed onshore with 20% offshore to a situation where 20% of the planning is completed onshore, the remainder 'at the coal face.'

#### Is technology the answer?

Significant investments in IT infrastructure have been made by oil companies in recent years, with the aim of delivering major performance improvement. The current reality is managers with more data and more issues to deal with, in less time, than before. So, increasingly managers are looking to technology to help them determine right time and place data.

It is widely recognised that there are still opportunities to release further value in mature fields (such as the North Sea) by focusing on cost management and 'barrel losses,' which can in turn release capital for new developments. Benchmarking has clearly shown the large size of the potential prize. In management terms, however, this gives two contrary agendas - managing decline and end of life fields, while developing additional capacity from new projects.

#### Effective implementation

Tipping believes the steps to increase a firm's adaptability and to produce industry-leading performance in the near term can be summarised as follows:

- emulate external benchmarks by studying success stories in other industries;
- motivate people to share and adopt best practices; and
- experiment at scale for rapid organisational learning - in essence,

continued on p32...

Kazakhstan E&P

# North Buzachi – meeting the challenge

Mojgan Djamarani takes a detailed look at the North Buzachi project in Kazakhstan which exemplifies many of the challenges and possible rewards associated with oil and gas exploration and production in that part of the world.

The North Buzachi oil field is located onshore the Caspian and is one of seven fields discovered on the Buzachi Peninsula. It lies in the Karazhanbas-Karakuduk structuraltectonic zone that extends in a northwesterly direction across the central part of the peninsula.

The Buzachi Peninsula is an area of very low lying and marshy terrain that is actively subsiding as a consequence of the rising level of the Caspian Sea. However, it is highly prospective for the discovery of new oil and gas fields in clinal, anti-clinal and combination traps. Oil was first discovered here in a shallow Jurassic and Cretaceous reservoir on the Buzachi high in 1974 and in 1975 at North Buzachi where the reservoir is less than 500 metres deep. Seismic surveys indicated a highly segregated reservoir structure that could make extraction more difficult than is the norm and which may also explain why the field was not developed during the Soviet era. Having delineated 27 wells, the field was put on hold.

#### Reserves and production history

To date, approximately 6.8bn barrels of oil and 1.1tn cf of gas in place have been discovered in five fields in the area. Four of the fields are currently producing – Kalamkas at 75,000 b/d; Karazhanbas at 18,000 b/d; Arman at 5,000 b/d; and North Buzachi at 4,000 b/d, expected to rise to 7,000 b/d by year end now that the Phase II appraisal programme has been completed (June 2001). (See **Table 1.**)

The North Buzachi and Karazhanbas fields have the most viscous (195–300 cp at 20°C) and the heaviest (18°–21° API) oil. The quality of the oil improves significantly in the deeper Jurassic reservoirs at the Kalamkas and Arman fields where gravity is 25°-29°API and viscosity is around 30 cp at 20°C. However, in both cases the sulfur content can be up to 2% and the oil contains concentrations of heavy metals.

KMG has a 1.75% interest in the CPC pipeline to Novorossiysk which is how the Arman oil is being exported. As for the Kalamakas and Karazhanbas fields, it was intended that they would supply the Mangystau refinery once it has been completed. However, work on the refinery has halted due to lack of finances. It is likely that the oil is currently being exported through the Soviet era Kalmkas–Karazhanbas–Aktau (530-mm diameter) pipeline which was commissioned in 1979.

#### **Field operator**

The North Buzachi field employs about 1,200 oil workers, mainly local Kazakhs with little expatriot involvement. Earlier predictions had given rise to more optimistic production levels by this stage. However, Texaco became operator of the North Buzachi field when it decided to acquire a 65% stake from Nimir Petroleum in September 1998 (with Nimir retaining 35%). It plans to invest \$800mn in the field.

So far more than \$150mn has been spent in assessing the field. In 1999, Texaco spent \$66.6mn on environmental impact assessment and drilling of four appraisal wells and in 2000 a further \$85mn was spent on 2D and 3D seismic survey of the field and the Phase II appraisal programme that involved drilling 30 wells. The Phase II programme was completed in June and the company expects to make a decision on whether to go ahead with the commercial development of the field within a year.

Texaco now has a better idea of the reservoir conditions and is now in the concept selection phase. If it decides that the field can be made commercially viable, production could reach a plateau of 100,000 b/d.

#### **Flooding risk**

A major concern with the development of the North Buzachi field must be the rising level of the Caspian Sea. Until 1977 the Caspian Sea level had fallen dramatically but, since then, such a sudden and dramatic reversal has taken place that scientists are at a loss to explain it.

From 1984–1994 the sea rose by more

Field	Operator (mn barrels)	Oil in place (bn cf) (mn barrels)	Gas in place oil reserves (bn cf)	Recoverable gas reserves	Recoverable
Kalamkas	Central Asia Pacific	3,500	1,100	1,200	741
Karazhanbas	Nations Energy	1,600	67	686	28
North Buzachi	Texaco	1,500	35	600	30
Arman	Kerr-McGee	142	35	44	17
Zhalgiztobe	Modulnay Technology	73	-	22	
North Karazhanbas 1& 2	Fiztech	50	2	18	1.7

Table 1: Oil and gas reserves in Buzachi fields

Kazakhstan E&P

than 2.5 metres and is continuing to rise at a rate of 15 cm/y. It is expected to rise a further 5 metres by the end of the current decade. The gradual flooding has precipitated abrasive erosion of sea shelves, endangering oil infrastructure and the rising seawater threatens to flood oil wells along the coast and cause spills directly into the sea.

The worst flooding of the coastline is occurring in Kazakhstan where some 20,000 sq km of land has disappeared beneath the water. Some 1,400 wells abandoned by the Soviets have been inundated. The implications for foreign operators in the area are considerable, not just in terms of exploration and development of oil fields and transportation of crude across the Caspian but also the threat to the environment of the sea as fields are flooded and oil is washed into the sea.

#### Exporting the crude

According to Azeri press reports last September, Texaco has submitted proposals to the Azeri Government for transport of North Buzachi crude across Azerbaijan. The proposal calls for tankering specified volumes of oil across the Caspian and then onto Batumi port by rail. The initial transit volumes at 500,000 t/y are small but are expected to rise to 5mn t/y once the field enters full production.

The northern area of the Caspian Sea is shallow with depths of only 4–6 metres and it would be very difficult to offload crude onto tankers. Small quantities of crude are currently being transported across the Caspian on barges, but it is not a viable option for transporting large quantities of crude.

Shipping oil by pipeline is another option for North Buzachi crude. The field is well placed to link up with the two existing pipelines that carry oil from western Kazakhstan to refineries and export outlets in Russia, or with the Caspian Pipeline Consortium's pipeline.

Texaco, however, is considering the 1mn b/d Baku-Tiblisi-Ceyhan route as an alternative export outlet for North Buzachi crude. Whether construction of the pipeline will begin this summer is still very uncertain. There would need to be sufficient volumes of crude to justify the huge investment required for its construction. The Kazakhstan Government has not yet formally committed itself to the Ceyhan route, preferring to keep its options open. In 2000, Kazakhstan had net exports of 473,000 b/d of crude and condensate. much of which was shipped via the

210,000 b/d Atyrau–Saransk–Samara pipeline through Russia. The rest was shipped by barge across the Caspian or via rail to Russia and China.

According to an article written by Alexander Akimov of the Oriental Studies Institute in Moscow, during 2000 some 12mn tonnes of Kazakh oil was transported via Russia, including 1mn tonnes that went to Finland and 1.3mn tonnes to countries neighbouring Russia.

Meanwhile, the export outlets for Kazakh oil are expanded by:

- the completion of the CPC's 990mile long Tengiz–Novorossiysk pipeline with an initial capacity of 564,000 b/d;
- the \$100mn expansion of the Tengiz-Aktau pipeline to 160,000 b/d;
- Russia's decision to increase Kazakhstan's crude quota that could go through its pipelines;
- opening of the Chechniya bypass; and
- the renovated Khasuri–Batumi pipeline to the Black Sea.

In the near future, at least, Kazakhstan's crude oil contributions to the Baku–Ceyhan pipeline will be limited. This may call into question the commercial viability of the pipeline.

The differences in the quality of the crude must also be of consideration for Texaco as the North Buzachi crude is highly viscous.

So far, Texaco is the only oil major in Kazakhstan that does not have an export quota in the CPC line. It is not yet apparent how the company plans to lift its share of output from the Karachaganak field where it holds 20% of the shares. However, if merger plans between Texaco and Chevron gains the consent of the US anti-trust authorities in October of this year, Texaco will gain access to the CPC pipeline not only for its Karachaganak guota but also for North Buzachi. The second phase of the Tengiz-Novorossiysk pipeline will see capacity expand to 1.34mn b/d.

#### Meeting the challenge

The prize for getting North Buzachi right is an onshore field with a high plateau production level. However, in order to attain this target, Texaco will not only need to overcome the technical challenges posed by the reservoir geology and potential flooding by the Caspian but also the political hurdles both in the US and internationally in order to seek secure export routes to markets to the East and West.

#### ... continued from p30

acting your way into a new and potentially better way of working.

But he notes that the only way these steps can be achieved is through effective leadership.

#### Role of consultants

The main role of consultants, Tipping believes, is helping oil companies to achieve sustainable growth – both topline and bottom-line. In the past, consultants were hired mainly for their knowledge of the industry.

However, knowing about the best practices in other companies is not the same as understanding how to apply them in your own company on a day-today basis. Similarly, historic performance data fails to link what the people in your company do best from day-to-day with the results they achieve.

#### Implementation

'Many companies have failed to successfully embrace change,' argues Tipping. 'The real challenge is taking the first step on the road to change and second, and most crucially, successfully implementing change.' And this, he explains, is why there has been widespread experience of the failure of many companies to embrace change, usually falling at the critical implementation hurdle.

Tipping also points out that, historically, there has been the 'boxes' problem – the consultants delivered the plan, the senior management bought into the plan and possibly modified it, before passing it onto line managers to implement. The new role for consultants is in managing outcomes, and managing teams of people to use their own skills and knowledge to achieve those outcomes. The key is to build practical knowledge among people so they can physically deliver results.

In managing outcomes, consultants should not be required or encouraged to try and develop a solution that is 99% 'correct'. Rather they should create one that is 65% complete and iteratively work out the rest with the team as the implementation progresses.

Specifically, using this approach to measure contractors can add to improvements achieved. Today's performance-based contracts tend to deliver the performance contracted, but no information on important issues such as where and how better results could have been achieved. 'Where people in the offshore industry have been trained to 'do' activities related to drilling and producing, now they need to be trained to deliver results through those activities,' Tipping concluded.

### Prospects for the Bush energy plan

The Bush energy plan dealing with the future supply of oil and natural gas is a very fair representation of the status quo which is that most of the easily available oil and gas fields of the US have been developed to production. It stresses the need to find new reserves to meet ever-increasing demand, especially for natural gas. Judith Gurney reports.

he energy plan calls attention to the fact that Federal Government owns almost one-third of the country's land mass and all of its territorial offshore waters (other than those under coastal states' jurisdiction) and that most of the presumed undiscovered oil and gas reserves are believed to lie in these federal holdings. At the present time, the oil and gas industry is forbidden access to many of these presumed reserves. However, Bush's energy plan calls for the removal or abatement of these barriers to access, stressing that technological advances have greatly reduced damage to the environment during exploration and production in sensitive areas.

The defection of Vermont Republican Senator James Jeffords, resulting in the Administration's loss of control in the Senate, raises the question of what the government can do to increase access to off-limit federal lands and waters without the support of Congress. Democrats insist that barriers to access are necessary to protect the environment and have promised to oppose any legislation aimed at removing these (see Petroleum Review, July 2001 p3).

#### **Offshore prospects**

In the late 1990s, the US Minerals Management Service (MMS), the US Department of the Interior division that oversees the extraction of minerals from federal offshore waters, published an estimate of 45.6bn barrels of undiscovered oil in the federally administered Outer Continental Shelf (OCS).

More than 15bn of these undiscovered reserves are off limits to the oil industry as a result of moratoria which Congress regularly includes as addenda to the annual fiscal spending legislation. These reserves include 10.7bn barrels off the Pacific Coast, 2.3bn barrels off the Atlantic Coast and well upwards of 2bn barrels in the eastern part of the Gulf of Mexico off the coast of Florida. (Previous US Presidents have decreed executive moratoria that President Bush can rescind. However, he cannot block Congressional moratoria except by vetoing annual fiscal legislation in its entirety.)

With regard to natural gas, the MMS estimates that there are 268tn cf of undiscovered gas reserves in the federal OCS. But, according to the Bush energy plan, whose estimates are slightly higher than those of the MMS, 76tn cf of these reserves are under Congressional moratoria – 31tn cf off the Atlantic coast, 21tn cf off the Pacific coast and 24tn cf off the Florida coast.

Although the energy plan calls on executive departments to 're-examine' the legal and policy regimes of moratoria, and the MMS is said to be investigating the extent of offshore gas resources affected by moratoria, Bush has stated that he will not press Congress to rescind the moratoria affecting federal waters off the Pacific and Atlantic coasts.

The situation regarding the Florida offshore is less clear. The Governor of Florida, Jeb Bush, who is also the President's brother, is pushing the Administration not only to observe the moratoria but also to cancel the proposed MMS offshore Lease Sale 181, scheduled for December. This sale involves blocks believed to hold substantial gas reserves in the Gulf of Mexico's central region that intrudes slightly alongside the Florida coast (although at a distance of 100 miles from shore). Although the House of Representatives has passed a bill to block this sale, the Administration has announced its intention to go ahead with it. Bush has compromised by reducing the acreage offered from 6mn acres to 1.5mn acres. The fate of this sale, along with that of the longstanding, but unresolved, Destin Dome project located in the same area, is uncertain.

There are two offshore areas believed to contain new oil and gas reserves where moratoria do not apply and are unlikely to happen - the central and western Gulf of Mexico and the Alaskan OCS. The MMS has given a surprisingly low estimate of 8.3bn barrels for undiscovered oil reserves for this part of the Gulf, even including prospects in deep and ultra-deep waters. Its estimate of 95.7tn cf for natural gas, by contrast, is high, especially in view of the difficulties involved in its extraction. Much of this Gulf of Mexico gas is believed to be located in very deep reservoirs in relatively shallow waters and will be costly to develop. Furthermore, gas fields found in the generally oil-prone deep waters of the Gulf may not be developed at all unless they are large or lie reasonably close to existing pipeline systems which make their production economically feasible.

The substantial amount of undiscovered reserves which the MMS believes to lie offshore Alaska – 125.9tn cf – face development costs of such magnitude the MMS estimates that only 1.1tn cf would be produced at a gas price level of \$3.52/mn BTU.

#### **Onshore prospects**

The prospects for exploration and production of new oil from onshore locations are poor following the loss of Senator Jeffords from the Republican ranks. The US Geological Survey (USGS) has estimated that there are 30.25bn barrels of undiscovered oil, with more than 30% of these reserves believed to lie in Alaska, most probably in the 1.5 million-acre coastal plain of the Alaskan National Wildlife Refuge (ANWR). Lack of a majority in the Senate almost certainly means that this Administration will not be able to secure the legislation necessary to allow exploration in the

#### review



US federal and state lands

ANWR plain and Bush has indicated that he will not seek this.

Another source of onshore oil in Alaska is the National Petroleum Reserve Alaska (NPR-A) where there was a limited sale of leases in 1999, with a second limited lease sale due in June 2002. There has been a modest discovery in the leased blocks and it may be possible for the Bush Administration to arrange a more wide-ranging lease sale here in the future, without turning to Congress.

An important factor regarding oil reserves in both ANWR and NPR-A is that development needs to begin relatively soon. The steady decline in North Slope oil output portends the closing and disassembly of the 1,280-km Trans-Alaskan Pipeline System which is required by law when throughput falls below a certain level. Once this happens, there would be no means of bringing any of this oil to the Lower 48 States.

The rest of the USGS estimate of new oil is fairly evenly divided among the several regions where oil is currently being produced and where, presumably, there will be no major problems for exploration and production except in the case of unusual local environmental concerns. With regard to new natural gas reserves, the USGS estimates that there are some 258.7tn cf of untapped gas reserves onshore. Almost two-thirds of these reserves are said to lie in the Gulf Coast, onshore and in state-controlled offshore waters, and in Alaska.

With regard to Alaskan gas, although there is little hope for the extraction of untapped gas in the ANWR plain, there are an estimated 32tn cf to 36tn cf of available proven gas reserves in the Alaskan North Slope. Companies have been reluctant to commit huge capital investments for their development when gas prices were low, but with the recent, hopefully reasonably stable, rise in gas prices they consider that there will be an economic basis for the development of this gas potential, and Washington politicians of both persuasions generally support this view.

Consideration has been given to the export of produced Alaskan gas as LNG or as products of a gas-to-liquids plant, but the most likely option is a pipeline – possibly one that goes through Canada and captures the 173tn cf of estimated gas resources in Canada's Mackenzie Delta/Beaufort Sea area. North Slope oil producers have commissioned a \$75-mn viability study of a gas pipeline, but given the many regulatory and environmental hurdles to be overcome it would be unrealistic to expect the completion of an Alaska gas pipeline before 2006 at the very earliest.

The area which holds the most promise for exploration and production of new gas without Congressional support is the area around the Rocky Mountains. The energy plan estimates that this region contains a gas potential of 342tn cf, of which 137tn cf, some 40%, are currently either closed to exploration (29tn cf) or open to development under restrictive provisions (108tn cf).

#### Rocky Mountain prospects

As the above map shows, the Federal Government owns a large proportion of the lands in the three Rocky Mountain states – Wyoming, Montana, and Colorado – which contain abundant mineral resources, including coal, gas and, to a lesser extent, oil. The Bureau of Land Management, an agency of the Department of the Interior, and the National Forest Service, an agency of the Department of Agriculture, administer these federal public lands, sharing practical management with state and local officials who oversee their own public holdings. As a property owner, the executive branch of the Federal Government can take measures to expand exploration and production of new gas in these Rocky Mountain states without recourse to Congress.

Very little of the federally owned land in the Rocky Mountains consists of national parks or national monuments where access for oil and gas exploration and production is forbidden and likely to continue. Most consists of desert or high mountain plains that are unsuited for intensive agriculture or grazing and have remained as Federal Government property for this reason.

The energy plan calls on federal agencies to streamline the process whereby they issue permits for energyrelated projects and to consider the energy impact of new regulations. An executive order issued prior to the publication of the plan instructed these agencies to coordinate federal, state and local actions necessary for energyrelated projects and approvals. The exact manner in which agency representatives will exercise their authority to follow these instructions is not clear, and success will undoubtedly vary in terms of the local conditions and the people involved.

A good example of what the government agencies are able to do without Congressional approval can be seen in Wyoming, a sparsely populated state which is the nation's top producer of coal and the fifth largest producer of natural gas. Wyoming's Powder River Basin, which has some deposits of oil and conventional gas, contains the largest coal deposit in the country, with an estimated 1.3 tn short tons of coal in place. It is rapidly expanding as a major producer of coalbed methane, a source of natural gas that now accounts for 6% of US gas supply.

The Powder River Basin shallow coal beds lend themselves particularly well to the extraction of coalbed methane and an operator often can drill a well in one day at a cost of about \$50,000 and have it in production within a week. But a lot of wells are needed to extract a substantial amount of methane, and a continuous removal of water from fracture system of the coal bed is necessary in order to reduce pressure in the area surrounding a well and to free methane from its attachment to coal surfaces. Although water disposal from coalbed methane extraction could raise environmental concerns, it rarely does in the arid Powder River area.

The local Wyoming agency of the Bureau of Land Management has been restraining Powder River Basin coalbed methane production for several years

#### Federal Government land ownership

he Federal Government acquired substantial acreage in the late 1700s when the original 13 states surrendered their claims to unsettled lands beyond their western boundaries. In 1803, it vastly increased its holdings as a result of the Louisiana Purchase whereby Napoleon sold close to 2.2mn sq km of territory stretching from the Gulf of Mexico up to what is now the Canadian border, including all of the lands from the eastern foothills of the Rocky Mountains to the Mississippi. It then set up a federally administered national domain to administer its territories.

Some federal lands in what are now the Rocky Mountain states went private after the Homestead Act of 1862 offered 160 acres of public land free of charge, except for a small filing fee, to

by refusing to accept applications for permission to drill new wells on the grounds that a new Environment Impact Statement was needed. The Federal Government is expected to order this agency – if it has not already done so – to complete its environment report promptly and to begin processing some 50,000 pending new drilling permits.

A similar situation of restraint by agency officials exists in the Wyoming Green River Basin where conventional gas is produced from relatively deep, over-pressured reservoirs. The industry is eager to increase output in this area, and some larger companies are moving into an area that historically has been dominated by small companies.

Constraints on gas production in federal lands have resulted in increased output from wells on private holdings, which are subject to fewer regulations. In some cases, these wells are believed to be sucking gas out from under federal lands. Wells are on private property and often involve complex ownership situations as surface land rights and rights to sub-surface minerals have been severed in most states that have large mining or oil and gas production. Landowners have tended to sell surface rights and mineral rights separately, so that there may be numerous mineral-rights owners for every deed to a property's surface. Owners of mineral rights often lease these to oil and gas companies in exchange for royalties of production and the latter often face few restrictions on their operations. In Colorado, for instance, the law allows companies to drill a well despite objections by the owners of surface rights if they post a

anyone who built a home – often a log cabin – and lived on the land and cultivated it for five years. But many of those who obtained homesteads this way failed to fulfill these terms. Raising crops was impossible on most of the Rocky Mountain foothills which consist of arid, often saline, high mountain plains, and 160 acres was not enough to sustain a herd as 40 acres were needed to provided sufficient grazing for a single cow or steer. Many homesteads in the Rocky Mountains reverted to the Federal Government ownership by default.

Land in the vicinity of railroad lines, however, has remained privately owned as the government gave the railroad companies a 16-mile corridor to build their lines which they subsequently sold off.

bond against possible surface damage.

Another area where the Federal Government can act to increase exploration and production without recourse to Congress is with regard to so-called stipulations on oil and gas activities that prohibit surface operations. There are stipulations in winter in some areas, for instance, concerned with the movement of big game, others in spring regarding the breeding of raptors, others in summer regarding the strutting area of sage grouse, and others in the autumn regarding recreational hunting. Local land managers can relax these stipulations and issue waivers to let companies continue and start operations. Many stipulations are very broad and generalised, and there are lots of ways that the Administration can change their form and application if it gets the right people in place locally. Federal land managers and state officials also have at least some latitude to waive, or more likely modify, restrictions to allow for the construction of roads to proposed drilling sites and of pipelines to move production out.

But the government will not find it easy to increase Rocky Mountain production. This is an area containing two very important national parks – Yellowstone and Grand Teton – and environmentalists are very concerned with issues regarding the ecosystems of these parks and the nearby corridors for big-game migrations. The question of access to public lands is viewed differently not only from state to state but also from site to site, and site local conditions in the long run will determine the extent to which exploration and production will be permitted.

# Reducing product used during meter proving

The following is a report on a recent IP-funded Technical

Development Project conducted by *E J Lowres* to establish the effects of reducing the amount of product used during the proving of loading gantry meters.\*

The Institute of Petroleum's Dynamic Measurement Committee set up a working group in April 2000 to review the IP's Petroleum Measurement Paper Number 4 – Code of Practice for the Proving of Loading Gantry Meters – to take account of the use of meters with electronic heads.

During the review it was identified that the amount of product normally specified for proving runs had been determined by the limitations of mechanical meters. As electronic meters have a higher resolution than mechanical meters heads it was anticipated that the amount of product used for proving could be substantially reduced when proving such meters.

Meter proving is a significant and recurring maintenance cost for refineries and oil distribution terminals. The effect of reducing the quantity of product used when proving (typically 2,500 litres per proving run), would not only reduce the time taken to implement the meter proving operation but would reduce the amount of product that has to be returned to storage or re-refined. The combined effect would have a significant impact on the overall meter proving process and would undoubtedly provide reduced costs for the oil industry.

#### **Initial field tests**

Initial field tests were carried out at an oil company's main line terminal in the Midlands in November 2000. Three tests were carried out as follows:

Normal proving at two flowrates, 2,100 and 450 litres per minute (I/min). The product quantity used during each proving run at these flowrates was 2,500 and 1,000 litres respectively.

- The same flowrates using 1,000 and 500 litres.
- The same flowrates using 500 and 250 litres. A summary of the results is shown (bottom left).

The consistency of these results proved significantly encouraging, enabling the working group to recommend that the field tests be expanded to fully validate a reduced volume proving procedure for meters with electronic heads. In particular it was proposed to review the limit of reducing the product quantity in different metering situations.

It was agreed to expand the field tests to include:

- different makes of positive displacement (PD) meter under test;
- different types of meter (PD and turbine);
- different types of electronic meter head; and
- different makes of reference meter.

#### **Additional tests**

Tests have now been conducted at the following sites:

The tests covered a combination of dif-

ferent meters under test (MUT), reference meters, products being measured and electronic meter heads.

All tests were supervised to ensure that similar standards and care were taken in producing the results. The tests were implemented to industry standards as applicable to the site where the tests were carried out; all implementation standards were equal to or better than PMP 4.

All the tests were carried out using valid and traceable equipment provided by the participating companies.

#### Test data

The collation of the prove data is shown in Table 1. In order to make this comparison the data has been shown as if all meters had been calibrated to strike (ie adjusted to zero error) on the first conventional prove. The first set of points (1st quantity reduction, eg 1,000 litres at high flowrate) shows the error difference with the nominal measured quantity reduced by 50%. The second set of points (2nd quantity reduction, eq 500 litres at high flowrate) shows the error difference with a further 50% reduction in the measured product. The last set of points (final prove) shows the error difference with a con-

Date	Location	Test company	
30/1/01	Shell Buncefield	SGS	
15/1/01	BP Hamble	Avery Hardoll	
27/2/01	Esso Avonmouth	Avery Hardoll	
26/2/01	Texaco Kingsbury	Sysco-FMA	

ventional measured quantity of product. This last set of points indicates the repeatability of the meter and test equipment.

For clarity two charts are shown in **Figure 1** and **Figure 2** – the first showing results at the higher flowrate and the

Flowrate (I/min)	Average length of run (litres)	Pre-calibration error (%)	Post-calibration error (%)	Repeatability (%)
2,100	2,500	-0.005	-0.005	0.004
2,100	1,025	-0.006	-0.005	0.016
2,100	525	-0.005	-0.005	0.001

Identifier	Location (bay/ meter number)	Meter type and Electronic Head	Reference Meter	Product	Flowrate established (approx seconds)
B16,4	Shell Buncefield 16/4	Smiths 4" PD + SpectraTek	Avery Hardoll	Kerosine	25–30
B16,5	Shell Buncefield 16/5	Smiths 4" PD + SpectraTek	Avery Hardoll	Ultra low sulfur diesel	25–30
B06,1	Shell Buncefield 06/1	Smiths 4" PD + SpectraTek	Avery Hardoll	Unleaded gasoline 95	25–30
H06,2	BP Hamble 06/2	Danials 3" Turbine + Accuload II	Avery Hardoll	Unleaded gasoline 95 Octane	25
H06,3	BP Hamble 06/3	Smiths 4" PD + Accuload II	Avery Hardoll	Unleaded gasoline 95 Octane	10–15
A06,2	Esso Avonmouth 06/2	Avery Hardoll 4"PD + Loadmaster	Avery Hardoll	Gas oil	Followed manual valve
K04,2	Texaco Kingsbury 04/2	Brooks 3" Turbine + Accuload II	Smiths	Kerosine	5–10
K03,1	Texaco Kingsbury 03/1	Avery Hardoll 4"PD + Accuload II	Smiths	Ultra low sulfur diesel	20

 Table 1: Identification of the meters in Figures 1 and 2

second showing the lower flowrate. The identification of the meters is given in **Table 1**.

#### **High flowrate**

At the higher flowrate (**Figure 1**) the reduction in product quantity introduces a noticeable scatter in the results although some of the tests conducted produced very satisfactory results.

The main variable factor that is likely to affect the results is the speed at which the flowrate is established. It should be explained that the flow to start and stop is controlled by the operation of a manual valve on the meter prover's test rig (reference meter). However, it was observed that the flowrate did not follow the profile of the opening of the flow valve – in most cases the flow lagged by several seconds and in several instances this lag was as much as 30 seconds.

Even when the full flow quantity is used and the duration of the test lasts about a minute this means that up to half the test is performed at the wrong flowrate. Whilst there is not conclusive proof that it is this effect that is causing the scatter in the results recorded at the lower product quantities this is considered to be the most likely reason for the observed scatter.

#### Low flowrate

With the exception of the turbine meter, the results at the low flowrate





### Technology meter proving

(Figure 2) are much more consistent at the lower product quantities. Since the duration of the test is around 2 minutes (quantity 500 litres and 1 minute (quantity 250 litres)) the establishment of the flowrate, usually within 15 seconds, did not have such an adverse affect.

The results experienced with the turbine meter may demonstrate that there is some other instability at the lower flowrates and it would require further work to establish the nature of this problem.

#### **Establishing flowrate**

It was found in most of the test cases that the flowrate established in the test set-up lagged some way behind the opening of the flow control valve on the reference meter test rig. It is suspected that the reason for this lag is due to the characteristic of the pilot operated loading valve that normally controls the flow during the automated loading of the road tankers.

Most of the systems tested had a diaphragm operated loading valve. This was initially set fully open by demanding a large volume to be loaded via the automation system. When full flowrate is established the test technician shuts off the flow using the manually operated reference meter valve. During this period of no flow, it is suspected that the automated loading valve starts to shut, this action being caused by the spring that operated above the diaphragm. It is not a function of the automation system. When flow is reestablished (the manual valve is opened) the loading valve starts to open again. However, the rate at which the valve opens is set by a needle valve in the hydraulic pilot system. Since there are no inter-site set-up procedures for the valve opening time the opening speed is highly variable, even on a given site.

The results obtained do not indicate that the different products or different reference meters had any effect on the results obtained.

#### Conclusions

The scatter of the results obtained at both high and low flow makes it difficult to recommend that the product quantities for meter proving be changed. The variable rate at which flowrate is established is the most likely cause of the test error that was observed and in some cases this was so severe that it is possible that it affects the proving results carried out at the normal flow quantities.

If progress is to be made in reducing the product quantity used during the meter prove operation then it would be a prerequisite that the 'loading system' be adjusted so that the flowrate is established within, say, five seconds of the manual flow control valve being adjusted. A further series of tests could then be carried out re-evaluate the possibility of reducing the measured product quantity.

#### Recommendations

It is recommended that:

- No changes to be made to the current proving process.
- The automated loading valve is adjusted to ensure that the required flowrate is established within, say, five seconds, thereby enabling the proving process to be implemented in a consistent manner for all meters.

\*Copies of the full report are held in the IP Library.

New publication

### Air quality and its association with human health effects – an update

The IP has published the proceedings of its October 2000 workshop "Air Quality and its Association with Human Health Effects - An Update". That such a link exists has been much discussed. The relationship between ill health and the episodes of "smog" at the end of the last century are not disputed. The results of more recent studies to identify and understand the effects on health of much lower levels of air pollution however, are more difficult to interpret. This has resulted in a divergence of views amongst the experts, which are only recently being reconciled.

The papers contained in this publication set out the issues related to air quality, the association between human health and air quality, and the difficulties and advantages associated with the use of environmental epidemiology in this area.

Specifically: Air Pollution - Better or Worse by Prof R. L. Maynard, Air Pollution and Exposure Modelling for Short and Long-term Health Effects by Prof David Briggs, Acute Effects of Air Pollution by Prof Ross Anderson, Chronic Health Effects of Air Pollution by Prof Paul Elliott, and Mechanisms of the Effects of Particulate Air Pollution by Prof Anthony Seaton.

It has been argued by some that the industry and its products has an effect on air quality. The information in this document helps clarify the current understanding of the issue, and provides a better awareness of the strengths and limitations of current techniques of analysis.

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### Enhanced oil recovery – ten years on

Adrian Gregory, Managing Director of MORE Oil & Gas Resource Management Consultancy, reviews the development of enhanced oil recovery (EOR) processes over the last decade in the North Sea and looks forward to the point when they are widely applied to the world's oil and gas fields. Prior to setting up the MORE consultancy, Gregory was the Technical Coordinator for the UK's EOR Programme run by the Department of Trade and Industry.

he last ten years has seen the dawn of enhanced oil recovery (EOR) processes. They have emerged from being tax incentive led, to become economic in their own right. The days of regulatory - and sometimes political - horse trading to encourage these processes to enter the world's global stage seems now well and truly confined to history. This, however, has been greeted with mixed emotions by many operators who still use uncertainty of outcome of applying EOR in their fields rather than appraising the associated holistic benefit versus risk.

#### From hype to reality

Just a decade ago, the use of EOR processes was not prevalent on the UK Continental Shelf (UKCS). In fact, the only actual EOR success was claimed for North Brae, a gas condensate field where gas recycling was actively increasing the field's liquid recovery. This was despite the existence of the UK EOR Programme, funded since 1978 by the UK Treasury, and an additional UK Reservoir Simulation Programme supporting UKCS regulatory studies into maximising the UKCS field economic recovery, funded since 1976.

However, in April 1992 a review of the UK's oil and gas regulatory practices was enacted. The Pukas Report, as it was later called, had industry backing and caused real step changes in the offshore arena – quite radical at the time. Somewhat fortuitously, this left the old UK EOR Programme away from any spotlight, yet with some £3mn annual spend.

By February 1993, the EOR Programme had become history in all but name, and the Improved Oil Recovery (IOR) Programme commenced officially in April 1994 running through to March 1997. In March 1994,<sup>1</sup> the UKCS IOR potential was published as 5.4bn boe, increasing to 8.6bn boe of which some 2.5bn barrels were on production or planned by September 1996.<sup>2</sup> With only published data to go on, the 2.5bn barrels seems closer to 4.35bn barrels in 2001 – a big improvement ten years on for the UKCS!

Key to the development of IOR was its take-up in 1999 by BP's Wytch Farm oil field in Dorset. The offshore development required pioneering extended reach drilling - not the preferred BP option which a year previously had been the proposed Poole Bay concrete island, offshore Bournemouth. It was primarily for environmental reasons that a new solution was needed. Luckily, Arco (now owned by BP) was able to support this new technology based on its US experience. The linking of IOR/EOR with environmental management best practice created the 'new dawn' for such techniques and processes to emerge on the world stage. From dreams to real implementation, a market place not just created by tax incentives but by real business need.

#### **IOR versus EOR**

Improved oil recovery (IOR) covers any activity which increases the primary recovery factor.<sup>1</sup> It includes improved reservoir management, supplemental recovery and enhanced oil recovery (EOR) processes.

Initially in 1992, IOR (under the UK's DTI programmes) was more a new philosophy than a science – all about providing business solutions. The primary recovery factor was typically meant at that time to mean the 'current' recovery factor, rather than the technical term it developed into by 1994.

The 'current' recovery factor, in the UK, was clearly defined in the Development Plan (Annex B). This helped by two means. Firstly, any improvements, however small, could be very easily defined and categorised. Secondly, and more importantly, as a regulatory body the DTI could easily see other similar fields, owned typically by different partners, where potential spread of best practice targets existed. This latter task was very easily resourced from the DTI programme funds and with major consequential impact. The regulatory body became suddenly more than just regulation, it was integral to the process – a real tangible source for best practice approaches and dissemination of information.

IOR is an excellent example of how much we can all benefit by working together – industry, the research community and governments working towards common or shared goals. Norway, too, had excellent IOR programmes in operation in the mid-1990s and there was a lot of good technical discussion, collaboration and debate. Although IOR/EOR has always had its doubters,<sup>3</sup> with hindsight, its benefits will become very clear in the next ten years.

EOR - as Figure 1 shows - has very strong roots in theory, mathematics and fundamental physics, and chemistry research and is strongly linked with niche laboratory-based practices or support services. For the poor oil field practitioners in 1991, EOR was the final step - a step too far. In their eyes, EOR stood for exotic oil recovery, expensive oil recovery. Figure 1 shows that after primary recovery comes secondary recovery, then enhanced recovery, which was either tertiary or guaternary recovery. Even this concept caused concerns of validity when applied to working practices of that time. With heavy oil recovery, typically there is no secondary recovery as Figure 1 depicts. In the UKCS, primary recovery rarely occurred as the regulatory emphasis was on producing above the bubble point which required waterflooding in many cases from day one. The UK IOR Programme funded critical and key work which, by 1994, resulted in late field production below the bubble point as witnessed and documented in the UKCS Arbroath field.

EOR, in very simply terms, is all about recovering predominantly residual oil trapped by waterflooding – ie correcting inefficiencies in the microscopic displacement. However, real improvements in oil recovery come simply from small step-wise improvements in the macroscopic sweep efficiency. No one can deny this with any credibility ten years on. This is the predominant reason why the UK EOR Programme became the IOR Programme in early 1993. It did not mean, however, that EOR processes were not commercial.

In fact, EOR is happening today in a very big way, with some full-scale



deployment at enormous scale. For instance, nitrogen flooding in Mexico; polymers in China; hydrocarbon gas injection in Alaska; microbial flooding in India; air injection (oxidation and combustion) in India; and carbon dioxide and hydrocarbon gas flooding in Malaysia. In the UKCS in 2001, citing just one example, the Magnus EOR project is being initiated, having been highlighted as a potential EOR target some ten years earlier.

Starting in 1992, at least under the UK programmes, the classical definitions of primary, secondary and enhanced recovery came under full scrutiny. The UKCS Brent depressurisation project was classed as EOR, yet it matched the neo-classical definition of supplemental recovery exactly. Improved reservoir characterisation; debottlenecking new and old facilities; 4D seismic; multi-component borehole seismic; production below the bubble point; multilateral well technology; horizontal wells; immiscible gas injection; flow diversion; partnering/ strategic alliances; portfolio asset management; extended reach drilling are all a selection of techniques which improve oil recovery yet have little relevance to EOR programmes. However, some of these IOR techniques in time, after being applied, will actually help support classical EOR applications by providing the necessary business environment. Thus, EOR is not today considered the domain of boffins, exotic or necessarily expensive, but an integral part of IOR's arsenal to actually economically improve recovery. Even in today's era of cost minimisation, EOR will happen as evidenced by the many UKCS offshore EOR applications. EOR processes have their niche applications, as do IOR techniques – it is the old 'horses for courses' adage.

Not all the advances in recovery techniques in the last ten years can be laid solely at oil improvements, the gas supply also has had some significant advances. Gas condensate liquid recovery is improved by gas injection as well as from waterflooding initially. Waterflooding gas fields has not emerged yet, but technically the potential is there. Increased recovery from tight rocks and fractured reservoirs have been significantly helped by horizontal wells, massive hydraulic fracturing programmes and multilateral well technology. Turning natural gas to liquids (NGtLs) is a growing industry, with enormous potential for the Prudhoe Bay oil field in Alaska for example. Gas recovery from coal bed methane projects is increasing but still mainly driven by local incentives, predominantly tax or subsidy driven.

In the last ten years technical risk management has certainly helped create robust IOR/EOR projects – man-

aging the trade-off between benefits and risks.<sup>4</sup> These now proven techniques mean that IOR/EOR does not have to be supported by an exact science or engineering argument. The management of risk, rather than debating uncertainties within technical cartels, is certainly a critical success factor worth pursuing. For instance, in the UKCS, the Leadon viscous oil field development will achieve exploration to production within two years by being 100% owned by Kerr-McGee. Multiple partnering to reduce exploration risk can be shown time and time again to be not ideal when it comes to assessing producing asset or even development risk.

#### **Resource stewardship**

Striving for best practice creates IOR/EOR opportunities as shown in the UKCS. Adoption of the 'best practice approach,' reducing any inefficiencies in current practices, has a very similar culture to environmental management best practices. Best practice approach really can be encapsulated into the concept of 'best stewardship of resources.' Today these concepts are becoming more centre stage and over the next ten years will become encapsulated as best practice. It is worth briefly describing these concepts as they will change in the future industry's working E&P

#### reserves

practices for the better as has thinking about long-term 'value' versus shortterm 'profits' in the last ten years.

For resource stewardship to be effective, industry as a whole must embrace, continually strive and continuously action:

- improved 'resource yield' (ie unit output productivity),
- improved 'resource use'(per capita) and, lastly
- harmonised 'resource mix' with society's changing preferences.

Certainly harmonising the resource mix is occurring today with major gas exploitation projects being funded around the world.

The more 'resource output' from a given 'total resource' (ie 'resource yield' or 'resource productivity') the less residual and environmental waste/pollution will result. Resource prices will always guide society in medium to long-term resource allocation (ie what, how and for whom). Resource margins guide industry and business suppliers on the provision of these resources as products or services, and their consequential resource management thereof. Hence the recent emergence of the era of cost minimisation to maximise short-term profitability.

The associated 'resource use,' once a new resource is added to a society, will increase steadily until this initial growth phase plateaus out. This for crude oil production occurred at the very end of the 1980s. Once this exploitation growth-phase of resource use has passed, annual advancements in use will be small but potentially still significant. Eventually, however, associated resource use will fall without continual innovation or substitution (eg 'resource mix') occurs at a greater rate than new use or expanded original use.

With any current level of 'resource output,' increased partial substitution by another resource will eventually occur such that a more harmonious balance with society's changing preferences can be attained. Resource mix, for instance, started to change significantly from coal as the preferred energy resource, to oil after the Second World War. Today, gas is currently starting to impinge on oil's principal use, with the necessary global infrastructure becoming operational in the next ten years.

'Pollution abatement' starts from day one when a new resource is added to the market place. To meet the growing demands from steadily increasing 'resource use,' improvements in the efficiency of resource production will result in less 'residuals' and therefore less 'pollution' to be created as part of this process. However, as more pollution is created and becomes more noticeable or offensive as the resource output significantly increases, concerns of society will be felt with increasing force from associated pressure groups. Around this time, resource use will start to plateau out and new improvements will be more closely linked with 'pollution abatement.' Improving resource yield at this stage will make a significant impact, just as IOR has done with crude oil output over the last ten years.

Improved yields from all hydrocarbon resources are increasing substantially. New hydrocarbon fuel technology is emerging which will not only reduce emissions from end of pipe gasoline and diesel sources but also significantly improve the efficiency of combustion engines. This can only lead to more use of conventional hydrocarbon fuels stemming, or significantly delaying, new substitute or substitute-supporting technologies such as solar and wind power, fuel cells and the hydrogen fuel economy currently being hyped. Oil and gas supply as the dominant desired resource mix could easily survive for another hundred-plus years. Just like the world's current coal resources, significant oil resources will still be present when it becomes replaced by the new energy economy.

#### Global economic systems

Twenty years ago it would have been difficult to argue that capitalism was more environmentally friendly than the other economic systems such as the socialist and communist economies. Surely capitalist economies put profit before all else, resulting in environmental degradation? Few make these claims today. The dismal economic performance of the alternatives inflicted high costs on not only the environment but also on the health and welfare of their citizens and workforce. There were no 'invisible hands' operating to limit and correct for such damage. Pursuit of profit has led to the increasing husbanding of resources.

Global preferences for the dominant local economic systems might have changed, even a 'third way' emerging, but business practices are hard to change even over 20 years. The capitalist ethos of 'cost minimisation' versus the socialist ethos of 'input maximisation' is still very much prevalent. This, in addition to the restructuring of the E&P oil and gas business since 1996 and its associated service support, has led to some very significant opportunities in niche geographical regions. It is these locations where new emerging IOR/EOR techniques and processes will gain commercial acceptance, becoming fully deployed and then spread globally.

### Exploitation versus appropriation

Oil and gas production is very much a classical production process. Owners of the resources can either choose to appropriate the cash flow streams currently encapsulated in their real asset or take the more proactive step to exploit the full business opportunities which are inherent in any real asset. Exploitation, however, being strongly linked with change - particularly technical change in the case of oil and gas fields - creates ambiguity and information asymmetrics within the market place. Ambiguity, particularly, is not the chosen domain for big global corporations nor even most venture capitalists. Ambiguity is the domain for entrepreneurs and for entrepreneurship.

Nearly always with joint industry project funded research or even internally funded research, the researchers do not fully understand the potential worth or cannot themselves ensure that the advances are enacted upon. However, with market implementation comes the added benefits from advances made through creativity - the ability to see relationships and linkages before they happen or form, WAG (water alternating gas as defined in the early 1990s) field results even now cannot be reproduced in laboratory experiments or coded with the right physics into reservoir simulation software. However, WAG has now also become simultaneous water and gas injection projects. WAG also covers water assisted gas injection projects. What other advances are out there in the future, held back today by preference for appropriation rather than exploitation?

#### Computing power and capacity

Some 30 years ago nobody would have predicted how much computing power would continue to increase nor how relatively cheap storage capacity for information would become. Mobile phones today possess as much computing power as many universities had back then. Moore's Law claims that computing power doubles every 18 months.

The fact that computing power is increasing in leaps and bounds means that during the next decade all thermal EOR processes, including in-situ combustion, will finally be within our everyday grasp to use in earnest on real full-scale oil reservoir simulations. This will have profound influence on heavy oil resources, particularly those currently felt to be too difficult to exploit, even appropriate.

#### 'Children of IOR/EOR'

Finally, the 'children of IOR/EOR,' at least in the UK, started to graduate in 1994 from institutions such as Imperial College, London, and are fully in tune with their benefits. They will see during their careers IOR/EOR become as standard as waterflooding was ten years ago. With so many of the seventies and eighties technical staff leaving the industry in the late nineties during the E&P industry restructuring, they are all very well placed to reap the future harvest.

#### Looking ahead

IOR/EOR internationally has undoubtedly been very successful with billions of dollars added to both national and industry coffers. IOR/EOR makes business sense for profit and value activities.

The last ten years have shown that new developments based on \$12-\$14/barrel of oil expenditures are more risky and have poorer rewards by comparison. If exploitation wins over appropriation much more can still be achieved. Ambiguity and the 'invisible hand' ensure that evolution of

IOR techniques and EOR processes will always prevail despite such barriers as technical cartels. Corporateship driven by economies of scale will always mean that market place evolution will create new business opportunities. Where IOR/EOR is not an adopted strategy, information disclosure, indirect incentives and regulatory compliance can be used to correct any deemed market failure.

The last ten years have been IOR/EOR's chaotic phase. This phase has, however, defined the space and time domains which these techniques or processes can or will occupy. Competence and know-how have been formed very much from coincidences. Design has been inductive. Testability' has been the dominant end-user requirement rather than appraising the potential business opportunities arising. No collective knowledge has emerged yet, just inner conviction by the key players.

The next ten years' phase will be dominated by IOR/EOR focus and technique/process differentiation. Market segmentation will be dominated by the dogma of company thinking, that they can achieve competitive advantage, even competitive edge, by erecting barriers to the advancement of collective knowledge. The following decade will be the most constructive with shared wisdom prevalent throughout the hydrocarbon industry.

I have already made my prediction that for light oil fields, we will be able to do 65% recoveries by 2020 and 70% by 2050. These increases in recovery rates could eventually add another 2tn improved oil recovery barrels.<sup>3</sup> The hydrocarbon economy future is still very bright – the future is still IOR/EOR.

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## **US markets are working**

For the first time in its 50-year history, the publication of this year's *BP Statistical Review of World Energy* (see p6) was accompanied by a companion volume looking at the US market. *Petroleum Review* outlines some of the key points highlighted by the new study and reports that, with the exception of California, US markets appear to be working.

	US	World (exc. FSU)
primary energy	1.8	1.9
GDP	3.3	2.6
oil	1.5	2.1
natural gas	1.9	3.6
coal	1.9	0.2
nuclear	2.7	2.9
hydro	-0.7	2.2
electricity	2.3	2.6

Figure 1: Average % growth in consumption 1990–2000



The US is the world's largest single energy market. It ranks first or second in the global production of oil, natural gas, coal and nuclear energy and represents more than 25% of world consumption of all four resources. In recent years, the US market has become increasingly volatile and energy policies have once again come to the fore – particularly so during the lead up to and subsequent election of George W Bush as President in November 2000.

The BP Statistical Review of US Energy - June 2001 assesses medium term trends in the US and compares them with global developments. US energy markets in 2000 were characterised by high prices, low inventories, increased capacity utilisation and an increased dependence on net energy imports. According to the report, US primary energy consumption grew by 2.3% in 2000, well above the 10-year average rate of 1.8%/y. The strength of this demand stemmed largely from the country's fast-growing economy - an average of 3.3% over the past decade, some three-quarters of a percent above the rate of the world as a whole - and colder winter weather.

The US also contrasted the rest of the world with respect to the growth of coal and gas consumption in 2000. Globally, growth in the use of coal was flat while US consumption increased by 3.3%, driven by higher power generation demand (electricity from coal increased by 4.3% over 1999 levels). More than half of US electricity production is derived from coal-fired plant. US coal production remained flat over the past decade, however.

Global natural gas consumption grew by nearly 4% during 2000 but, in the US, grew even faster at 4.6% in response to the general economic strength, the growing penetration of natural gas in power generation and colder winter weather, particularly in November and December. However, during his presentation at the launch of the US Review in New York on 27 June, Professor Peter Davies, Chief Economist at BP, stated that 'it remains to be seen whether the strength of the US natural gas prices over the last year will have an impact upon the choice of fuel in electric power going forward.'

US oil production in 2000 fell by 1.4% in the face of the maturity of the resource. 'This should change in coming years, however,' stated Davies, 'as the giant deepwater discoveries in the Gulf of Mexico are progressively developed.' In contrast, US natural gas production grew by 3.5% – but this was less than consumption growth of 4.6%. This, coupled with the fall in US oil output and flat coal production, led to net energy imports rising, with imports of oil and natural gas growing and coal exports halving, according to Davies.

#### **Petrol price**

As in the UK and Europe, petrol prices in the US have been one of the most publicised energy issues of the last year. According to Davies, the average petrol price in the US rose by 27% in 2000 – from \$1.21 to \$1.54 per gallon. 'In 2000, higher crude prices were responsible for about 80% of the increase in average retail gasoline prices,' he stated in New York.

As an aside, he noted that: 'Net US gasoline imports over the 1990–2000 period have remained essentially unchanged despite an increase in consumption of 17% – they only represent 3% of gasoline consumption. The same trend is true of total US oil product imports. The refining system has increased net capacity – despite some specific refinery closures and tighter, costly new product specifications – mainly through debottlenecking or capacity creep. All the growth of US oil imports has been in the form of crude oil.'

#### Gas prices

The price of natural gas, too, rose steeply in 2000. The price at Henry Hub in Louisiana rose by 86% from an average of \$2.27/mn BTU in 1999, according to Davies, to \$4.23/mn BTU in 2000, peaking at around \$10 in December. 'Prices have since fallen back sharply as markets have adjusted, but are still today around \$3.50-\$4,' he noted.

According to Davies, this is a clear indication of 'markets working efficiently.' Natural gas prices rose firstly because of domestic supply and demand. As already noted, natural gas consumption accelerated during 2000, rising by 4.6% (2.7bn cf/d) on the back of a strong economy, colder weather and a 7% growth in the use of natural gas in power generation. Production of natural gas, however, had remained flat between 1994 and 1999 as a result of low prices and low drilling, leading to gas storage being low in 2000. Prices thus rose. In addition, natural gas was having to compete with other fuels - most notably with residual fuels oil and distillates. Therefore, as the oil price rose, so did the price of natural gas.

In the face of higher prices, both

#### To the point

Promoting the launch of the US Review in New York, Sir John Browne, BP Chief Executive Officer, made four key points about global energy trends.

He started by stating that there 'is no fundamental energy shortage' and that although he didn't underestimate the problems that have been experienced over the last year in particular areas, these have 'been a series of market responses to particular circumstances and patterns of regulation rather than anything structural." He noted that world proven oil reserves stand at over 1,000 bn barrels, representing 40 years of current consumption. Furthermore, according to the US Geological Survey, there is at least another 1,000 barrels of recoverable reserves (split 50/50 between reserves growth in existing fields and undiscovered reserves). Natural gas reserves are equivalent to over 60 years of current consumption, with estimates of the ultimate resource at least double that figure, he reported.

His second point was that 'markets are more international than ever.' Using natural gas as an example, Browne stated that '15 years ago, only 17% of total natural gas consumption was traded across an international border. Now it is 27% and that figure is rising rapidly.' Some 58% of daily oil consumption is traded internationally and 15% of coal consumption. On the latter, Browne said: 'It is interesting to note the sharp increase in Chinese coal exports this year, as substitution changes the energy mix in parts of the Chinese economy.'

The third point he focused on was

supply and consumption responded. Natural gas production in the US rose by 3.5%, or 1.7bn cf/d, while natural gas consumers switched fuels to residual fuel oil and distillates whenever feasible. As a result, consumption in 2001 is estimated to have fallen back by between 2bn and 3bn cf/d and prices are now falling back to the residual fuel oil equivalent.

#### An exceptional case

However, there is always an exception to the rule – the recent electricity blackouts in California clearing indicating a market failure (see *Petroleum Review*, April 2001). A number of factors contributed to this situation. Hydroelectric output in California, Oregon and Washington – which conthe fact that 'the efficiency of energy consumption is improving.' He stated that energy is being used more productively. For example, in the US average annual growth in GDP of 3.3% over the last decade has been accompanied by a growth in energy consumption of just 1.7%/y - a ratio of 0.52. In the European Union over the same period, the ratio has been 0.45 and in China 0.12 (10% GDP growth against 1.2% growth in energy demand).

'And in turn there is a further improvement,' he said. 'Carbon emissions are not rising at the same rate as energy consumption. In the US, the ratio over the last decade has been 0.9% increase in emissions for every 1% increase in energy demand; in Europe 0.33% and in China 0.58%.'

Browne's final point, as already indicated by Peter Davies' round-up of US trends, was that markets work. 'Markets respond to price signals,' he said. 'Price movements stimulate substitution and the development and application of new technology ... Trade helps markets to work more effectively by promoting diversity and competition.' He went on to state that: 'The greatest problems seem to occur in those areas where the market is hampered - where there is an absence of open competition and choice, and where the signals imposed by regulation set the wrong incentives for both consumers and producers."

He concluded that this should be the 'starting point' for any debate on energy policy – 'how to use market mechanisms to resolve problems and to produce a better outcome; how to remove the barriers which prevent the market working effectively.'

tributes 25% of California's power needs – fell by 14% in 2000. To compensate, in-state generation had to be ramped up to extremely high levels, leading to a massive surge in natural gas demand and soaring spot gas prices (\$50/mn BTU at peak).

Compounding the situation, not only had the state been running down its buffer of spare power generation capacity in recent years, the electricity deregulation process had proved disastrous with utilities forced to buy the bulk of their electricity in the open market while prices to consumers were fixed.

'The lesson of California is not that deregulation does not work,' stated Davies, 'it is that the design of a deregulation programme is extremely important.'

### **Globally accessible** enviromental data

To facilitate the petroleum industry's access to environmental information on biodiversity, sensitive areas and protected regions, a new interactive mapping service - ImapS - has been established. The service offers environmental data about specific locations and provides those involved in exploration and emergency response with the information they require - 24 hours a day.

eveloped by UNEP World **Conservation Monitoring Centre** (www.unep-wcmc.org) in partnership with IPIECA, the International Petroleum Industry Environmental Conservation Association the IMapS service (www.ipieca.org) can provide you with Internet access to the world's most comprehensive biodiversity data sets.

Biodiversity information is presented in IMapS as text, pictures and through an interactive mapping tool. The user is able to select which data layers are displayed, to zoom in or out, pan around the map and to retrieve information on the layers displayed.

Eric Calonne of TotalFinaElf and the Chair of the IPIECA IMapS Steering



Sensitivity map of Korinthian Canal coastal area. Supplied courtesy of Motor Oil (Hellas)

Committee believes that IMapS is a valuable decision making tool. He comments: 'With IMapS, users can create their own personalised maps of a region overlaid with environmental data, such as on parks, protected areas, breeding areas and vulnerable species. This has many applications - for example in emergency response situations, oil spill contingency planning and in strategic planning."

It is vital that data is kept as current as possible. With this in mind, the system has been designed to allow users to provide feedback on its accuracy, to identify gaps and to contribute new data as this becomes available - adding further value to the data set.

Discussions are also in progress with other parties to make data such as meteorological information, satellite images, locations of power stations and amenities, accessible via IMapS. Industry specific data can also be included and the generic system can be tailored to meet the requirements of a specific organisation.

#### Industry need

UNEP-WCMC maintains the global environmental data sets that support international conventions and is able to provide information on World Heritage Sites, protected areas, breeding sites, biodiversity hot spots and more. Until recently, access to this data involved creating individual maps for clients and interpreting the data for non-specialists, both of which were time consuming activities. With the support of BP, IPIECA and others in the private sector, the Centre began to explore ways in which this valuable data could be made more accessible to a lay audience.

Tim Johnson, Director of Programme Development at UNEP-WCMC, has worked closely with the private sector to address this matter. He points out that 'IMapS is a good practical example of how maps can be used to display complex data in an intuitive format. We have developed a number of prototypes with the oil industry [covering areas] such as the Mediterranean, Black Sea and Indian Ocean, with the next stage being to see how they can be used in real world situations."

For example, the IPIECA Mediterranean Oil Industry Group (MOIG) has been using IMapS to develop informative and concise maps for its membership, with UNEP-WCMC providing the environmental data, and further layers of information being provided by third parties. (See box piece.) It is planned to soon include industry information such as tourist amenities, shipping lanes, energy and power stations.

#### Dealing with oil on troubled waters



Incident control room, Korinthian refinery.

MapS is of great value in emergency response situations, in preparing oil spill preparedness plans and for use in training exercises. During a meeting on 5–8 June 2001 in Loutraki, Greece, the IPIECA Mediterranean Oil Industry Group (MOIG) members were able to observe a four-hour exercise conducted by Motor Oil (Hellas) (MOH) in the marine terminal area of its Corinth refinery. The scenario involved the detection of an oil spill of

IMapS is also used to support training sessions carried out by Oil Spill Response Limited (OSRL) based in Southampton, UK. Peter Taylor from OSRL comments that 'for an effective response in the early stages, it is crucial that the environmental resources under threat are properly assessed and protection priorities determined. The advantage of an Internet-based system is that this information will now be available 24 hours a day, seven days a week.' Supplied courtesy of UNEP-WCMC. unknown origin by a tanker in the vicinity of the MOH marine terminal area.

The exercise involved three main sections: the incident command centre, the response at sea and the response on land. The incident occurred at 0900 hours. The Oil Spill Response Commander, in this case the Fuels Offsites Manager, operating from the incident command centre, was notified by the Dockmaster that an oil spill had been detected. The Fuels

Feedback from the emergency response managers suggests that IMapS will be particularly beneficial for contingency planning. This would mean that maps could be prepared and priorities assessed and then delivered into the hands of the response team.

Should more advanced mapping capabilities be required, the data sets can be downloaded across the Internet for modification within the users' own mapping tools. For example, Shell is



Landsat 7 image of Korinthian canal coastal area.

Supplied courtesy of USGS

Offsite Manager immediately activated the Tier 2 oil spill contingency plan and, under his supervision and coordination, all involved personnel effectively carried out their duties. Sensitivity maps of the area close to the refinery were used to determine those sites (mainly fish farms and holiday resorts) requiring protection. These sites influenced where the booms and other equipment were placed to prevent the oil reaching the shore.

The response at sea included several tugboats, boom equipment, skimmers and a helicopter and plane for aerial surveillance. The exercise suggested that all of the oil had been contained except for a slick that reached the shoreline and therefore required a shoreline clean-up operation. This included beach cleaning, hot water washing, booming, the use of absorbent materials, plus vacuum pumping and storage in fast tanks.

IPIECA and UNEP-WCMC participated in the exercise by providing satellite images and sensitivity mapping using IMapS for the area around the Motor Oil (Hellas) refinery. These were used to provide the regional context for the local information already held within the refinery.

developing an early warning system that will allow projects to be screened for environmental sensitivities and can be used by various business units. It will provide a user friendly and interactive interface for complex databases.

#### Looking ahead

IMapS is being expanded and upgraded and UNEP-WCMC is seeking further oil industry partnerships to achieve this goal. As part of the United Nations Environment Programme, UNEP-WCMC is committed to providing the world's most comprehensive and accessible source of environmental data. In the near future, the organisation plans to harmonise the way that the data is held, to make it more easily interrogated and to ensure that the very latest information is always available.

IPIECA continues to work closely with UNEP-WCMC and is channelling support to expand the regional coverage of the IMapS system and to ensure that users within the industry are aware of its benefits.

For further details please contact Rebecca Tindale at IPIECA, Tel: +44 (0)20 7221 2026; e: rtindale@ipieca.org or Phill Fox at UNEP-WCMC, Tel: +44 (0)1223 277314; Fax: +44 (0)1223 277136; e: **phill.fox@unep-wcmc.org** 

# **NEW**Schnology

#### Programmable relay for forecourt software

Texol Technical Solutions of Dundee has used Schneider Electric's components in its design and build of new electrical panels controlling fuel pumps capable of dispensing LPG on station forecourts. The existing pump design has had to be developed to handle fuel stored under pressure. The new control system uses a Zelio Logic programmable relay to provide functionality incorporating the safety features required.

'LPG is stored under pressure and demands extra safety precautions so the new control system had both to fit into a small enclosure and provide the additional safety features required for LPG pumps,' explains Texol. 'For example, if the gas pressure drops below a certain level once every set period there is no problem, but more frequent low supply pressure may require pump switch-off and alarm activation.'

The Zelio Logic programmable relay is a software controlled unit that can have up to 12 digital inputs and eight relay outputs, with additional analogue inputs available on DC powered modules. It is said to be ideal for the control of small systems within machinery or heating, ventilation and air conditioning control within buildings.

Tel: +44 (0)1203 416255 Fax: +44 (0)1203 417517



#### Monitoring oil build-up in deep sumps

lonics has introduced the Leakwise ID-223 oil detector for environmental monitoring of deep sumps and tanks. According to the company, the unit is highly sensitive and gives a direct measurement of oil thickness and build-up over time.

A triangular-shaped float, which sits at the oil-water interface unaffected by the oil, carries the ID-223's electromagnetic absorption sensor. Designed to cope with situations where there are wide variations in water level, typically 70 mm to 2,000 mm or more, it has many environmental and product loss detection applications within the power, petrochemical and oil distribution industries.

Leakwise oil-on-water detectors are said to be simple to install and require minimum maintenance. They can be used to actuate alarms, skimmers and discharge pumps. Other sensor surrounds and stilling wells are available for the ID-223 where there are greater water variations or for sumps that dry out. These include surrounds that can be suspended from above the water or alternatively fixed to the floor of an emptying sump.

Tel: +44 (0)161 866 9337 Fax: +44 (0)161 866 9630



#### **3D** visualisation support

INT and OpenSpirit have join forces to develop an OpenSpirit enabled 3D Viewer. Written completely in Java, the viewer will offer platform independent support for 3D visualisation of well, seismic and interpretation data. The viewer will be distributed as a free utility within the OpenSpirit run-time environment, and developers who wish to extend the viewer's functionalities may also license INT's J/View3DPro toolkit from INT to help rapidly develop full function, OpenSpirit enabled 3D visualisation applications.

'Our goal is to bring economical 3D visualisation to the desktop. Integrating INT's visualisation tools with the OpenSpirit Application Integration Framework results in a powerful application component that supports both data access and visualisation. We want to provide components to developers in the E&P industry that allow them to produce better, more affordable and maintainable applications in less time' says Olivier Lhemann, President of INT.

'The rich set of development tools offered by INT, combined together with the OpenSpirit Application Integration Framework manage the complex task of visualisation and data integration and allows the software developer to focus on improved algorithms and methodologies for finding reserves,' comments Neil Buckley, CEO of OpenSpirit.

The 3D Viewer complements previously released OpenSpirit enabled well and section viewers built upon components of INT's J/GeoToolkit.

Tel: +1 (281) 940 0200 Fax: +1 (281) 940 0201

#### Strong alliance

Furmanite and DML (Devonport Royal Dockyard) have formed a new alliance – FD Alliance – that is said to provide a permanent repair and strengthening service for pipelines and structures used in the oil and gas industry without requiring costly shutdowns.

'Using materials typically based on carbon fibre and epoxy resin, composite repairs are strong (up to 10 times as strong and twice as stiff as steel), lightweight (20%–25% the density of steel) and do not corrode,' reports the alliance.

Tel: +44 (0)1242 528877 Fax: +44 (0)1242 222494

# NEWschnology

#### Wellsite chemostratigraphy service

Halliburton's Sperry-Sun Drilling Services and Westport Technology Center International, in alliance with Chemostrat, have launched LaserStrat<sup>™</sup> – a wellsite chemostratigraphy service.

The successful completion of the first deployment for North Sea operator Veba Oil & Gas Netherlands is reported to have demonstrated how the 'formation fingerprinting' service can bring the powerful correlation technique of chemostratigraphy out of the laboratory and to the wellsite, where it can be used to assist with critical drilling decision-making in near real time.

'The LaserStrat service has the ability to provide the industry, for the first time ever, with rapid-turnaround elemental analysis of cutting samples for chemostratigraphic correlation at the wellsite,' states Jody Powers, President, Halliburton Energy Services, 'which can help our customers make more informed drilling decisions, such as picking casing and coring points. This innovative new tool can also aid in geosteering, save time and money, and minimise risk during drilling operations.'

The service can be used as a stratigraphic tool to identify horizons and as a look-ahead tool for drilling operations by providing chemostratigraphic correlations to offset wells in near real time. It is also said to aid the selection of coring and casing points, and total depth, and can be useful in recognising expanded sedimentary sections, unconformitites and faults.

Tel: +1 281 871 4319 Fax: +1 281 871 5125

#### Steel and epoxy 'superpipe'

A pipe for high pressure conditions with a service life claimed to be ten times that of alternative pipes has been developed by Ameron International. The pipe, Bondstrand SSL, has been constructed with a new design – several layers of thin ultra-high strength steel have been embedded in glass fibrestrengthened epoxy to give 'an extremely strong and corrosion-resistant pipe for the most demanding types of environments, such as those found in the oil industry,' states the company.

Bondstrand SSL is said to be manufactured at around a third of the cost of an all-epoxy pipe designed for the same pressure capacity. The pipe has a conventional GRE composite on the interior and exterior of the pipe wall and a layer of SSAB Swedish Steel's ultra-high strength steel Docol 1400 DP in the middle. The layer of steel consists of 100.4 mm wide and 0.5 mm thin diagonally-wound steel strips. The GRE composite provides resistance to corrosion and the steel core reinforces the pipe at a comparatively low cost, explains Ameron.

The pipe has a service life of at least 30 years according to the company. 'This is longer than the estimated lifespan of stainless steel pipes, which ranges between six months and three years in

similar pressure and corrosion conditions.' The pipe is manufactured in diameters between 200 mm and 1,000 mm and is designed for pressures up to 400 bars.

'The idea of combining materials comes from the rocket industry, where this technology is used for rocket engine casings. The weight of the Bondstrand is 75% less than a pipe made entirely of fibreglass and 60% less than a stainless steel pipe designed for the same pressure. This also reduces labour and transport costs,' states the company.

Tel: +31 345 587 587 Fax: +31 345 587 561



#### Multiphase pumping

An oil field development in western Siberia has allowed Sulzer to test the technical and economic feasibility of building a pumping station based on multi-phase technology to export unprocessed effluent direct from well clusters, rather than build a costly gas oil separation plant.

The project involved helping Yukos to solve a production constraint at the Priobskove oil field. The constraint was the limited capacity of a 426 mm pipeline which linked production from downhole pumps on the right bank of the river Ob with treatment facilities 29 km away on the left bank. The pipeline was limited to to a throughput of 1.8mn t/y (37,000 b/d), but the right bank is capable of producing 4.7mn t/y (100,000 b/d). The costly alternatives were to build a separation plant on the right bank, build a further pipeline across, or find another method of pumping unprocessed effluent through the existing pipeline.

The economic solution was provided by the development of a multi-phase pump capable of pumping raw effluent. Normally oil has to be processed to separate it from gas and impurities before it can be pumped. The gas would then be transported separately with a compressor, unless it was re-injected to maintain well pressure or flared off. The multi-phase pump combines the advantages of a conventional pump and compressor in one device and can also cope with entrained solids such as sand and other impurities.

Two type MPP 11 pumps were supplied for the field, each powered by an electric motor of 6 MW – the largest in the world to date, according to the manufacturers. Each pump operates through a variable frequency drive in parallel to deliver a throughput of up to 500,000 b/d of oil, plus all associated gas (90% by volume at suction).

To minimise site work, all the pumps were supplied in self-contained package models, complete with heating and ventilation. Duplex stainless steel pumps, remote controls, automation, HV switch gear and transformers were also supplied.

Tel: +44 (0)1252 525336 Fax: +44 (0)1252 525227

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

### **Membership News**

#### **NEW MEMBERS**

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#### STUDENTS

Mr M D Brown, Oxted Ms S K Marin, London Mr V Mishnyakov, London Mr O Ogbeiwi, Nigeria Ms A Osijo, London Mr N X Ramirez Carabali, Ecuador Ms A Xavier, London

#### NEW FELLOW

#### Mr G Singh FInstPet

Mr Singh is currently working as Business Manager with Kvaerner, with technical and commercial responsibilities in the areas on field development and pipelines. Previously he was Principal Consultant and Director of PLT Engineering Limited, an international oil and gas consultancy. He undertook his undergraduate and post-graduate studies at The City University, London and Henley Management College. Mr Singh obtained his BSc (First Class Honours) in Mechanical Engineering from City University in 1971. Mr Singh is also a Fellow of the Institution of Gas Engineers, Institution of Chemical Engineers and Institution of Mechanical Engineers.

#### Dr Jack Birks, CBE, FInstPet 1920–2001

It is with great regret that we announce the death of Past IP President (1984–1986) Dr Jack Birks. A key figure in the oil and gas industry, Jack was Managing Director of BP from 1978 to 1982. Perhaps his most important achievement was the development of the Forties field, the first major oil field in the North Sea.

Having gained a doctorate in physical chemistry at Leeds University – after leaving the Army where he served in the Royal Electrical and Mechanical Engineers during the Second World War – Jack joined Anglo-Iranian Oil (later to become BP) in 1948. After a number of years in the oil exploration sector, he became Manager of Petroleum Engineering at the BP Research Centre at Sunbury from 1957–1959.

From 1959 to 1962 he was Vice President – Exploration for BP in North America, from where he built up the company's interests in the western hemisphere, in particular Alaska. This was followed by eight years in Iran where he was responsible for coordinating BP's exploration and production activities.

Jack returned to the UK in 1970 as General Manager of BP's exploration and production department.

He was appointed a CBE in 1975, and in 1978 he joined the Board of BP. He was appointed by the Scientific Research Council in the late 1970s to Chair a committee establishing a number of offshore technology centres.

Retiring in 1982, Jack continued his involvement in the industry, acting as Chairman of several organisations. The UK Government appointed him to the Chair of the National Maritime Institute, where he oversaw its privatisation and merger with the British Ship Research Association to become British Maritime Technology. He became a Life President of the organisation in 1995.

# **EVENT** Forthcoming

#### **SEPTEMBER 2001**

#### 4-6

#### Antwerp

Aberdeen

MariChem 2001 Details: Turret RAI, UK Tel: +44 (0)1895 454545 Fax: +44 (0)1895 454647 www.marichem.com

#### 4-7

Offshore Europe Details: The Offshore Europe Partnership, UK Tel: +44 (0)20 8949 9222 Fax: +44 (0)20 8949 8186 e: oe2001@spearhead.co.uk www.offshore-europe.co.uk

#### 7-8

Singapore Pacific Petroleum Insiders Details: The Conference Connection, Singapore Tel: +65 226 5280 Fax: +65 226 4117 e: info@cconnection.org

#### 9-12

Alberta Changes Influencing International Negotiations - New Opportunities for Success Details: Association of International Petroleum Negotiators (AIPN), Canada Tel: +1 403 290 3155 Fax: +1 403 290 3517 www.aipn.org

#### 10-11

Singapore Petroleum Trading and International Law Details: Abacus International, UK Tel: +44(0)1953 497099 Fax: +44(0)1953 497098 e:Karen@abacus-int.com www.abacus-int.com

11 Wolverhampton Improving Safety in Petroleum Distribution **Details: Laura Viscione** The Institute of Petroleum

#### 11-14

St Petersburg Offshore Oil & Gas of the CIS Details: RESTEC, Russia Tel: +7 812 320 80 91 Fax: +7 812 320 80 90 e: oil&gas@restec.spb.su www.restec.ru

11-14 St Petersburg Development of the Russian Arctic Offshore Details: RESTEC, Russia Tel: +7 812 320 80 91 Fax: +7 812 320 80 90 e: oil&gas@restec.spb.su

#### 12-13

Singapore Petroleum Trading and Cargo Storages Details: Abacus International, UK Tel: +44(0)1953 497099 Fax: +44(0)1953 497098 e:Karen@abacus-int.com

#### 12-13 London

Gas to Liquids IV Details: Smi Energy Conferences, UK Tel: +44(0) 870 9090 711 e: customer services@smi-online.co.uk www.smi-online.co.uk/gtl.asp

#### 13-14

Stavanger Station Keeping Seminar Details: IMCA, UK Tel: 44 (0) 20 7931 8171 Fax: +44 (0)20 7931 8935 e: imca@imca-int.com www.imca-int.com

#### 15-18

Dubai

Dublin

Berlin

Arab Oil & Gas Show **Details: International Conferences** and Exhibitions, UK Tel: +44 (0)1442 878222 Fax: +44 (0)1442 879998 e: general@ice-ltd.demon.co.uk

#### 17-18

Irish Energy III Details: SMi Conferences, UK Tel: +44 (0)870 9090 711 Fax: +44 (0)20 7252 2272 www.smi-online.co.uk

#### 17-18

Houston Gas to Liquids - Viability, Economics and Strategy Details: IBC Global Conferences, UK Tel: +44 (0)20 7637 4383 Fax: +44 (0)20 7453 2058 e: sherri.wasmuth@informa.com

#### 17-19

ERTC Reliability Conference Details: Global Technology Forum, UK Tel: +44 (0)1737 365100 Fax: +44 (0)1737 353068 e: events@atforum.com www.gtforum.com

#### 18-20

London Advances in Risers, Moorings and Anchorings in Deepwater Fields Details: IBC Global Conferences, UK Tel: +44 (0)20 7637 4383 Fax: +44 (0)20 7453 205 e: sherri.wasmuth@informa.com

#### 26

London **Cadman Memorial Lecture** Details: Christine Pullen, The Institute of Petroleum

#### 19-20

Introducing Subsea Pipeline Engineering Details: Trevor Jee Associates, UK Tel: +44 (0)1892 544725 Fax: +44 (0)1892 544735 www.tja.co.uk

Aberdeen

Manchester

Berlin

#### 24-25

Leeds Incineration of Municipal Waste with Energy Recovery Details: University of Leeds, UK Tel: +44 (0)113 233 2494 Fax: +44 (0)113 233 2511 e: cpd.speme@leeds.ac.uk

#### 24-25

London North Africa Oil & Gas Summit Details: IBC Global Conferences, UK Tel: +44(0) 1932 893857 Fax: +44(0) 1932 893894 e:cust.serv@informa.com

#### 26

**RIBEX 2001** Details: Pira International, UK Tel: +44(0) 1372 802046 Fax: +44 (0) 1372 802243 www.piranet.com

#### 27-28

World Trade and Standardisation Details: IFAN, Germany Tel: +49 (0)30 26 01 2485 Fax: +49 (0)30 26 01 4 2485 e: uta@djadali@din.de

#### OCTOBER 2001

London 1-2 The Russian Oil and Gas Sector - Prospects and Opportunities for Growth and Development **Details: Laura Viscione** The Institute of Petroleum

London **IP Awards Lunch 2001 Details: Christine Pullen** The Institute of Petroleum

17-19 **Rio de Janeiro** 13th Annual Deep Offshore Technology Details: Pennwell, UK Tel: +44 (0)1992 656652 Fax: +44 (0) 1992 656735 e: pattyv@pennwell.com

PETROLEUM REVIEW AUGUST 2001

## **NE** Publications

#### Product Tanker Markets to 2010\*

(Ocean Shipping Consultants, Ocean House, 60 Guildford Street, Chertsey, Surrey KT16 9BE, UK). Price: £545 (\$950). 281 pages.

This study provides a full appraisal of the prospects of the international product tanker market. Near-term developments within the sector are expected to be dominated by supply considerations resulting from the phase out of single-hulled tankers and IMO amendments to Marpol 73/78 regulations are expected to curtail life for many vessels. The current fleet age profile implies much higher scrapping levels over the forecast period compared with the 1990s, whilst trade restructuring is set to fund different growth profiles for individual size sectors. The report examines the implications of increased product demand in Asia – particularly in China and India – as well as the impact of tightening product specifications in North America and Europe. A fully updated and detailed appraisal of all aspects of product tanker supply and demand is provided. The report also includes extensive detailed forecasts for all sectors of the product tanker fleet on vessel demand, fleet development, freight rates, costs and profitability.

#### 21st Century Emissions Technology\*

(Professional Engineering Publishing, Northgate Avenue, Bury St Edmunds,, Suffolk IP32 6BW, UK). ISBN 1 86058 322 9. Price: £129. 312 pages.

This book is useful for all those working in industry groups involved in combustion systems, fuels, fuel and air systems, engine design options, engine control, after-treatment, vehicle and machine systems, emission measurement techniques and legislation trends. Contents include a review of the challenges and opportunities in emissions catalyst technology; mobile emission control technologies; cost implications of various Euro 4 and 5 after-treatment solutions for heavy duty diesel vehicles; injection natural gas engines for light-duty applications; 4-stroke active combustion (controlled auto-ignition) investigations using a single cylinder engine with Lotus active valve train (AVT); chemistry limits on minimum in-cylinder NO<sub>x</sub> production for internal combustion engines; and evaporative emission systems.

#### International Road Transport Guide\*

(Freight Transport Association, Hermes House, St John's Road, Tunbridge Wells, Kent TN4 9UZ, UK). Price: £39.

This guide has become an essential tool for international transport operators as it comprehensively explains what rules, conventions and customs regulations are in operation in over 45 countries.

#### Interactive Drilling for Fast Track Oilfield Development\*

Editor: Jacqueline Lecourtier (Éditions Technip, 27, rue Ginoux, 75737 Paris Cedex 15, France). ISBN 2 7108 0804 8. Price: FFr260 (euro 39.64; \$39). 120 pages.

This publication is a compilation of the proceedings of a seminar on interactive drilling for fast track oil field development held in Rueil-Malmaison, France, on 9 November 1999 and organised by the Institut Français du Pétrole (IFP). The aim of interactive drilling is to remove geological uncertainties while drilling progresses, so as to better direct the well itself to the production zones. This involves completely re-thinking the interactive procedures that link drilling measurements to the geological models or reservoirs that were the starting point for scheduling the well drilling. In addition, new measurement techniques need to be developed to improve the understanding of geological formations. This papers compiled in this book cover smart drilling, well data acquisition strategies, geosteering opportunities, wellbore stability and interactive drilling, as well as a case study looking at achieving and maintaining improved drilling performance in the tectonically stressed Andean foothills of Colombia.



#### YOUR OFFICE AWAY FROM HOME

#### Databases held on IP website

IP Members have exclusive access to *Petroleum Review's* News in Brief database (which holds approximately 6,000 news items dating back to 1998); an address database (containing over 1,500 useful industry-related addresses); and the *International Petroleum Abstracts* database (indexing over 11,000 articles dating from 1995).

Members and non-members alike can access the IP Library Monographs and Periodicals holdings catalogues; IP Publications for Sale and Test Methods databases; and the IP Consultants database.

The *IP Corporate Directory* has also recently been made into a database. If you work for a Corporate IP Member and would like your company included, please contact Catherine Cosgrove for more information.

#### New Editions to Library Stock

- Development of UK Oil and Gas Resources 2001: The Brown Book. The UK Department of Trade and Industry, The Stationery Office, London, UK, 2001.
- Geological Perspectives of Global Climate Change. Edited by Gerhard, L C; Harrison, W E; Hanson, B M. AAPG Studies in Geology 47. American Association of Petroleum Geologists (AAPG), Tulsa, US, 2001.
- Oil Supply Security: The Emergency Response Potential of IEA Countries in 2000. International Energy Agency (IEA), Paris, France, 2001.
- Arab Oil and Gas Directory 2001. Arab Petroleum Research Centre (APRC), Paris, France, 2001.

#### Library & Information Service Hours

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

#### **Contact Details**

- Information queries to: Chris Baker, Senior Information Officer, +44 (0)20 7467 7114 Sally Ball, Information Officer, +44 (0)20 7467 7115
- Library holdings and loans queries to: Liliana El-Minyawi, LIS Assistant, +44 (0)20 7467 7113
- Careers and educational literature queries to: Information Assistant, +44 (0)20 7467 7116
- LIS management queries to:
- Catherine Cosgrove, Head of LIS, +44 (0)20 7467 7111
- IFEG queries to: Sally Ball, IFEG Secretary, +44 (0)20 7467 7115

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

\*Held in the IP Library

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Conference proceedings

#### IP 💞 THE INSTITUTE OF PETROLEUM

#### International conference on Deepwater Exploration and Production

The joint workshop on Deepwater Exploration and Production held in London on February 22nd 2001 proved a remarkable success. This joint venture of the Institute of Petroleum and the International Association of Oil and Gas Producers attracted a very large number of delegates to listen to talks by experts in their field from around the world.

Deep water exploration and production targets receive an increasing share of the industry's interest and expenditure as we move further into the 21st century. Areas that were thought inaccessible only a few years ago, are now in production. As in the past the industry will rise to the technical safety and environmental challenges if the rewards justify the risks. This workshop looked at the issue from a global view point with a suite of internationally recognised experts sharing their experience and advice.

Within these complete proceedings, the opportunities and challenges are reviewed then followed by a series of case studies from areas currently under development. The afternoon session papers focus on the technical challenges and solutions that will help unlock even more challenging prospects and the current thinking of the Regulators is also presented. The papers conclude with an assessment of the economics of such ventures.

ISBN 0 85293 337 1

£146.00

25% discount for IP Members

Other conference proceedings published by the Institute of Petroleum are available form Portland Press Ltd include:

Dispute Resolution in International Oil and Gas Industries: The Role of Alternative Dispute Resolution

0 85293 321 5 £146.00

Interspill 2000 International Conference and Exhibition A New Millennium – A New Approach to Spill Response. Spills on Water Surfaces, Shorelines and Inland

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For a complete and up-to-date listing of all IP Publications see our website: www.petroleum.co.uk

### **IP Discussion Groups & Events**

#### Energy, Economics, Environment

#### 'Implications of the Gas and Electricity Crisis in the US'

by **Graham Weale**, Director, European Energy Studies, Primark WEFA Ltd

**19 September 2001, 17.00 for 17.30** at the Institute of Petroleum, 61 New Cavendish Street, London W1G 7AR, UK

Contact: Laura Viscione Tel: +44 (0)20 7467 7100

#### Energy, Economics, Environment

#### 'West Africa – the Elephants' Graveyard'

by **Joseph Bryant**, President, Angola Business Unit, BP Exploration Operating Company

**11 October 2001, 17.00 for 17.30** at the Institute of Petroleum, 61 New Cavendish Street, London W1G 7AR, UK

Contact: Laura Viscione Tel: +44 (0)20 7467 7100

#### Energy, Economics, Environment

'Merger Strategies and Outcomes – Winners and Losers in Oil and Gas Investments'

by **Martin Lovegrove**, Harrison Lovegrove & Co. Ltd

**30 October 2001, 17.00 for 17.30** at the Institute of Petroleum, 61 New Cavendish Street, London W1G 7AR, UK

Contact: Laura Viscione Tel: +44 (0)20 7467 7100

#### 100 Not Out

Alan Chamberlain notched up a century when he chaired the IP's Oil Cargo Measurement Panel PM L-3 on the 5 July. Alan attended the first meeting way back in 1985 and has been to every meeting since then. In addition to this feat Alan has been the 'Captain' (Chairman) since 1990. Great knock so far Alan. Double century in the offering?

#### IP P OF PETROLEUM

#### **Branch Activities**

Southern				
Contact:	Veronica Cloke Browne			
	Tel: +44 (0)1962 715399			
22 Aug:	BP Wytch Farm visit			
TBA Aug:	Softball tournament			
TBA Sep:	Talk by West Moors School of Petroleum,			
TBA Sep:	Visit to local industrial plant			

#### Seminar on Alternative Energy

#### London, Monday 17 September, 14.00-20.00

Organised jointly with the London Oil Analysts Group

Presentations from companies involved in wind power, solar energy, fuel cells, biomass, and coalbed methane, moderated by a speaker from one of the larger integrated oil companies.

Cost per delegate: £25.00, to include post-seminar cocktail reception.

Contact: LOAG Secretary Judith Parry Tel: +44 (0)1132 421171

#### Opportunities in the Nigerian oil and gas/energy industry

The new democratic Government in Nigeria is implementing measures that have created new opportunities, better fiscal incentives for foreign oil and gas investments in Nigeria. As a result, the following opportunities currently exist in Nigeria for foreign oil and gas/energy companies.

1. Upstream (E&P) oil and gas opportunities – There are opportunities for small, medium and large oil and gas exploration and production companies to acquire interests in certain oil and gas blocks onshore and offshore Nigeria, from existing concessionaires. These oil blocks are already proven, with already discovered oil fields which now require only development and production.

2. Downstream oil and gas opportunities – Opportunities also currently exist in Nigeria for establishment of gas projects, sale and purchase of gas (NGLs, LNG, LPG, Condensate, etc.); sale and purchase of petrochemicals; establishment of refineries; exportation of petroleum products (fuel oil - LPFO/HPFO etc.) from Nigeria; importation of petroleum products such as automotive gas oil - AGO (diesel) to Nigeria; etc.

3. Independent power project (electricity) – Foreign companies are also needed to establish Independent Power Projects (IPPs) in various parts of Nigeria.

For more details contact: Inter-Consulting Associates (ICA) 11 Raymond Njoku Street South-West Ikoyi, Lagos, Nigeria Tel: 234-1-2693839; 234-1-2694492 Fax: 234-1-2694492 E-mail: oo-eirl@cyberspace.net.ng; inconas@hotmail.com

### **IP Conferences and Exhibitions**

#### Cadman Memorial Lecture Springboard for progress – building on the energy industry's record for responsiveness

Sir Mark Moody-Stuart KCMG (right) Former Chairman of the Royal Dutch/Shell Group of Companies

Gibson Hall, Bishopsgate, London EC2: Wednesday 26 September 2001, 16.30 for 17.00

Admission, strictly by ticket only, is free of charge. In the event of the Lecture being oversubscribed, priority will be given to IP members. Tickets and further information are available from the IP Conference Department.

#### **IP** THE INSTITUTE OF PETROLEUM

Seminar and Exhibition Improving Safety in Petroleum Distribution

Tuesday 11 September Wolverhampton Science Park, Wolverhampton, UK

For more information please contact the IP Conference Department Tel: +44 (0)20 7467 7100 e: *events@petroleum.co.uk*  The IP's Distribution and Marketing Safety Committee's new seminar providing information on new initiatives, disseminating new IP guidance, and advising pertinent regulatory developments for SH&E professionals and managers of distribution terminals, distribution contractors and authorised contractors.

For further information on these events please contact the IP Conference Department Tel: +44 (0)20 7467 7100 Fax: +44 (0)20 7580 2230 e: events@petroleum.co.uk or view the IP website: <a href="https://www.petroleum.co.uk">www.petroleum.co.uk</a>

The Russian Oil and Gas Sector: Prospects and Opportunities for Growth and Development

in association with AFTP, Confitec, DGMK and Trade Partners UK

London: 1-2 October 2001

Risk Management for Russian Crude and Product Trade – Prospects and Challenges for Building a Domestic Russian Oil and Product Futures Market

Workshop: London 3 October 2001

Full details from the IP Conference Department.

#### Topics will include:

- European Liberalisation of the Oil & Gas Market and the EU Russian Co-operation
- Current Reserves Structure and Forecasts for the Future
- Upstream Infrastructure Development
- Transportation and Distribution
- Financing Solutions
- Improving Managment and Resource Allocation

#### Speakers include:

- Francois Lamoreux, European Commission
- Gurami J Avalishvili, First Deputy Energy Minister, Russia
- Stephen O'Sullivan, United Financial Group
- Yuri Beylin, Yukos E&P
- Alexander Belousov, Deputy Minister of Natural Resources, Russia\*
- Professor Constantine Milovidov, Gubkin University
- Stanislav Vasilenko, Pridneprovskiye Oil Pipelines
- Kairgeldy Kobyldin, KazTransOil
- Professor Leonid Sorkin, Dr of Technical Sciences and Chairman of the Board of Petrocom
- Sergei Mayorov, Mosco Interbank Currency Exchange \*invited



## MOVESople

**Chas Lawrence,** Chief Executive of Wincanton, has been named President of the UK Freight Transport Association.

Wolfram Littich, Peter Michaelis and Norbert Zimmermann have been elected to the Supervisory Board of OMV.

ABB and Schlumberger have created a new joint field venture company, Syntheseas, to offer companies an integrated approach to oil field problems. **Svein Kjellesvik**, a Schlumberger Executive, has been named as Chief Executive.

**Dr Bruce Dean**, Head of Asset Managment Solutions at ERA Technology, has been appointed Chairman of the Board of the Power Industries Division of the Institute of Mechanical Engineers for a three-year term of office.

PdVSA has announced a number of new appointments in a management reshuffle. Luis Pacheco has been named Executive Director of Planning; Carlos Arteaga, Corporate Manager of New Business; Ludovico Nicklas, Executive Director; Cesar Jimenez, Exploration Manager; Jorge Carnevali, Managing Director of Business with Third Parties; Edgar Paredes, Excecutive Director of Refining, Supply and Commerce. At PdVSA Gas, Nelson Nava and Luis Andres Roja were appointed President and Vice President respectively.

BP Marine has created an Oslo-based international fuels team, to be run by Tore Larsen and Ole Jota.

Five new members have been voted to the Board of Nymex. **Michel Marks, Joel Faber** and **Joseph Cicchetti** were elected to a number of newly created positions as Equity Holders Representatives. **John McNamara** was elected to complete a two-year term in the Futures Commission Merchant Catagory and **Melvyn Falis** was elected to complete a one-year term as a Public Director.

**Mitchell Lewis** has joined the North of England sales team for Fisher-Rosemount's PlantWeb and DeltaV process atomation systems.

Phillips Petroleum and Tosco Corporation's new Refining, Marketing and Transportation organisation will be headed by Phillips Executive Vice President **Mike Panatier**, who will become Chief Operating Officer of the new organisation; **Tom Nimbley** will be in charge of refining and become Senior Vice President of Philips; Phillips Transportation and Products Supply Manager, **Steve Barham**, will be in charge of Transportation and will become Vice President of Phillips; **Mark Harper**, Tosco's Vice President of Branded Retail, will be in charge of dealer/marketer activities for the new organisation.

Baker Hughes has appointed **Derek Walden** President of its EIMCO unit.

DuPont Safety Resources, the safety consultancy specialist company, has appointed Juan-José Salamanca Business Vice President-Europe, Middle East and Africa (EMEA).



John Cairns has joined the expanding global team of Ross Electrical Oil and Gas International as Business Development Manager for Safety Products.



Opec's Board of Governors has appointed Kuwaiti Adnan Shihab-el-Din as Director of Research.

Judy Boynton has been named Finance Director of Shell.

Smartbunkers, the online exchange for marine fuels, has named **Ian Workman** head of its new offices in Stamford, US.

**Richard Nayler** has been appointed Sales Manager of tank builders and pipework contractors Rhyal Engineering of Milford Haven.

IntercontinentalExchange, the electronic marketplace for over-the counter energy and metals products, has opened an office in Singapore and has appointed **Soo Molyneux** as Marketing Manager.

**Craig W Gordy** has joined Paragon Engineering Services as Manager of Safety Engineering Services.

Dr Peter Swift has recently been appointed Managing Director of Intertanko. He had previously been involved with Intertanko as Chairman of its Market Research Group and as a member of the Communications and PR Committee.



The European Energy Exchange (EEX) Supervisory Board has elected **Frank Gerstenschläger** as its Chairman and **Dr Jürgen Kroneberg** Deputy Chairman.

Swift Energy has named **Terry Swift** Chief Executive, in addition to his role as President.

The UK Offshore Contractors' Association (OCA) has appointed Kvaerner Oil and Gas Managing Director, **Alan Wilson**, as Board Member responsible for Health, Safety and the Environment. **George Brown**, Managing Director of MacGregor Energy Services, has been appointed OCA Vice Chairman.

Briggs Marine Environmental Services has promoted **Joe Small** to Director of International Business Development and **David Cook** Director of International Operations.

Mary Henderson has been named a non-Executive Director of Shell Transport and Trading.

Wincanton, a UK supply chain management company, has appointed **Bob Tennuci** as Risk and Insurance Manager.

**IP W** THE INSTITUTE OF PETROLEUM

### **Training Courses 2001**

#### 2 November 2001 London

in association with Management Training

#### INTRODUCTION TO MANAGING CULTURAL DIFFERENCES

Delegates to this one-day, interactive course will learn essential skills which are vital for those working with diverse national cultures, either in the UK or abroad. The oil and gas industry brings together people from many different countries and expects them to work in harmony in sometimes difficult environments. These situations inevitably involve differences in attitudes and cultures, which can lead to misunderstanding and conflict. Those in the oil and gas industry are more aware than most that effective handling of cultural issues can improve company profitability, business opportunities, and career advancement. This course provides the critical skills and necessary understanding so that working abroad becomes a rewarding experience for the individual and his or her company.

#### The Course Will Cover:

- The critical areas that cause difficulties between different nationalities
- The scope of business activities that are affected by those critical areas
- Selected skill techniques designed to improve business and personal efficiency in a multinational environment



#### Who Should Attend?

This course is essential for anyone working abroad or with foreign nationals in the UK. This includes:

- Technical, operational, and engineering personnel
- Marketing, sales and support staff
- Executives, policy makers, managers
- Foreign nationals working in the UK will also benefit from the course

Registration Fee: IP Member: £400.00 (£470.00 inc VAT) Non-Member: £475.00 (£558.12 inc VAT)

### **CONFIRMATION NOTICE**

### 8 - 10 October 2001

### **Introduction to Oil Industry Operations**

A 3-day training course of particular interest to **NEW STARTERS** to the oil and gas industry and companies supporting it and **THOSE ALREADY** working with or within it wishing to expand their knowledge of its activities and structure.

> IP Member: £1300 + VAT @ 17.5% Non-member: £1500 + VAT @ 17.5%

For more information please contact: Nick Wilkinson at the Institute of Petroleum Tel: +44 (0)20 7467 7151 Fax: +44 (0)20 7255 1472 E-mail: nwilkinson@petroleum.co.uk www.petroleum.co.uk/training

#### IP W DEPETROLEUM IP AUTUM IP AUTUM

Guest of Honour and Speaker

Euan Baird Chairman and Chief Executive Officer Schlumberger

#### Park Lane Sheraton, London W1 Tuesday 2 October 2001

The Institute of Petroleum is pleased to announce its fourth annual IP Autumn Lunch, this year with Guest of Honour and Principal Speaker, Euan Baird, Chairman and Chief Executive Officer, Schlumberger

The IP Autumn Lunch is now an established date in the oil and gas calendar of events, and provides a unique opportunity to hear an internationally-renowned figure speak on the issues influencing our global industry today.

For more information on registering for the above event please contact: Christine Pullen, IP Conference Supervisor, The Institute of Petroleum, 61 New Cavendish Street, London W1G 7AR Tel: 020 7467 7100 Fax: 020 7580 2230 e: cpullen@petroleum.co.uk

For more information on other IP events please visit the IP website: www.petroleum.co.uk



Lunc

Euan Baird, a Scot educated in the UK, joined Schlumberger in 1960 as a field engineer. His career commenced with various field assignments in Europe, Asia, the Middle East and Africa, following which he was appointed Vice President of Operations, Technical Services, Paris, He moved to New York in **1979 as Executive Vice** President of worldwide wireline operations, and in October 1986 he was elected Chairman of the Board. **President and Chief Executive** Officer.

> TICKETS ARE LIMITED

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