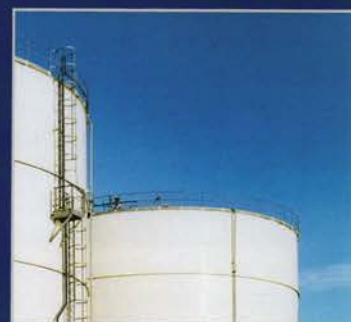
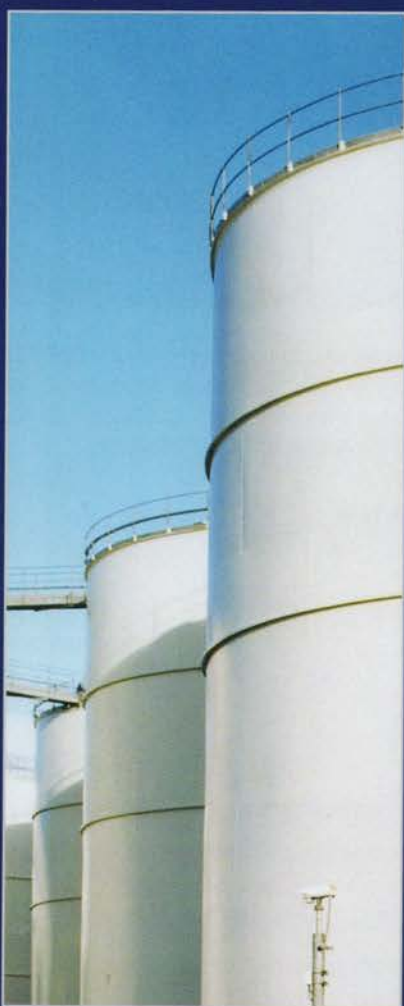


Petroleum *review*

AUGUST 2002



Bulk storage

- A serious business

Trading

- Getting connected for e-business

Gas

- Plenty of natural gas?

Supplies

- Deepwater oil to solve US energy crisis?

Covering the international oil and gas industry from field to forecourt –
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IP Autumn Lunch

Tuesday 8 October 12:30-14:30

Claridges Hotel, Brook Street, London

Guest of Honour and Speaker

Peter Sutherland, Chairman, BP Plc

Tickets are limited. Book now to avoid disappointment.

Peter Sutherland is non-executive Chairman of BP Plc (1997-current). He is also Chairman and Managing Director of Goldman Sachs International (1995-current). Of Irish nationality he was born on 25th April 1946 and was educated at Gorzaga College, University College Dublin and the King's Inns. He currently serves on the Board of Directors of Investor AB, Telefonaktiebolaget LM Ericsson and the Royal Bank of Scotland Group Plc. Prior to his current position, Mr Sutherland served as Attorney General of Ireland (1981-1984); EC Commissioner responsible for Competition Policy (1985-1989); Chairman of Allied Irish Banks (1989-1993) and Director General of the World Trade Organisation, formally GATT (1993-1995). Peter Sutherland has received numerous awards and has eleven honorary doctorates from universities in Europe and America. Peter Sutherland is married and has three children. His leisure interests include reading and sport.

To apply for tickets, please complete this form in BLOCK CAPITALS and return it to the address below, together with payment in full. For further information please contact Laura Viscione, The Institute of Petroleum, 61 New Cavendish Street, London W1G 7AR. Tel: + 44 (0) 20 7467 7174, Fax: + 44 (0) 20 7580 2230, lviscione@petroleum.co.uk

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ABBREVIATIONS

The following are used throughout *Petroleum Review*:

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

No single letter abbreviations are used.

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

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Tank farms

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A plea for more hard science

The extraordinary success of the international oil and gas industry in finding and delivering the energy its customers want is due to one single, central idea. That idea is the effective and consistent application of hard science – testable, reproducible science and engineering. Deepwater, or any other, oil and gas fields are not found and developed by hope and hunch but by applying scientific understanding and engineering techniques. Endlessly checking, testing, recalculating while also evaluating and adopting improvements.

One positive result of this process is that the industry has a remarkably good safety record. The recent tragic helicopter crash in the North Sea, however, reminds us that although rare major accidents do happen and that there is a real human cost to the reliable supplies of oil and gas we all take for granted. Unfortunately for the industry the spirit of the times is permeated with soft science, feelings, beliefs and unscientific prejudices. For any industry clearly built on hard science this has been little short of bewildering.

As the direct result of vast investments in cleaner fuels air quality in many of our cities is back to levels last seen in the 1950s. The smell of petrol and diesel has virtually been banished from the streets but, the industry gets little recognition and less praise for this achievement. All too many people would rather stick with their prejudices about a rapacious and despoiling industry rather than address the reality. The single most devastating consequence of this approach is the number of young people whose minds are all but closed to the possibility of a career in the oil and gas industry. Neither society nor the industry can afford this but how do you make people clear eyed in an age of fuzzy thinking?

Of all the many factors contributing to the demonisation of our industry nothing has been so pervasive as the myths surrounding global warming – or more correctly climate change. Climate change science is an extremely 'soft' science and very imprecise. Those involved have done a fantastic job at persuading governments and populations that the results are clearcut and precise. They are not. In most cases the variability – the +/- error – is greater than the effect recorded. To try and put things on a more balanced and scientific basis, a number of key questions must be addressed.

1) Are global weather patterns and global temperatures actually moving outside historic ranges?

Comprehensive statistics have only been available for 100 years or so and even then only for a limited number of locations. Calculations and extrapolations to earlier periods are subject to considerable uncertainty and variability so the answer is:

- a) On a geological scale the current variation is trivial;
- b) On a 1,000 year time-scale it is well within known variation;
- c) Only if we pick an arbitrary date say 1780, 1900, 1970 is there any possibility of showing that variables might be moving outside some pre-defined range.

Many people disapprove of contemporary society and lifestyles. So called climate change has become a convenient cover for those who wish to have a 'scientific' justification for their authoritarian impulses.

They actually wish to tell us how to live our lives. Climate change fears appear to legitimise their prejudices.

2) Why is climate changing?

Firstly this begs the question as to whether, in any significant sense, it is. Climate is always changing – in fact it would be rather more worrying if it stopped changing. So if there is significant change what is the cause? The honest answer is we don't really know. There are probably earth/orbit components, there also seem to be effects from changes in solar radiation. The most widely held explanation is the changing concentration of the so-called greenhouse gases. Calculations show the direct effect of these to be quite small. The headline grabbing numbers come from the computer extrapolation of the basic effect plus a whole series of feedback effects (improbably, virtually all the feedback effects included appear to be positive – making things worse). Now the extrapolations and future effects are all calculated using super computers and meteorological models of the atmosphere. However, the computer models are exactly the same ones that were used to 'prove' chaos theory. A bit more hard science and a little less 'if this trend continues' would appear to be in order if we are to actually understand what might be going on.

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



Users of Fugro's differential GPS (DGPS) services are now able to obtain updated coverage charts by means of a new web-based service called Survey Planner. Aimed at the offshore oil and gas, seismic and hydrographic survey, dredging, specialised shipping and other marine markets, visitors to www.surveyplanner.com can produce customised maps for any location and type of service.

The Oxford Princeton Programme has unveiled its latest web-based training course – 'Introduction to Credit Risk Management' – that aims to help students understand credit risk and teach companies how to minimise credit risk. For more information, visit www.oxfordprinceton.com.

Wellhub is a new website dedicated to the distribution of wellsite information, including logs, reports, documents and images. For more information, visit www.wellhub.com – access will be free for a limited period only.

Visitors to the new www.oilandgas-projects.com now have full access to a worldwide projects database that includes projects from the original nine countries within the previous Trade Partners UK service in addition to Angola and the deepwater Gulf of Mexico. As part of the new service, country overviews are provided that contain contacts both in the UK and internationally – signposting subscribers to forthcoming opportunities.

Chemists around the world now have access to two new chemistry tools online at www.ChemWeb.com (r) The tools supplied by Advanced Chemistry Development – ACD/Name to Structure and ACD/Name.

The European Internet Network has launched additional online new services covering all 50 US States and Canada. Free trial subscriptions are available at www.europeaninternet.com/login/affiliate_register.php3

Australia's Department of Industry, Tourism and Resources has relaunched its website. The Resources & Energy section contains information on Australian offshore petroleum exploration, including liquefied natural gas; exploration areas available for bidding; environmental, investment, legislative and taxation issues; and the Timor Gap Joint Petroleum Development Area. Log on at www.industry.gov.au/resourcesandenergy

Ofgem's consultation policy is available on the Ofgem website www.ofgem.gov.uk

Subscribers to Sibneft datafeed can compare the latest monthly data with historical data contained in the archive at www.sibneft.com

In Brief

UK

Following further appraisal reserves for the Buzzard field have now been put at 850mn–1bn barrels of oil in place – making it the largest North Sea oil discovery in the past 25 years. EnCana, the operator, is understood to be planning to submit a field development plan to the UK Department of Trade and Industry by late 2002/early 2003. First oil is slated for 2005.

Petro-Canada has finished development of the Guillemot West & Northwest oil fields in the central North Sea. Total production from the two fields is in the region of 28,000 b/d with a further 18,000 b/d contribution from the recently completed Western Extension.

TotalFinaElf has received development approval from the Norwegian Ministry of Petroleum and Energy for the Skirne and Byggve gas and condensate fields located in the south central section of Block 25/5, in the Norwegian North Sea.*

Wood Group Engineering (North Sea) subsidiary, Gas Plant Services has been awarded a contract by Mobil North Sea Ltd (MNSL), an ExxonMobil division. The contract is for the engineering, procurement and construction of modifications to MNSL's Sage plant at St Fergus.*

Talisman Energy (UK) and its co-venturer Amerada Hess has announced first production from the Halley field.*

Europe

ENI and Saipem have allegedly been awarded three-year drilling contracts from Statoil, worth \$160mn.*

Complete news update

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

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

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

www.petroleum.co.uk

NEWS *Upstream*

Development started on the deepwater Xikomba field



Schemata of ExxonMobil's deepwater development technology

ExxonMobil subsidiary Esso Exploration Angola has commenced construction of the Xikomba deepwater development offshore West Africa. The field, discovered in 1999, is located in the northwest corner of Angola Block 15, approximately 230 miles northwest of Luanda. It is estimated that recoverable resources in the field are in the region of 100mn b with an expected peak production of 80,000b/d.

The technology to be utilised for the block will consist of nine subsea wells tied back to a Floating Production, Storage and Offloading (FPSO) vessel in water depths of 4,000–5,000 feet. In order to accelerate start-up a purpose built FPSO has been leased which will be employed as an Early Production System (EPS).

First oil is scheduled for late 2003 – the first production from Esso-operated Angolan Block.

Technip-Coflexip has been awarded the contract for the procurement, fabrication and installation of flexible flowlines and risers connected to the FPSO as well as installation of umbilicals, rigid jumpers and associated subsea equipment. The company will project manage, engineer transport and install the required production lines, water injection/gas injection lines, gas injection lines and flowline end terminations,

with the installation to be executed by a the CSO Constructor during 2003.

The local community will also benefit from the deepwater production with the award of contracts and subcontracts to Angolan companies for the provision of in-country fabrication, logistics support as well as training, development and employment of Angolan nationals. The contracts will support sustained growth and expertise in Angolan capacity to also support future offshore developments according to Exxon.

ExxonMobil also has exploration interests in nine Angolan deepwater blocks as well as a one shallow-water block covering over 12mn gross acres of which it owns a 40% stake. Other participants include BP Exploration (Angola) (26.67%), Agip Angola Exploration (20%) and Statoil Angola (13.33%). Sonangol is the concessionaire. In total, the co-venturers have announced 22 development discoveries on Angolan Blocks 15 and 17, which represent development opportunities, and a with recoverable resource potential of over 7.5bn boe.

Other development ongoing on the Block is the construction of the \$3bn Kizomba A project which commenced in August 2001. This field has approximate recoverable resources of 1bn b of crude with an output target of 250,000 b/d.

BP heads for Sakhalin with Rosneft

BP, in conjunction with its alliance partners Rosneft and Risneft Sakhalinmorneftegaz has been awarded a five-year exploration licence for part of the Sakhalin V block. The alliance was purposely set up in 1998 to develop Sakhalin V hydrocarbons of which BP owns 49%.

The exploration licence is for the Kaigansky-Vasuyansky blocks of the East-Smidt offshore area in the southern area of the Sakhalin V tract.

Although Sakhalin is ice-bound for

much of the year and technically challenging, BP's 30 years of experience in Alaska will help overcome any problems with exploring in a similar climate.

Geological studies of the subsurface of the licence area will be jointly carried out by the Alliance as well as seismic acquisition and exploration drilling.

The Sakhalin Offshore has produced five major oil discoveries of more than 500mn/b of oil and 1tn cm of gas over the last 30 years.

Dissent growing over Greater Sunrise

Opposition to Shell's plan for a floating liquefied natural gas (FLNG) barge to extract and process gas from the Greater Sunrise fields in the Timor Sea is growing, reports *Brian Warshaw*. Shell and Woodside Energy believe that the benefit of the FLNG barge, with its lower capital expenditure than that of a platform, pipeline and onshore processing plant, will enable it to sell to a wider market, at a competitive price. Market research carried out by joint-venture partner Phillips Petroleum, however, indicates that all the gas could be sold in the Australian market without the need for LNG processing.

The Northern Territory (NT) Government is arguing for a mid-way solution, with half the gas being processed into LNG for export, and the other half being available for domestic

consumption. It claims that anything less than 50% will result in the economic development of the country being stunted. Sunrise gas would provide the security of supply leading to new gas-based industrial development, the substitution of gas usage for carbon dioxide-producing coal and diesel, the creation of 4,400 full-time jobs, along with an annual income of A\$110mn for the State and Commonwealth governments. The NT Government forecasts that A\$15bn in gross domestic product would be added to the economy over the lifetime of a land-based project.

The Greater Sunrise fields contain an estimated 9.17tn cf of gas and 300mn barrels of condensate. Development, before the current controversy, was planned for mid-2006.

Calder field consent

The UK Energy Minister Brian Wilson has given formal consent for the development of Burlington Resources' Calder field in the East Irish Sea. Field reserves are put at 250bn cf of gas and 49,000 barrels of condensate. Production is expected towards the end of 2003.

Calder is the first of five fields planned to be developed as part of the £165mn Rivers project, which also includes a new 45-km long, 24-inch diameter pipeline to carry gas to a new onshore treatment plant being built adjacent to the existing North Morecambe terminal in Barrow, Cumbria. The other four fields – Darwen, Crossans, Hodder and Ashland – will be produced as spare capacity becomes available in the Calder facilities.

Latest developments in the Gulf of Mexico

- *Kerr-McGee's deepwater Boomvang field in the Gulf of Mexico, located in 3,500 ft of water has come onstream. The field is currently producing 50mn cf of gas plus condensate and is anticipated to hold up to 100mn/boe. The company predicts peak production will be 160mn cf of gas and 32,000b/d in the 2Q 2003.*
- *The Red Hawk deepwater natural gas field, located in 5,300 feet of water in block 877 of the Garden Banks area of the Gulf of Mexico, has had development approval*
- *from Kerr-McGee. The field, which has estimated reserves of more than 250bn cf of gas, will be developed by means of a mini-floating production facility, capable of processing 120mn cfd of gas.*
- *It has been reported that BHP Billiton will invest up to \$25mn to develop the Boris oil and gas field in the Gulf of Mexico.*
- *The US Minerals Management Service (MMS) is reported to have accepted 489 bids valued at a total \$355.3mn in its latest central Gulf of Mexico lease sale.*

DEA development approval

Plans for the licensees of the Nini and Cecilie oil fields have been approved for development by the Danish Energy Authority (DEA). Operator of the development Dong has signed a contract with Saipem UK and Bladt Industries for construction and installation of the platforms and establishing the pipeline connections between the two fields and the nearby Siri platform. The two unmanned installations will be built at Bladt Industries in Aalborg, Denmark. Production is expected to start in late summer 2003. Oil from the Nini and Cecilie fields will be processed at and shipped from the Siri platform.

In Brief

*Alpha North, a Statoil-operated satellite, has been given the green light by licensees. The satellite is close to Statoil's Sleipner West field**

It is reported that Italy's Eni Spa has signed an agreement for investment worth Euro 320mn with Croatia's INA to develop gas reserves offshore Croatia.

*Petroleum production from the Norwegian Continental Shelf in May was 22.2mn cm with oil production approximately 14.9mn cm.**

ABB has signed contracts with Norwegian oil company Statoil worth a total of \$230mn. ABB will receive \$70mn to supply an offshore power transmission system and \$160mn to design, build and install a compression module for Statoil's Troll A gas platform in the North Sea.

*Norsk Hydro has submitted a \$280mn development plan to export gas from its Visund field in the northern North Sea to Europe. The company is looking to export gas to Europe through the Kollnes onshore gas terminal in Norway.**

North America

Canadian Natural Resources has said that it has applied to build a \$5.3bn oil sands project north of the oil sands hub of Fort McMurray, Alberta. The Natural Horizon's project, if approved, would start pumping 110,000 b/d of synthetic oil by 2007, increasing to 232,000 b/d by 2011.

Middle East

*Apache has announced the successful completion of its Tut 51 well, which tested at a daily rate of 3,200 b/d and 7.7mn cf of gas. Located on Apache's 2.3mn acre Khada Concession in Egypt's Western Desert, the well tested 54 of 162 total feet of Khatatba pay.**

*ExxonMobil has announced that it will drill a second exploratory well in Azerbaijan's offshore Nakhchivan field.**

Syria is planning to offer 11 exploration blocks covering 63,300 sq kms in an upstream licensing round.

Russia & Central Asia

Halliburton's Energy Services Group has been awarded a two-year contract extension with Agip KCO (formerly

OKIOC) for the provision of integrated drilling services to the Kashagan field in the Kazakh sector of the Caspian Sea. Agip KCO, the field operator, is expected to deliver first oil by 2005.

Russian 2Q oil production was up by 8.6% from year ago levels at 7.31mn b/d. Gas production also rose in by 2.6% for the same period to 302.7bn cf/d.*

The ChevronTexaco-led Group has launched a \$800mn project to boost output at the Tengiz oil field in Kazakhstan. The project will involve injecting gas into the reservoir.*

Sibneft aims to increase oil production to 830,000 b/d by 2005, under a long-term growth strategy. The company's Sugmut field, which contains reserves of close to a billion barrels is forecast to make a contribution of 140,000 b/d.*

The Lukoil-Fortum joint venture company Severtok will borrow \$200mn from EBRD to finance the development of an oilfield in the Arctic Circle reports UFG.*

Asia-Pacific

The second phase development of Unocal Thailand's development of the Pailin field in the Gulf of Thailand has commenced, raising total field production to 330mn cf/d of gas.

The Apache-operated Harriet Joint Venture has reported that its Gibson and South Plato fields in the Carnarvon Basin offshore Northwest Australia are now on production, flowing at combined rate of 22,265 b/d from two wells.*

China National Offshore Oil Corporation (CNOOC) and Sinopec are understood to be planning to invest some \$100mn on upgrading their Bohai Bay oil and gas facilities in order to treble output to 21mn t/y from the shallow water area by 2005.*

Husky Energy and the CNOOC have reported first oil from the Wenchang offshore project in the South China Sea.*

The Indian Government is reported to have approved state-owned Oil & Natural Gas Corporation's (ONGC) \$750mn bid for Talisman Energy's 25% stake in the Greater Nile Petroleum Operating Company that currently operates 230,000 b/d of production from oil fields in Sudan.

Latin America

Shell and Mitsubishi Corporation have signed an agreement covering their par-

UK oil production rises in April

April oil production rose on the month and year for the first time since December 2001. However gas production was down on the month and year according to the Royal Bank of Scotland Oil and Gas Index.

'The current oil price environment is positive for UK oil production' said Tony Wood, Senior Economist with Royal Bank of Scotland Group. 'However, gas price weakness has seen production cut back. Despite this, the long-term fundamentals for UK gas are positive with the UK expected to

become a net importer over the next three years and long-term demand expected to grow.'

UK oil production was up 5% in April compared to March and up 1.7% on April 2001. The average daily production was 0.5% lower than in the 12 months to April 2001. Gas output was down by 2% on March and 4.3% lower than in April 2001. Combined oil and gas production rose by 1.6% on the month. Average daily production in the 12 months to April 2002 was 3% lower than in the 12 months to April 2001.

Year Month	Oil production (av. b/d)	Gas production (av. mn cf/d)	Av. oil price (\$/b)
Apr 2001	2,223,924	11,918	26.00
May	2,170,520	9,155	28.30
Jun	1,993,483	8,639	27.60
Jul	2,033,323	8,841	24.70
Aug	2,018,982	8,814	25.60
Sep	1,984,388	9,091	25.90
Oct	2,169,226	8,909	20.60
Nov	2,161,755	11,949	18.80
Dec	2,425,159	12,621	18.60
Jan 2002	2,270,322	12,303	19.30
Feb	2,247,395	11,732	20.20
Mar	2,153,321	11,640	23.80
Apr	2,261,331	11,403	25.70

Source: The Royal Bank of Scotland Oil and Gas Index

North Sea oil and gas production

Libyan platform contract for Saipem

The government of Libya has commissioned Saipem of Italy to build and install a gas production platform north-west of Tripoli. The contract is worth \$551mn. The platform, off the shores of Libya in the Mediterranean, is expected to produce close to 6bn cm/y of gas. In a collaboration earlier this year between Libya and Italy, the former's Noc and the latter's Eni jointly awarded a \$1bn contract to an international consortium for planning/building hydrocarbon treatment/LPG plants on the outskirts of Mellilah, on the Libyan coast and in the desert area of Wafa. Approximately 2bn cm/y of the output is for local use and 8bn cm will be exported to Italy via a 540-km submarine pipeline which is due to be completed in 2003 writes Stella Zenkovich.

Results of UK 20th Offshore Licensing Round

UK Energy Minister Brian Wilson has offered 25 Licences in the latest Offshore Licensing Round to companies willing to participate in the ongoing development of the UK's oil and gas resources.

The 25 Production Licences have been awarded to groups made up of 33 different companies ranging from the majors, to companies acquiring their first offshore licences.

Wilson commented that 'it is encouraging that so many companies see further opportunities for investment and development in the North Sea's core areas after 40 years of intensive exploration there'. He said in encouragement of the smaller applicants that 'the DTI will seek to give every opportunity to small, innovative companies eager to exploit the UK's hydrocarbon resources with new technology.

Want to know the latest rig count from Baker Hughes? Visit the IP website home page @ www.petroileum.co.uk

Guidance on fire and explosion hazards

In February 2002, the UK Offshore Operators Association (UKOOA), and the UK Health & Safety Executive (HSE) commissioned the MSL Consortium* to develop the first part of new industry guidance for fire and explosion hazards. The new initiative will develop guidance to assist designers and duty holders, as well as regulatory and verification bodies, and will encompass guidance for both the design of new offshore installations as well as modifications to existing facilities.

Approximately 300 joint industry projects and sole HSE-funded research and development (R&D) projects in the field of fires and explosions have been executed since 1988, at a total cost to industry of some £31mn. The findings from these exhaustive R&D efforts will be reflected in the new guidance, which will comprise three parts:

- Part 1 – guidance on design and operational considerations for the avoidance and mitigation of explosions.
- Part 2 – guidance on design and oper-

ational considerations for the avoidance and mitigation of fires.

- Part 3 – detailed guidance on the implementation of good design practice in fire and explosion engineering.

An advisory panel and peer review panel have been set up to provide technical guidance and direction to the project. The draft guidelines for each part will be made available to industry for comment via planned workshops in London and Aberdeen. The draft guidelines for Part 1 are expected to be available in July 2002. Fireandblast.com expects to issue tender documents for Part 2 later this year. For more details, visit www.fireandblast.com/ign-update.htm

*The consortium comprises MSL Engineering, Century Dynamics, Genesis Oil & Gas, Imperial College, Aker Kvaerner, Morgan Solutions and WS Atkins. Fireandblast.com is the project facilitator on behalf of UKOOA/HSE.

Singapore to Baku – the incredible journey



A complicated towage and carriage operation of a partially-assembled semi-submersible oil rig platform has successfully been completed by Silverburn Shipping. The voyage began at the Keppel Shipyards in Singapore and progressed along the Volga Don River/canal system in southern Russia for use by ExxonMobil in the Caspian Sea. The project required the simultaneous placing of up to eight tugs and two heavy lift barges in two different locations in the Black and Azov Seas to meet with ocean-going vessels, in order to transfer the cargo quickly and deliver it within the required 25 days to Baku (above).

Sonangol to barter oil for Israeli goods

Sonangol, the oil/fuel company, has got the Angolan government's agreement to export 10,000b/d of crude to Israel in barter for non-military – primarily agricultural – goods. Bilateral trading has so far been hampered by the African countries low credit rating. The deal has been under negotiation for the past 18 months writes Stella Zenkovich.

In Brief

Participation in the \$3bn Mariscal Sucre project to develop LNG in the Paria peninsula. The project calls for the construction of a 4.7mn tpy LNG terminal by 2007 that will be fed by some 10tn cf of offshore gas reserves. Up to 300mn cf/d of gas is expected to be destined for the domestic market. Project partners are PdVSA (60%), Shell (30%) and Mitsubishi (8%), with the remaining 2% earmarked for Venezuelan investors.

Falklands Islands Hydrocarbon Consortium have been awarded 10 offshore exploration licences by the Falklands Islands Government. The licences are located in the southern area of the Islands, covering a total of 57,000sq km.*

The Mexican Government aims to expand output from the current 3.1mn b/d to 4.1mn b/d by 2006.

In accordance with Opec's recent announcement on quotas, non-Opec member Mexico has said it will maintain its current oil export quota of 1.66mn b/d during the 3Q.

Africa

Daewoo Shipbuilding Marine Engineering Company, the world's second largest shipbuilder, has won a \$426mn order to supply an oil and gas rig to Angola, reports Mark Rowe. The South Korean firm said it would build the rig in the West African state for US oil giant ChevronTexaco by the end of 2003.

Energy Africa has announced that the G-10 exploration well that discovered oil in block G in the Rio Muni Basin offshore Equatorial Guinea is to be renamed Abang. Located just 3 km from the Oveng and Elon discoveries, Abang is the company's seventh discovery in Equatorial Guinea.

ExxonMobil, together with partners BP, Agip Statoil and Sonangol have started development of the Xikomba deepwater field in block 15 offshore Angola. They are working to recover 100mn barrels of reserves located in 4,000-5,000 feet of water.

The Algerian Ministry for Energy and Mines and the Algerian state company, Sonatrach, have awarded Repsol YPF two gas exploration blocks on the Reggane basin in southern Algeria*

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

UK

UK Energy Minister, Brian Wilson has welcomed the announcements by ExxonMobil and Centrica to bring new sources of gas to the UK. The Exxon deal will bring Liquefied Natural Gas (LNG) to the UK from Qatar from 2006/7, allowing the UK to have a more diverse gas supply.*

Legislation has been introduced in the UK giving shareholders an annual vote on company directors' salaries and has been laid before Parliament.

Europe

Aker Kvaerner has established a new company with Conoco. The new company – DeepWater Composites – will manufacture and sell risers and tethers made of composite materials.

TotalFinaElf is seeking to acquire a 25% stake in the 2tn cm offshore Stockman gas field, in the Barents Sea reports UFG. The field is currently licensed to Rosshelf – a 5% Gazprom subsidiary with a 12% LUKoil minority interest.*

Deutsche Shell GmbH has agreed to the sale of its shareholding in Ruhrgas, a major German gas distributor, to E.ON, the German utility company. Deutsche Shell has a 14.75% indirectly held interest in Ruhrgas.

North America

ChevronTexaco has increased its merger-related synergy target to \$2.2bn to be achieved by April 2003. The company says it also expects to meet its previously announced \$1.8bn annual synergy objective by October 2002, six months ahead of schedule.

ChevronTexaco has revealed a half-year decrease in profits with net income down to \$752mn from £2.4bn last year.

Canadian oil companies have criticised a recently passed bill in the US Senate that would set a floor price for Alaska gas, which could spark a trade dispute between Canada and America, writes Monica Dobie. Ron Brenneman, CEO of PetroCanada said that it 'represents a form of subsidy for gas from one particular source in North America. We would have gas effectively coming into a deregulated market – that we all compete in – which might actually be subsidised by the US federal government.'

Contract competition in the Burgos Basin

Petróleos Mexicanos (Pemex) has invited foreign companies to compete for contracts worth \$8.8 billion to extract dry natural gas from the Burgos Basin, just south of the border with Texas writes *Simeon Tegel*.

Pemex, the world's third producer of crude oil, intends to offer around six multiple service contracts lasting between 10 and 20 years with initial bids due in by November.

The move is intended to ease the pressures on the cash-strapped state-owned oil monopoly that hands over almost all of its profits to the Mexican treasury. It would also see the biggest return to Mexico of foreign oil companies since the industry was nationalised here in 1938.

At the same time, the projects will boost natural gas production in a rapidly developing country where daily demand is set to rise from 1.2bn cf now to 3.9bn cf by 2010. The Burgos Basin, meanwhile, which produces around 1bn cf/d and falling, may finally reach its true potential of 1.4bn cf per day.

However, Pemex still faces two major hurdles before any of the contracts can be signed – skepticism from the commercial oil companies, and domestic political opposition in a country where sovereign sub-soil energy rights are protected from foreign control by the constitution.

As a result of that constitutional bar, Pemex may only offer service rather

than risk contracts. Contractors will thus be paid a fixed return for building and operating wells rather than given a share of the gas extracted.

Traditionally, the major oil companies prefer to work only with risk contracts, permitting reserves to be listed as assets on their balance sheets. However, Pemex hopes its multiple service contracts, grouping large numbers of smaller service contracts into one bigger deal, will offer both the scale and incentives needed to attract the major players.

Meanwhile, the contracts could face a supreme court challenge from the left-wing Democratic Revolution Party and members of the former ruling party, the Institutional Revolutionary Party, who believe they violate not just the spirit but also the wording of the constitution.

'It is political,' said an independent Mexico City-based energy analyst. 'There are people who are going to want to challenge these contracts in the courts. It is by no means certain they will be allowed to go ahead.'

Pemex has named a list of 70 companies that have expressed interest, including Shell, BP, Chevron Texaco, Schlumberger and Halliburton. About 400 oil executives attended Pemex's presentation on 20 and 21 June. Most regarded the contracts as a significant step towards opening up Mexico's energy sector but were non-committal about whether they would bid.

Russia is boosting oil production and exports

The Russian government has announced that it will raise oil exports by 150,000b/d in the third quarter as the volume Russian oil export plans to the US are taking shape. Lukoil has purchased 22% of the state's 60% equity-holding in Murmansk Seaport for 282mn roubles/\$9.4mn. The 33,194 shares had a nominal price of 0.5 roubles – but were sold for R8,500 each. The largest Russian oil company is completing an oil terminal within two years on the Barents Sea at Murmansk, which is the most viable export outlet for the US according to Vice-President Leonid Fedun. Projected freight/shipping costs at the terminal will come to a competi-

tive \$28/t. Lukoil is also building a products terminal aimed at the US market at Vysotsk, in the Bay of Finland.

Transneft, the oil pipeline monopoly, is developing oil production and export plans of its own from the integrated Druzhba-Adria-tic pipeline via Omisalj in Croatia, and from Nakhodka in the Russian Far East, which it is to hook up with a new pipeline. However, Yukos has already loaded US-bound crude in June on the *Astro Lupus* VLCC offshore Greece, and also dispatched another 80,000 tonnes of crude via another chartered VLCC in July to the US Gulf writes *Stella Zenkovich*.

Thinking about a career in the oil and gas industry?
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UN predicts problems for 'Iraq Oil for Food Programme'

Diplomats at the United Nations' headquarters in New York say that the 'Iraq Oil for Food Programme' is in danger of running into serious problems once again unless alleged ambiguities and contradictions in the current system are sorted out, reports *Michael Fox* in New York.

Critics are particularly focusing on the retrospective pricing mechanism that was introduced last October in an effort to stamp out illegal premiums that Iraq had been charging oil companies, of up to 30 cents (US\$) a barrel. The idea was that by setting the price after contracts had been signed, the Iraqis would be prevented from slashing the official price of the oil supplied to companies, who were offered cheap product as long as they paid a premium direct to the Iraqi government.

Since then, oil sales through the scheme have fallen to around 1.5 million barrels per day, well below the permitted 2.2mn b/d, and the 2mn b/d seen last year. For example, in the first two weeks of this June just 5.7mn/b were lifted.

Fred Eckhard, spokesman for UN secretary general Kofi Annan, said: 'As long as the volume of oil sales remains low, revenue remains low, and there's less money going into the humanitarian efforts.'

By mid-June, approved humanitarian projects worth \$2.24bn were on hold due to lack of funds. The head of the Iraq Oil for Food programme Benon Sevan has expressed his concern about the failure to agree a new system.

He said the combination of the retroactive pricing, linked to Iraqi demands for higher premia, were to blame for the drop in Iraqi exports. Indeed, not knowing the price when agreeing a contract is one more reason to avoid Iraqi oil. Uncertainties over the supply have also increased in recent

months; in April Iraq stopped oil production for a month, as a political move to display to the Arab world its solidarity with the plight of the Palestinians.

As a result, refiners have found alternative sources – one observer said Iraq is now the 'producer of last resort'; refiners have, for instance, found an easy and nearby substitute for its Kirkuk crude, from producers in the Russian Urals.

Officials at the US government's Energy Information Service predict that Iraqi sales will average at 1.5- 2mn b/d for the rest of 2002, with the usual wide fluctuations. It has observed a pattern of sharp dips in June and December, around the time that the future of the Oil for Food programme is discussed at the UN's headquarters.

This summer may prove to be no exception, with discussions starting at the UN about reforming the oil pricing mechanism, with the aim of encouraging buyers back to Iraqi oil. Unfortunately, there is no clear route ahead; one diplomat involved told *Petroleum Review* that there are a 'lot of ambiguities and contradictions'.

He said: 'Some kind of compromise must be found', between the hard-line positions of Britain and the US which back the current scheme, and those prepared to allow Iraq to take some premiums in order to boost the oil revenues funding humanitarian aid.

Iraq is to raise the issue with UN Secretary General Kofi Annan at scheduled talks on weapons inspections in Vienna in early July. But UN diplomats do not expect any agreement on a new pricing system soon. So unless the oil market becomes tighter during the year, it may become increasingly difficult for Iraq to find customers.

Second quarter trading update from BP

BP has announced an increase in oil and gas production, up 5% on earlier year levels in its 2Q trading update. 2Q production is estimated to be above 3.5mn boe/d. Downstream and Chemicals volumes were at record levels after full quarter of contribution from Veba acquisition. The company's liquids realisations rose to around \$4/lb and the company's North American gas realisations were up \$0.60/mncf compared with 1Q 2002, although both lagged the rise in marker prices. Refining margins strengthened by 25% over 1Q 2002. Retail margins recovered from the depressed levels of 1Q 2002. Chemicals trading environment improved slight relative to the last quarter.

Arabs accelerate \$1bn gas pipeline

Stella Zenkovich reports that following a two-day ministerial-level conference in Amman in June, Jordan, Syria, Lebanon agreed with Egypt to speed up the building of a pipeline that is to supply them with Egyptian gas and approved the setting up of an Arab Gas Authority in Beirut by September.

In Brief

Reports say exploration firms including ExxonMobil and Shell are to cut world-wide expenditure by up to 2.5% before the end of the year. A report by Salomon Smith Barney states 2002 budgets for drilling and servicing natural gas wells in the US could decline by 16% from 2001 levels.

Middle East

It is reported that ExxonMobil have invited up to three US oil contractors to bid for a preparatory study on building a gas plant in Qatar. The US oil company has signed a preliminary agreement with Qatar Petroleum to develop a 100,000 bld GTL plant that turns gas into liquid petroleum products. The companies invited to bid for the initial study include Halliburton, Bechtel and Fluor.

*Talks between international oil giants and Saudi Arabia have recommenced with a view to reaching final agreements on three major gas projects with a combined investment of \$25bn.**

The Yemeni government has extended the scheduled completion of the country's \$5mn, 5.3mn/t pa LNG plant by four years, until June 16, 2006 according to Stella Zenkovich.

Russia & Central Asia

Gazprom and Ukraine's state-owned Naftogaz have signed an agreement for Russia to transport gas through Ukrainian territory. Through the agreement, Russia will have the right to transport 110bn cm of gas annually across Ukraine from 2003 until 2013. Russia currently supplies around 25% of Europe's gas with 90% of supplies transported through the Ukraine.

Asia-Pacific

BP and Petrovietnam are in discussions to invest up to \$800mn for the creation of a gas processing hub for Vietnam's Nam Con Son basin.

Latin America

*It is reported that PdVSA plans to increase investment spending by up to \$1.6bn to \$5.44bn for the remainder of 2002.**

UK

Shell will decide next year on the location of what is claimed will be the world's biggest natural gas-to-liquids (GTL) plant, writes Mark Rowe. Malaysia, Argentina and Iran are understood to be leading contenders for the \$1bn project, which will produce 75,000 b/d of kerosene, diesel and other fuels and is due to start operation in 2006.

Technip-Coflexip has been awarded a major lumpsum turnkey contract by Abu Dhabi Oil Refining. The contract, worth about \$480mn, is for the expansion of the Ruwais Refinery to modernise the existing facilities and to add new units for the production of unleaded gasoline and low sulfur gasoil.

Electricite de France (EdF)'s UK subsidiary London Electricity Group is reported to have acquired UK power utility Seeboard for £1.5bn.

Leading pollution control companies within the Environmental Industries Commission have launched an Oil and Marine Pollution Control Group to lobby Government for better controls to tackle oil and marine pollution.*

TotalFinaElf has launched a Euro120mn major works program at the Normandy Refinery which will prepare the site for the next stages of its modernisation. Approximately Euro80mn will be allocated to modernisation investment with a further Euro40mn specified for maintenance work scheduled for the main shut-down in September 2002.

Foster Wheeler Energy has been awarded an engineering services contract from Texaco, Pembroke Plant. The contract, which will be undertaken by the Pembroke Refinery in South Wales, will include the full range of project management, engineering, procurement and construction services for miscellaneous development projects under a term agreement.

Europe

Fitch ratings expects environmental regulations and requirements to play an increasing role in the credit profiles of Europe's power utilities following the EU's ratification of the Kyoto protocol in June. The company says that

Refinery communication system improves safety



Public address and general alarm system company Akusta has won a contract to supply and install a digital intercom system at BP's Coryton refinery at Stanford-le-Hope. The system has been designed to introduce voice communication between tanker drivers loading bitumen and the control room operator.

This will provide increased levels of safety and significantly improve the time taken for drivers to load their vehi-

cles. The equipment to be installed at Coryton is based on the company's Echo digital intercom and alarm system. The BP installation features four IP66 (hazardous area) telephone handsets connected from the bitumen loading bays to the control room. GL industrial sounders have been installed on overhead gantries to enable the operator to sound the alert in the event of an emergency and relay instructions to drivers.

OMV outlines fuel retail expansion plans

OMV has entered the Yugoslavian fuel retail market with the recent opening of two outlets in Lapovo. An additional three sites are currently under construction and the company plans to have 14 outlets operational by the end of 2002. OMV plans to further extend the new network – that will feature Viva convenience stores, Vienna cafés and restaurants, and automated car washes – to 100 sites by 2007, targeting a 10% market share.

According to OMV Deputy Chairman Gerhard Roiss, the company is now looking for further penetration into the markets of Bosnia-Herzegovina, Bulgaria, Croatia, the Czech Republic,

Germany, Italy, Romania, Slovakia and Slovenia, in which it made its first market entries in 2001. The expansion will concentrate around the Danube corridor and the company is targeting a two-fold increase in its sales volumes, boosting its Central and Eastern Europe market share from 10% to 20%. As part of this drive, OMV Romania Mineraloel opened its new headquarters near Bucharest Airport on 13 June 2002.

OMV currently operates a total of 1,180 service stations in Central and Eastern Europe – 534 in Austria, 165 in Bavaria and northern Italy, and 481 in the reform countries.

Upgrading refinery orders tank gauging system

Bahrain Petroleum Company (BAPCO) has ordered a radar-based tank gauging system for 60 tanks from Saab Rosemount Tank Control.

The system is using TankRadar Rex gauges and includes temperature sensors and interfacing to the newly upgraded control system. All gauges are connected on the existing field bus where the radar gauges replace oil mechanical gauges. The BAPCO refinery, in Bahrain, is currently undergoing a major upgrade that will turn it into one of the region's leading refineries.



Biodiesel – at a forecourt near Stroud



Andrew Owens, MBE, with rape seed and oil

The premier sale of a new low emission biodiesel blend at a UK independent forecourt happened this month. Developed by clean fuels supplier Greenergy, GlobalDiesel is said to cut greenhouse gas emissions by 5%, with up to 28% lower emissions of particulates as well as a reported 1% reduction in fuel consumption.

Made by blending rapeseed oil – a renewable energy source – with Ultra Low Sulfur Diesel, the fuel can be used in any diesel car without the need for engine modification and without

infringing car manufacturers warranties.

According to the company, fuel sales increased by 500% in the week after the biofuel was officially launched at the Holbrook Garage in Bisley.

With a 5% biofuel content GlobalDiesel will qualify for a 1p/l tax break under the UK Government's Fuel Duty Incentive (FDI) where 100% bio-content results in a 20ppl reduction

Retailing at 77.9p/l, the fuel is awaiting Royal Assent in August, after which the FDI discount of 1p/l in retail price will apply.

Montenegrines return INA's filling stations

The government of Montenegro, now in a loose federation with Serbia, has recognized the restitution claim of INA, unlike its Serbian counterpart, and has gradually completed the return of the Croatian company's filling stations and other assets, confiscated at the end of 1990 by the government of Former Yugoslavia writes *Stella Zenkovich*.

China co-branding

Shell's China division has signed a draft contract with Sinopec to set up an oil products marketing joint venture, which will include building a network of 500 forecourts in the Jiangsu province within three years of the project being registered.

The investment in the project, will total \$190mn, in which Sinopec will hold a 60% stake.

The joint venture is a result of a strategic alliance signed by the two companies in December 2000. The project is currently awaiting approval by the State Council. The forecourts will be co-branded and sell both Shell and Sinopec oil and lubricants products.

Clean air problems for ethanol in US?

America's Environmental Protection Agency says that US ethanol producers may be violating the country's Clean Air Act reports *Philip Fine*. In a letter to the industry, the EPA said 'most, if not all' US ethanol producing plants are releasing volatile organic compounds into the air. Tests at five plants found formaldehyde and acetic acid in the atmosphere. The EPA is expected to ask the \$2.48bn/y industry to spend more than \$1mn per plant on pollution-cutting equipment, EPA administrator Tom Skinner has said.

the new regulations may expose the sector to new costs and operational constraints at a time when it is focused on liberalisation, increased competition and coping with falling power prices.

Datamonitor reports that Russian oil company Yukos is one of the frontrunners to purchase BP's surplus German oil assets consisting of 650 service stations and a 45% share in a refinery. Yukos has earmarked \$2bn towards improving its position in western European refining and retailing.

Following Koninklijke Vopak NV's (Vopak) Extraordinary General Meeting in June, the company has announced the spilt of the chemical distribution activities to the newly incorporated company Univar NV. After completion of the split-off, one Univar common share will be received for every two Vopak common shares.

Under an agreement with Agip Petroli and Galp, TotalFinaElf plans to sell its 186 branded service stations in Spain in return for the acquisition of 195 Agip Petroli service stations in Italy as well as 111 Galp service stations in Portugal.*

Univar NV, the company continuing Vopak's Chemical Distribution activities, has announced the change of its reporting currency from the Euro to the US dollar. As a result Vopak has terminated certain foreign exchange contracts, resulting in a gain of Euro30mn.

Foster Wheeler Iberia has been awarded a contract by BP Oil Refineria de Castellon, to upgrade part of its 120,000 b/d Castellon refinery in Spain to produce ultra-low sulfur fuels.

North America

US companies are to begin building two gas pipelines this month, reports Philip Fine. Northwest Pipeline Corporation is to spend \$75.2mn on facilities in Washington State, while Kern River Gas Transmission Company is to build and eventually operate a \$28.9mn California pipeline. Both pipelines are due to become operational in April 2003.

Phillips Petroleum Company plans to construct S Zorb Sulfur Removal

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Technology (SRT) units at two of its refineries. The company will build its first S Zorb-Diesel unit at its Sweeny, Texas, refinery and its second S Zorb-Gasoline unit at its Ferndale refinery in Washington. Applications for the technology at other Phillips refineries are being reviewed, including plans for the Sweeny, Texas and Bayway, New Jersey refineries.

Russia & Central Asia

Yukos has commissioned its new gas processing plant in Tomsk that will be designed to process 1.5bn cmly of gas and underpin the company's sales to the domestic gas market.

CPC has rejected Transneft's proposal to build a link between two pipeline systems to enable more crude to be shipped from the CPC terminal at Novorossiysk. As a result Transneft plans to construct additional storage capacity at its terminal in Novorossiysk to enable a probable 60,000 b/d increase in shipments reports UFG.

Latin America

Peruvian company Refineria La Pampilla has awarded an EPC turnkey contract to a joint venture between Technip-Coflexip and Spanish group Dragados covering a major expansion of the La Pampilla refinery near Lima.

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Lukoil on the prowl in the Ukraine

Lukoil is to start the second stage of Odessa refinery's modernization and will spend \$30mn of the \$100mn earmarked for investment in 2002-3 on expanding its filling station network in the Ukraine according to President Vagit Alekperov. Alexander Nerush, Director General of Lukoil Ukrayina added that a new phase of building an oil tank farm is underway at Borispol, in the Kiev region, where an LPG terminal with a 12,000 t/y. Capacity will start operations late summer. From there LPG sales, currently restricted to the Lukoil station network, are planned to be extended to the filling stations of rivals, and the company will be selling LPG to industrial enterprises under direct contracts from 2003 writes Stella Zenkovich.

Tribute to 'Women in Oil'

A 'Women in Oil' presentation is currently on display in Aberdeen. The exhibition is a collection of photographs, artefacts and quotations from women working in the UK and Norwegian oil industry. The words of women working as stewards, technicians and OIMs are recorded from informal interviews.

In the UK around 18% of the oil industry workforce is female while Norway has 15%, although offshore the UK has 1% to Norway's 10%. The exhibition is open until 24 August at the Maritime Museum in Aberdeen. Entrance is free.

Sibneft targets Tomsk retail market

Sibneft is to acquire a network of service stations in the Tomsk region, one of three new markets that the company is entering this year. Sibneft recently unveiled its first service station in Moscow, and the company has also entered the Krasnoyarsk market, where it is developing a network of dealers.

The Russian company is targeting sales in the Tomsk region of around 6,000

tonnes of refined products per month, and to secure a 20% stake in the region's fuel retail market. It also plans to add almost 200 outlets to its network of service stations, primarily through acquisitions, at a cost of \$61mn. In addition, Sibneft plans to increase domestic sales of petrol and diesel by more than 18% from 2.3mn tonnes in 2001 to over 2.7mn tonnes this year.

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UK Deliveries into Consumption (tonnes)

Products	†May 2001	†May 2002	†Jan-May 2001	†Jan-May 2002	% Change
Naphtha/LDF	134,819	81,481	751,266	432,561	-42
ATF - Kerosene	896,325	877,645	4,249,236	3,927,183	-8
Petrol	1,801,903	1,774,873	8,572,600	8,490,123	-1
of which unleaded	1,718,763	1,713,549	8,165,535	8,248,601	1
of which Super unleaded	33,827	45,607	155,286	216,414	39
of which Premium unleaded	418,121	-	4,223,507	-	-100
ULSP (ultra low sulfur petrol)	1,266,815	1,667,942	3,786,742	8,032,187	112
Lead Replacement Petrol (LRP)	82,330	61,324	406,255	241,522	-41
Burning Oil	265,008	263,274	2,123,605	1,831,646	-14
Automotive Diesel	1,317,304	1,422,084	6,515,790	6,952,062	6.7
Gas/Diesel Oil	535,045	513,624	2,692,047	2,638,576	-2
Fuel Oil	211,701	167,908	1,020,704	951,816	-7
Lubricating Oil	71,513	65,916	387,474	354,047	-9
Other Products	652,550	694,966	3,266,296	3,425,434	5
Total above	5,886,168	5,861,771	29,579,018	29,003,448	-2
Refinery Consumption	370,553	370,976	2,010,688	2,067,789	3
Total all products	6,256,721	6,232,747	31,589,706	31,071,237	-2

† Revised with adjustments

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

Getting connected for e-biz

E-procurement was supposed to be the 'low hanging fruit'. In practice, doing business on the Net is proving more difficult than anybody expected writes **Brian Davis**.

Major oil industry players are putting enormous effort into bringing key suppliers onboard through the Trade-Ranger exchange and individual initiatives. But most initiatives are still at the tier one level. All parties stress the need for significant change management as most processes require revamp and standardisation to meet the challenges of the e-business world.

Oil and chemical industry experts recently got together at Microsoft's HQ in Reading to discuss efforts to drive down the cost of B2B connectivity. Business leaders from Shell, Trade-Ranger, Elemica, seal supplier John Crane and others shared experience of developing ambitious e-business programmes. Lessons learnt are most revealing.

A question of standards

Chris Miles, managing director of Southampton-based consultancy Rex facilitates e-business projects in a variety of business sectors. He is working closely along with the Chemical Industry Data Exchange (CIDX) and Petroleum Industry Data Exchange (PIDX) to thrash out common industry standards, so suppliers and trading partners can share data and document formats online.

Miles considers the main drivers for conversion to e-business are increasing revenues and customer satisfaction, reduced order errors, lower direct costs, reduced inventory, simpler accounting and improved information exchange between trading partners.

'The biggest challenge is getting your business aligned with e-business, which demands significant culture change. First, companies must simplify and standardise internal processes in order to automate them. Then they must standardise data within and across organisational boundaries, and finally tackle IT infrastructure.'

Until a couple of years ago there was no standard approach to data exchange. Now CIDX which represents 80 chemical industry leaders, has developed XML-based Chem eStandards defining over 50 messages required to carry out secure transactions over the Internet. PIDX plays a similar role in the petroleum industry and is eager to standardise descriptions in a Babel-like sector.

In an important cross-industry move in June, CIDX, PIDX and RAPID which represents the agrochemical business, signed an agreement to develop common e-business data communica-

tions standards based on XML (extended mark-up language). Miles maintains, 'The move towards common standards will reduce costs, improve business operating efficiencies, and promises to boost e-business throughout the supply chain.'

Creating common standards for e-commerce is well in hand, but how are oil majors like Shell finding developing e-business in practice? John Boardman, Global e-Procurement Project Manager, had some interesting things to share at the conference. Then Chris Miller, Group Advisor for Strategic Sourcing at Royal Dutch Shell filled out the picture exclusively for *Petroleum Review*.

Experience learning

Shell boasted one of the first e-procurement initiatives in the energy sector, with launch of the Commerce One Buysite within the group in October 1999. Subsequently, Shell became one of the 14 founder members of the Trade-Ranger exchange, in partnership with BP, Statoil, TotalFinaElf and others, representing over half the procurement spend in the industry. About 1,100 suppliers are now linked to Trade-Ranger, and the figure is growing after a slow start.

Today Trade-Ranger has 10 members. That's not a matter of drop-out but reflects the extent of merger and acquisition activity, as companies like Shell acquired Equilon and Motiva, and Philips teamed up with Conoco and Tosco, BP merged with Amoco and Arco. All the original equity members remain, though some, like Shell, are far more active than others. Statoil is the second biggest user, followed by TotalFinaElf. ENI and Repsol, Conoco/Philips, are also building up their online activity.

Shell leads the gang in terms of transaction volume, and estimates e-procurement accounts for 3-5% of annual \$22bn share of spend on goods and services worldwide. But Chris Miller, Group advisor on Strategic Sourcing at Royal Dutch Shell reveals, 'We need to get 30% of spend online before break even on the total cost of e-procurement investment.'

Shell operates in about 140 countries and has 148 operating companies. About 27 units transact electronically at present, and Shell anticipates all unit will be onboard by 2005. 'The major challenges are over, it's just a question of maintaining momentum,' says Miller.

John Boardman, Global eProcurement Project manager reckons 'e-

Business is moving our business forward. But it's a matter of evolution rather than revolution.'

Shell uses Trade-Ranger for 'pretty well everything' from taxi business, goods and services, to supplies of upstream plant. Chemicals and feed-stock purchases are handled through Elemica. Shell's principal e-procurement tool is Enterprise Buyer professional (eBPro – a SAP/Commerce One product) and eB Desktop. Shell now has a single e-business architecture which links into back office systems based on SAP, JD Edwards and legacy ERP systems, via XML-based links from Trade-Ranger.

The management information system (MIS) MarketSet is a key part of Shell's e-business architecture, for gathering e-procurement related information and turning it to commercial gain. Miller insists, 'The MIS system accounts for 60% of the business case for investment in e-procurement. It helps share information throughout the group which was never previously available.' Other MIS benefits include improving the efficiency and use of resources, standardising compliance, encouraging supplier price reduction and strategic sourcing. The MIS is used to analyse data and a Content Integrator allows business units to use more than one description of any item or product. For security purposes, there is a firewall between MarketSet and Trade-Ranger to protect all Shell's commercial information.

Miller emphasises that reduction of transaction costs has not been a major objective, 'as Shell had spent the previous decade hammering supply chain management efficiency. Consequently, we'd plateaued out and couldn't get much further without better information on where (and how much) we spend money on contractors and suppliers on a global basis.'

He also thinks change management is the biggest challenge for e-procurement uptake internally and externally. 'It's not simply a matter of capturing existing process on an electronic system. An organisation has to change radically in order to get the benefits of e-business.'

For example, Shell had to set up strategic sourcing groups of people with a thorough understanding of the marketplace, who would take a top-down view of procurement information and turn it to commercial gain. Whereas, procurement traditionally took a bottom-up approach, Miller suggests, 'e-Procurement requires a new breed of professional supplemented by

personnel with strong technical and commercial disciplines.'

So what has been done to encourage supplier enablement?

Shell claims it has made 'tremendous' efforts to bring suppliers on board, organising forums, listening to supplier needs and 'genuinely trying to help them.' Admittedly, there have been a few brick walls. Trade-Ranger originally made the mistake of trying to charge suppliers a transaction fee. This wasn't taken kindly by suppliers who already viewed e-marketplaces as a hammer to beat down prices, without the added indignity of being charged to be beaten up! Fortunately, in June 2001 the transaction fees were scrapped. 'That was a breakthrough and significant numbers have joined since,' says Miller.

Internally, Shell has obtained strong commitment to e-business from the top down, running education programmes, sharing best practice, and helping business units sign up suppliers.

Shell has also embarked successfully using reverse auctions via Freemarkets (not Trade-Ranger). 1,500-2,000 reverse auctions have been carried out online, representing 10-15% of Shell's spend, and involving several thousand suppliers. Miller estimates that savings on products and services range from 10-15%, including online bids for complex projects and 10-year contracts worth several million dollars. 'Our goal is to get a significant reduction in the inbound supply chain cost through online bidding. But we're not just aiming for the lowest cost. Online bids allow us to consider other criteria such as quality, delivery and net present value.'

Trade-Ranger progress

Trade-Ranger is at last building up a head of steam. Gavin Critchley, VP Northern Europe, admits there's been lots of 'stop/starts'. 1,100 suppliers are on board (50% European, 25% US and 25% Asian) and transactional volume is growing, with about 1,500 transactions a week, which include many more line items.

The exchange is based on Commerce One and i2 with growing Webmethods capabilities, and supports a range of standards including PIDX, CIDX and xCBL version 2 and 3.

Trade-Ranger offers three levels of access. At its simplest, the supply/order system offers web access with no integration, so companies can receive purchase orders and send responses via Trade-Ranger. At the next level, a handful of suppliers are using direct integration with customers through Trade-Ranger, using CIDX, PIDX or xCBL formats. At the top level, customers and suppliers can integrate directly using a Punch Out Round Trip (PORT) buying tool, which offers a shopping basket approach to a supplier's web site

John Boardman eProcurement Manager at Royal Dutch Shell suggests key lessons:

- A clear mandate from the Board is prime to success.
- It's all about Change Management. You need a clear vision as e-procurement involves people, processes and culture.
- Recognise it's evolution rather than revolution - taking the process step by step as there's no end game.
- Select technology that integrates easily into your system, from software suppliers with staying power.
- Exchanges should be free to suppliers or have a very low entry cost otherwise people won't use them.
- Set realistic targets, one step at a time.
- Content is king. Quality content is essential.
- Maintain a standard Group-wide solution for e-procurement.
- e-Procurement is simply the first stage towards full collaboration throughout the supply chain. So both sides must satisfy their business objectives.

(via Trade-Ranger), where they can select products, fill the cart and return to the buying tool and user's site.

The first option is a free web-hosted application, quick to start, but not scaleable. There are no significant process cost savings, and it still requires change to existing purchase practices using fax and phone. Critchley admits, 'The supply/order system becomes tedious for more than 10 transactions a day, and there is a trade-off between the volume and value of transactions.'

The direct integration route has excellent scope for process efficiency savings, is scaleable, and offers the advantage of lock-in to specific suppliers (who must be OCI compliant). But the cost can be high, from £50,000 to £500,000 or more per link, along with software architecture implementation and the ongoing maintenance costs. Implementation takes about two months, and the learning curve is steep.

The PORT solution also offers significant process efficiency savings, scaleability, lock-in advantages, and lends itself to large catalogue and configurable items. But it is costly and likely to be preferred for links with major suppliers with large volumes of content and configurable items. Implementation, web site integration can be costly, complex and relatively time consuming.

Critchley suggests, 'Though the supply/order option is free and useful for low transaction volumes, as online transaction volumes grow companies must consider integration options as early as possible. The technology decisions are getting easier, and the exchange landscape - following the dot.com debacle which eliminated Petrocosm and many smaller market-places - is getting clearer.'

He says most Trade-Ranger members have completed the pilot phase and are starting to roll-out major e-procurement initiatives. Critchley anticipates that transaction numbers will increase rapidly, and insists that the original shareholders are fully behind the

exchange 'We can't demand liquidity, people have their own demands.'

On the supply side

John Crane, a member of the Smiths Group, is a leading industrial sealing solution supplier and joined the Trade-Ranger in early 2001. The company operates 20 manufacturing sites worldwide, with 200 service centres and manufactures of 400 multi-configurable products. It favours the PORT approach with the deployment of a series of extranets/private virtual Web-sites with links to major customers, implemented with the support of IT consultancy Rex.

E-business director Kevin Murray aims to develop 500 extranets, which will enable customers to view a personalised catalogue of products with their particular coding references and price files. Customers will be able to log into the extranet from their procurement system, and round-trip purchasing applications into the John Crane web site via Trade-Ranger. Orders are formatted by Trade-Ranger into XML using Microsoft's .NET tools on a BizTalk Server, which translates orders into John Crane's system.

Murray says the extranet-based system promises significant cost and efficiency savings, by elimination of rekeying data, avoiding inaccurate order data and error reduction. 'The key issue for a supplier is to make a company easy to do business with. In our experience customers will not use general web catalogues. Extranets provide a very personal interface with customers, particularly where round-trip is used, as there are many cost saving opportunities.' The system also offers 24-hour access to configurable products in multiple languages, reducing order process costs and cycle times, and eliminating order entry errors.

Ultimately, e-business offers a more customised and personal relationship on each side of the equation - for the oil industry, its trading partners and suppliers throughout the value chain. ●

A serious business



Independent storage terminal operators play a crucial role in the oil and chemical supply chain and continue to invest to provide the assets that their clients require. *Petroleum Review* reports.

Consistent economic growth and volatile product prices have helped keep Europe's storage tanks full in recent years, providing quite handsome returns to the independent operators. This year, however, has seen something of a downturn. A more uncertain economic outlook, combined with relatively high product prices, has encouraged cargo owners to draw on their stockholdings. While utilisation has fallen somewhat, lease rates are still reasonable and none of the operators is actually suffering, but these conditions have discouraged speculative construction of new tanks.

Company development

Further confusion has been thrown into the marketplace this year by two major corporate moves. Simon Group, which owns Simon Storage, one of the UK's largest independent terminal operators, put itself up for sale, largely at the behest of its shareholders but so far without success. Its unusual portfolio of interests, which also includes port infrastructure, project cargo shipping and road haulage operations, has apparently played a part in deterring potential buyers. There will be a further problem for any company interested in the bulk liquids terminals in that seven of the eight UK and Ireland sites are co-owned in a 50-50 joint venture with Vopak. Any future investment in these facilities will have to be undertaken in cooperation with the Dutch company.

Which brings us to the second major change in the industry structure this year. Vopak announced early in 2002 that it was undertaking a strategic review of its entire operations and, as was expected, later came up with the proposal to split itself in two, a proposal that was agreed by shareholders at an EGM in June. Essentially the company's chemical distribution activities have now been spun off into a separate company, Univar, leaving Vopak as owner of the oil and chemical logistics assets – primarily bulk storage and tanker shipping.

One outcome of these two developments has been to put a virtual halt to new investment both by Simon and Vopak. Simon has only been continuing to upgrade the old ICI terminal in Teesside and only Vopak's Spanish joint venture TEPESA has been adding tanks.

Another new name in the list of independent operators this year is Rubis Terminal, formed by the acquisition of Propétrol by CPA's parent company, Rubis. This year the company has concentrated on adding small stainless steel tanks at its sites at Rouen and Strasbourg, targeting the chemicals sector, while upgrading loading facilities for gasoline both at these two facilities and its others in Dunkirk and Village-Neuf.

Chemical growth

Rubis is far from alone in investing in chemical tankage. Even operators like Oiltanking, which traditionally concentrated almost exclusively on petroleum storage, have been expanding into the chemicals market where the potential to offer value-added services is greater. The German company, an affiliate of oil trader Mabanaft, is currently building a 220,000 cm chemicals facility at Terneuzen on behalf of Dow Chemical and has also added a third tank at its specialist sulfuric acid plant in Varna, Bulgaria. Another dedicated facility is being developed in Antwerp, where 72,500 cm of chemical and gas storage has been devoted to one client. An additional jetty is nearing completion to handle the extra throughput and plans for another 87,000 cm of new tankage are currently being studied.

Antwerp has been the centre of much new construction over the past year, reflecting the focus on chemicals and the ever more intense competition for business between Antwerp and Rotterdam, where increasing congestion has been deterring investment in additional capacity. At the turn of the year a brand new chemicals site, Antwerp for Storage (A4S) was opened on the Noord Natie site as a joint venture between Noord Natie and Arpadis. It is dedicated to spe-



cialist chemical products. Across the river ADPO opened up a 75,000 cm expansion dedicated to handling chemicals for Celanese and the company is currently considering another 55,000 cm of capacity to deal with organic growth. ADPO has also added 20,000 cm of new tankage at its nearby Ghent facility.

ADPO, currently the only liquids terminal on the left bank, will shortly have a new neighbour. LBC has a 250,000 cm terminal close to the Noord Natie facility but, after building a 35,000 cm tankpit this year, has no room for further expansion. The group has acquired land and approval for a new facility on the left bank and plans to build a 140,000 cm terminal over the next eight to ten years. The pace of construction will depend on the level of demand.

Things have been rather quieter at northern Europe's other leading bulk handling port, Rotterdam. LBC completed a 16,000 cm expansion last year but the main focus of development has been at Odfjell's massive Botlek terminal, acquired in 2000 as part of the Pakhoed/Van Ommeren merger. Odfjell has drawn up a 10-year plan to improve and expand this site, initially concentrating on adding jetty capacity to cut port times and building additional stainless steel tanks. Vapour control systems are also being upgraded.

Regulatory pressures

Some investments are unavoidable and in recent years vapour control has been one such area. ST Services, which took over most of the old GATX network in the UK, has installed vapour recovery units at three sites over the past year as well as bottom loading gantries at those sites, such as Belfast, that handle a lot of gasoline. The Belfast site has also been given 14,700 cm of new tankage to help it handle the requirements of the unique fuels market in Northern Ireland.

Another significant area of non-discretionary spending has been the

implementation of the EU's Seveso II Directive (96/82/EC), which has been impacting almost every storage site in Europe. The Directive seeks to achieve consistent improvement in safety performance at industrial locations that present a risk of a major accident, and it is enacted in the UK through the Control of Major Accident Hazards (COMAH) Regulations 1999. Some UK operators have complained that other EU member states are being less assiduous in applying the requirements of the Directive, but the European

Toulouse in September 2001 may yet, however, have further implications for the storage sector. Speaking at the UK Tank Storage Association (TSA) conference in May this year, John Murray of the UK Health & Safety Executive warned the audience that the European Parliament is beginning to reconsider its position on risk management and is moving towards the idea of 'risk removal' – in other words, physically removing potential major accident sites away from centres of population. The industry will have a massive job on



Commission is evidently taking the matter seriously and has already issued infraction proceedings against four countries for their lack of progress.

For terminal operators the main task required of them under Seveso II is the preparation of response plans and incident reports. The latter are important, since the generation of information on such events will help all those involved – both in industry and government – ensure that the regulations and requirements governing the sector are effective in reducing accident hazards.

In the UK at least, enforcement agencies are aware that terminals are sometimes having difficulty in meeting their obligations and are beginning to provide active assistance. However, this does not mean that the requirements will not be fully enforced.

The incident which occurred in

its hands if such requirements are put in place and it is important that it understands the implications and readies itself to defend its position.

Another recent regulatory initiative to impact the storage sector was the introduction of dangerous goods safety advisers (DGSAs). With certain exceptions, all companies handling, storing or transporting products in scope of the regulations are required to have access to a qualified individual (not necessarily an employee) who is responsible for monitoring safety in the handling of dangerous goods and providing management with an annual report. DGSAs are required to re-qualify themselves every five years and the UK authorities have now determined that, to do so, DGSAs will have to re-sit the entire examination. There is a concern among

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Plenty of natural gas?

As we enter the age of gas, attention has recently been drawn to the thought that gas as well as oil may become scarce in the future. This possibility was highlighted by Shell in the introduction to a recently published Scenario on future energy developments, writes *Fred Thackeray*.

In a somewhat surprising statement—not part of a scenario, but an assessment—Shell said: 'Gas resource uncertainty is significant. Gas scarcity could occur as early as 2025, or well after 2050. Gas is considered by many to be more scarce than oil, constraining expansion.'

Such an outlook must seem alarming to companies and governments making major commitments to natural gas projects. With this in mind the upstream consultants, IHS Energy, were asked to present a paper at a recent conference* in London on Fischer-Tropsch Gas-to-liquids (F-T GTL). Although at present F-T GTL has barely got started, within the

next 10-15 years it is expected to begin to rival LNG in soaking up much of the world's gas reserves now categorised as 'stranded'.

While conceding that, of course, assessments of scarcity depend partly on forecasts of consumption, Ken Chew, Senior Consultant in IHS, gave assurances of abundant future availability of natural gas. He based his assurances on field-by-field estimates routinely made by IHS for all areas of the world except North America. In order to include the US and Canada he incorporated the estimates published by the USGS (United States Geological Survey).

He reckoned that total recoverable conventional reserves already discovered amount today to 6,760tn cf. This is after past cumulative production of 2,715tn cf. It includes future increases in estimates of reserves in already discovered fields. In other words, the percentage of discoveries to date which remains for future use is estimated at over 71%. On the basis of estimated production last year of 95tn cf**, the R/P (reserves/production) ratio is 71 years.

Ken Chew went further, however, to present figures on conventionally recoverable gas reserves 'yet to be found'. Inclusion of these figures boosts the estimates by no less than 65% to an estimated 11,135tn cf. He based this estimate on assessments made by the USGS. For the world outside the USA, the USGS assessment covered 128 major geological provinces for the period 1996-2025. Ken Chew updated the USGS figures by deducting the IHS' estimates of discoveries made since 1996.

Future reserves

The regional distribution of remaining recoverable reserves today does not come as a surprise. As shown in **Figure 1**, the Middle East and the FSU are estimated to each hold about one-third of the total, whilst the US and Canada have very little left.

The estimates illustrated in this figure, however, do not include either future upward revisions of estimates of already known fields or estimates of recoverable reserves 'yet to be found'.

When these estimates for the future are included, there are some significant changes. The Middle East and the FSU remain dominant, with each increasing its estimated recoverable reserves by about 70-80%. Remarkably, however, the USGS figures used by Ken Chew for North America indicate a large increase. On the basis of these estimates, almost half of recoverable gas in North America still remains to be produced. (It is relevant here to mention that all these estimates like other published estimates take no account of the energy content of gas reserves.)

Some interesting speculative judgments in Ken Chew's remarks included

- Possibly 7% of existing undeveloped gas discoveries will be too small and/or too remote ever to be developed, ie some small amount of 'stranded' gas will remain stranded.
- The growth of reserves estimates for already existing fields outside the United States will average 7% annually.

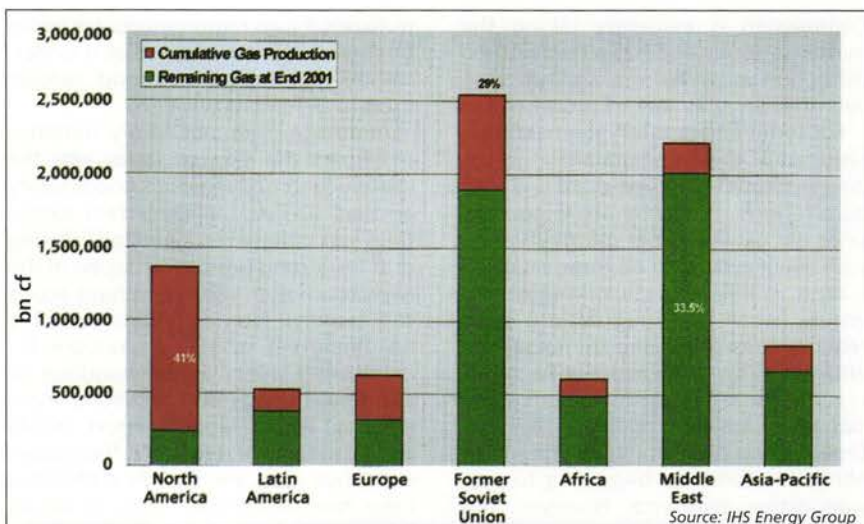


Figure 1: Produced and remaining conventional natural gas resources to end-2001

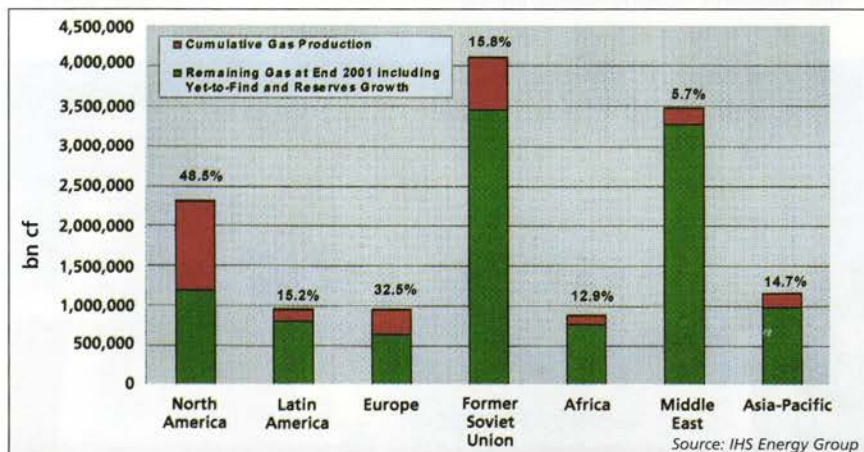


Figure 2: Produced and remaining natural gas resources with percentage depletion at end-2001

The presentation also looked at recent discovery success in the world excluding the US and Canada, contrasting the results for natural gas with those for oil in 'liquid-dominant' fields. Taking five-year averages of discovery size over the period since 1901, the sizes of natural gas discoveries were shown to have peaked in the early 1970's — the period when Russia's Urengoy was discovered — at just under 1.8tn cf. It then fell sharply in subsequent years to a low of about 300bn cf in the mid-80's, before rising to a lesser peak of around 700bn cf, including Iran's South Pars, in the mid-90's. In the year 2001, it was estimated at an average of about 400bn cf.

In contrast, the average size of oil discoveries has fallen in almost every five-year period since the mid-60's. From about 300mn/b in the mid-60's it declined to a low of less than 100mn/b in 1991-95. The last period of truly big discovery success was in the period immediately following the World War, when average discoveries were recorded at over 900mn/b. In the year 2001, the figure remained at under 100mn/b.

'Yet-to-be-found'

It is interesting to reflect, however, that the figure of 400bn cf estimated for average natural gas discoveries in 2001 is approximately equivalent in terms of energy content (assuming high-methane content) to around 70mn/b of oil. From this comparison — which was not made in Ken Chew's paper — it appears that if we are to discover the 'yet-to-be-found' conventional gas reserves a considerable exploration effort will continue to be required.

In the Conference paper, estimates were also presented on the possibilities offered by unconventional gas reserves. Two of several categories of reserves may be mentioned here. These are coal-bed methane and gas hydrates. Coal-bed methane is already in production in several countries, including the United States, where it is making a significant contribution to maintaining the production of natural gas. Gas hydrates have not yet been developed commercially, but they are the object of considerable R&D, not least off the coasts of oil and gas-deficient Japan.

Estimates regarding unconventional resources in the IHS paper included:

- Coal-bed methane 3,000-9,250tn cf recoverable
- Gas hydrates, consensus estimate of 600,000tn cf in place. ●

*CWC Conference on Gas-to-liquids on May 28/29

**This estimate is nine percent greater than the estimate of 2464 BCM (95 TCF) recently published in BP's Annual Statistical Review of World Energy.



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industry that this may deter qualified individuals from continuing as DGSA's, leading to a shortage of people able to fulfil the requirements.

South and east

Contrary to some opinion, safety and regulatory requirements are taken seriously throughout Europe, and not just in the northern countries. The 150,000 cm Solventas terminal in Gebze, Turkey, for instance, has undertaken more employee training than is required in EU legislation and has received ISO 9000 and 14000 certification. Recent tank building programmes and the opening of a new jetty in 2000 have brought the site up to an appropriate size for the local market and the focus now is on further safety and efficiency upgrades.

Similarly, La Petrolifera Italo Rumena (PIR) has halted new tank construction at its Porto Corsini terminal in Italy and is concentrating on the addition of emissions control and improving access by sea and rail. Limited additions to tank capacity have been made recently at three Mediterranean terminals: TEPESA's Tarragona and Barcelona facilities in Spain and DOC Livorno in Italy. As has been the case in northern Europe, however, these additions have mostly been smaller tanks for particular products.

One of the few companies to be actively investing in new tankage at present is LBC. In addition to its additions in Antwerp and Rotterdam, the French operator has lately added tankage at sites in Bayonne, Laver, Lisbon and Santander. Those in France have been for high-heat products while

the Santander expansion, due to commence shortly, includes three 10,000 cm tanks to allow smaller tanks to be devoted to speciality chemicals.

In eastern Europe too, the desire to join the EU means that regulators are often imposing equally strict environmental and safety requirements. For instance, some years ago Poland introduced vapour control regulations based on the German TA-Luft standard, which was far more restrictive than anything other countries had in place.

Poland also has a brand new storage terminal, built by US operator Westway at Gdynia. The first phase of construction comprises five tanks giving a capacity of 20,000 cm for chemical imports and exports of molasses and fertilisers. Further tanks will take capacity up to 45,000 cm. Westway and its affiliate SvG are both subsidiaries of UK-based sugar trader ED & F Man and SvG has also recently completed tank construction projects in Liverpool and Oporto, in both cases aiming to move away from the sugar business to offer multi-product handling.

What all these projects have in common, together with those in other parts of Europe, is that they are only going ahead with the backing of firm demand. Unlike other sectors in the oil and chemical supply chain, terminal operators tend to shy away from speculative investment. Once a terminal is in place, it is very difficult to move it, so owners have to convince themselves that demand is there. Given the current market conditions, such caution will be crucial to maintaining commercial performance while providing client industries with the facilities that are necessary to move products to the market. ●



Is 'sweating the asset' the right business strategy?

Tony Wood, Global Marketing Manager for IBM Chemicals and Petroleum Industries examines the current pressure on refinery operations and possible alternative strategies.

It is a tale of woe: a combination of high crude oil prices, OPEC's attempts at production control, a mild winter in Europe and the US, reduced demand for aviation fuel together with a spluttering world economy have led to a terrible time for refiners. European refinery margins recently hit a 15 year low.

Table 1 shows northwest European margins were negative during first quarter whereas Mediterranean margins were somewhat better. Looking at throughput and utilisation, **Table 2** shows a mixed performance by country. Given the volatility of margins and the variance in country performance the question for the oil majors, with refining assets spread across Europe is, 'Is individual asset utilisation the correct goal?', if not, 'How do I manage my asset portfolio?'

Is there a 'right' business model?

It is evident that many of the factors that affect refinery margins are outside the control of the refinery owner. With market-related information flows constantly improving it is likely that traders and speculators will be able to respond to world and regional events ever more quickly, perpetuating the environment of high price volatility, which, despite recent corporate announcements, is similar to that seen in the financial markets.

	Monthly Averages (\$/b)			End of Week (\$/b)				
	Jan	Feb	Mar	1 Mar	8 Mar	15 Mar	22 Mar	29 Mar
Refining Margins								
NW Europe								
Brent (Hydroskimming)	-1.27	-2.47	-2.48	-2.43	-2.48	-2.20	-2.65	-3.14
Brent (Cracking)	-0.87	-1.63	-1.34	-1.54	-1.41	-0.92	-1.47	-1.75
Mediterranean								
Urals (Hydroskimming)	0.46	-0.40	-0.67	-0.58	-0.53	-0.36	-0.94	-1.52
Urals (Cracking)	1.16	0.53	0.65	0.37	0.63	1.12	0.49	0.07

Source: International Energy Agency - Monthly Oil Market Report - 10 April 2002

Table 1: Refinery margins

	mn b/d				Utilisation Rate %			
	Sep 01	Oct 01	Nov 01	Dec 01	Jan 01	Feb 02	Feb 02	Feb 01
OECD Europe								
France	1.80	1.79	1.84	1.73	1.67	1.64	94.3	104.1
Germany	2.00	2.10	2.32	2.26	2.20	2.23	98.7	97.1
Italy	1.75	1.87	1.82	1.83	1.81	1.79	88.4	79.3
Netherlands	1.02	1.12	1.15	1.02	1.02	1.10	90.7	94.1
Spain	1.12	1.17	1.10	1.22	1.16	1.17	91.9	86.0
UK	1.67	1.67	1.72	1.70	1.69	1.64	94.3	88.8
Other OECD Europe	3.85	3.97	3.89	3.86	3.88	3.95	90.7	87.9
Total	13.21	13.68	13.83	13.63	13.45	13.53	92.6	90.5

Source: International Energy Agency - Monthly Oil Market Report - 10 April 2002

Table 2: Refinery crude throughput and utilisation in OECD countries

However, unlike the financial markets, there is a requirement to trade and utilise the physical products ie crude oil and refined products. Responding to rapid changes in the market place is difficult. Traditionally the industry carried out demand planning and forecasting activities in an attempt to optimise the utilisation of physical refining and distribution assets. These forecasts were based on assumptions about feedstock availability, product demand and prices, and are subject to specific and unique operating conditions or limits of the refining and distribution infrastructure. This individual 'asset-centric' approach is very evident with the refinery shut-downs and planned maintenance activities that have been brought forward as a result of negative refinery margins. So given this general state of affairs, what choices do oil companies and refinery owners have?

When investigated closely it is apparent that there are two discrete

strategies that can be adopted:

- an asset focused, vertically integrated strategy that has little reliance on speculative commodity trading other than supply – demand balancing or
- a strategy which leverages commodity trading.

It is recognised that most downstream companies probably adopt a combination of these basic strategies to accommodate their perceived local market conditions. If we accept that market price volatility for both crude and refined products is increasing, then the argument that oil companies and refinery owners should look to further leverage trading activities, perhaps on a regional or zonal basis, rather than just optimise the individual asset becomes more appropriate. By recognising the option value of assets and structural long/short positions, asset owners can actually benefit from higher price volatility.

The role of the Trader

To manage increasing market volatility and to improve refining margins the industry has long recognised the need to move from a 'supply push' to an 'optimal demand pull' model.

In many organisations the role of the trader is to secure refinery feedstock and help balance supply-demand so as to optimise the utilisation of individual refineries. Successful trading operations coordinate across markets, geographies, and trading books. Increasingly, however, trading operations can be used to leverage the physical asset base to hedge market risk and consequently increase commercial flexibility. How?

It is recognised that trading involves both tangible physical assets such as the physical supply chain (refinery, pipelines, storage terminals etc) and 'trading' or contractual assets such as exchanges, swaps, etc. The value of the asset base can be enhanced by lever-

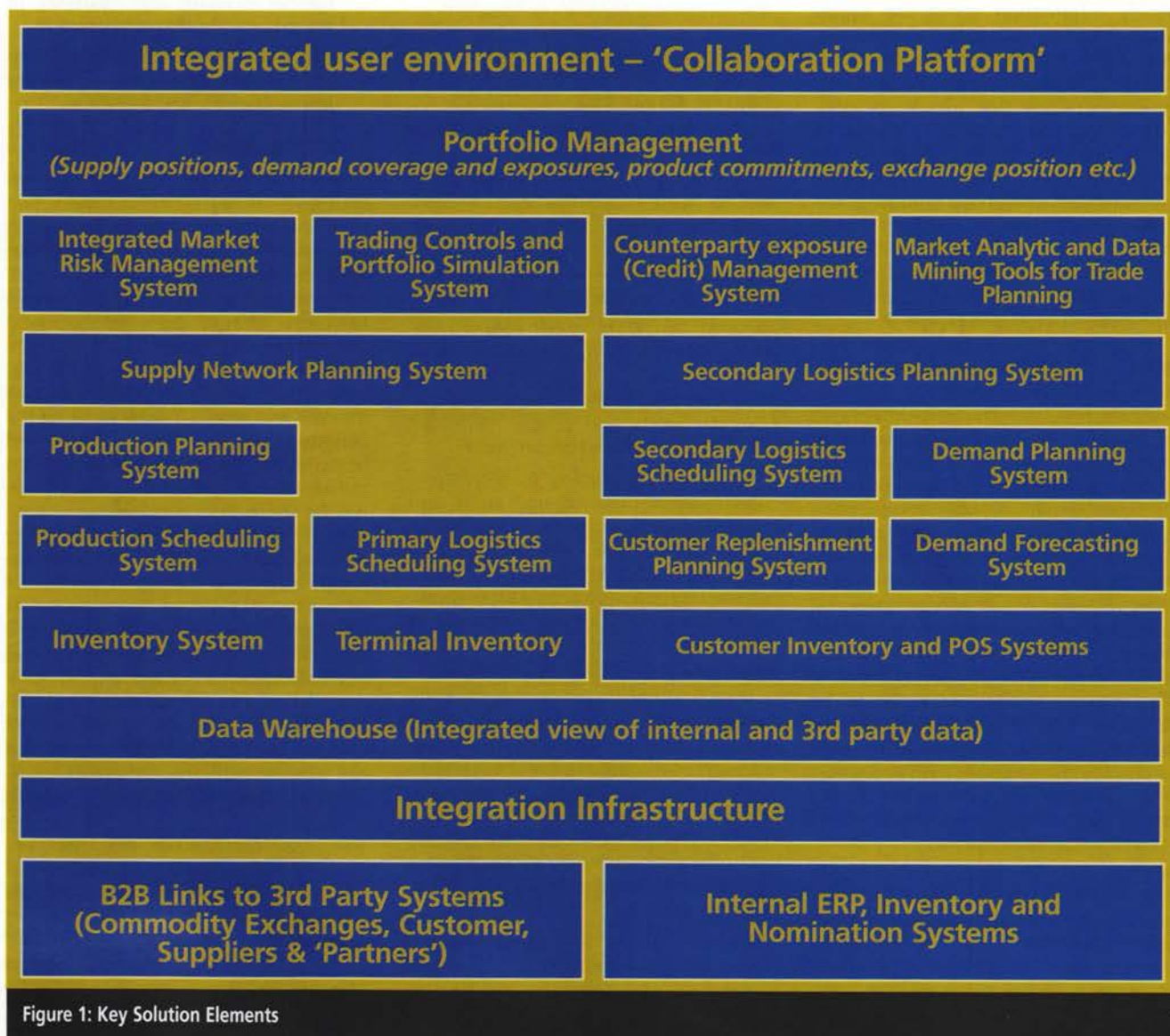


Figure 1: Key Solution Elements

aging its inherent opportunistic in the trading environment maximising the benefits captured through market volatility, and in turn allowing greater supply chain flexibility.

As with more integrated markets such as the equities market, to achieve this goal improved real-time visibility of the supply chain and market pricing is required. To accomplish this, a holistic planning system must be implemented which analyses the supply chain from end-to-end and includes all sourcing options. These planning systems will require 'enterprise wide' data and information solutions that will require full collaboration across the traditional organisational 'silos'.

The role of Information Technology

The use of IT solutions to tackle the supply chain and plant optimisation are becoming pervasive. However, in responding to the need for visibility of timely information across the supply chain, it will be necessary for oil companies and refinery owners to develop a data/information management and integration strategy that allows an incremental approach realising early benefits whilst providing the foundation for the enterprise wide solution. The IT solution will ultimately comprise a number of discrete industry-specific solutions linked together by a scalable, robust and secure infrastructure. A 'typical' solution stack to support a more holistic planning approach is detailed in **Figure 1**.

Many off-the-shelf supply chain solutions and specialist applications exist, such as those offered by SAP, i2, Aspentech etc., which can be integrated to develop the technology solution. Indeed, the utilisation of these solution components will help mitigate technical and commercial risk (when compared to developing bespoke applications). Similarly, for trading and risk management there is no single solution that is 'Best of Breed' for all energy categories and geographies, so integration is critical to success. To maximise both short-term and long-term ROI, the development of this solution architecture needs to be based on flexible and highly scalable infrastructure that integrates all the data and workflow processes used to support the operation and optimisation of the supply chain. The key components of this infrastructure layer include:

Middleware: Messaging software that connects disparate IT systems and solutions to allow the smooth flow of information between them. It has the ability to connect together applications through a simple programming interface. IBM is probably the *de facto* standard in transaction Enterprise Application

Integration. It can be linked with other message brokers such as TIBCO which can provide the messaging software for the external news and market feeds, supported by IBM's WebSphere MQ product range to provide consistent and assured transaction message delivery.

Workflow management: a business process management solution, which enables the definition, execution and swift change of complete business processes that span systems, applications and people, enabled through products such as IBM's CrossWorlds Integration Software.

The infrastructure layer needs to be based on open standards, such as XML (extensible markup language), CORBA and Java that are generally being adopted for e-business. This will ensure solution flexibility and adaptability both now and in the future and provide the business with strategic flexibility ie the ability to change the business model with minimal disruption or change to the supporting solution architecture.

Steps along the way – a route map for success

The move to using agile trading strategies to integrate the refining value chain and manage a portfolio of assets will not be made in a single step. Indeed, given the state of legacy systems, both technological and organisational, this would probably be an unwise strategy. IBM's suggested route map for success is:

Develop a Data and Information Foundation: A solid data and information foundation is a pre-requisite, therefore start at the refinery and other discrete assets and ensure improved data integration and optimisation.

Deploy the Supporting Infrastructure: At the same time develop an IT and organisational infrastructure which spans functional departments and other parts of the organisation which can be built upon to provide the appropriate geographic view of inbound and outbound supply chains, as well as the appropriate global trading position.

Assuming the appropriate IT technology choices have been made, the IT infrastructure can easily be developed to support a collaborative environment which allows the traders and the operations teams to optimise downstream profitability, not just individual refinery utilisation. This will provide a consistent and common enterprise wide decision-making process.

Take Care of the Soft Issues: As you move along the route map ensure that the softer organisational issues such as reward systems are aligned with the strategy for information integration

and optimisation. As with any need for change, this is not an easy process, however, the rewards could be substantial.

The benefits that an oil company or refinery owner can achieve include reducing volumetric risk (a closer alignment of supply with demand), reducing exposure to commodity market price volatility.

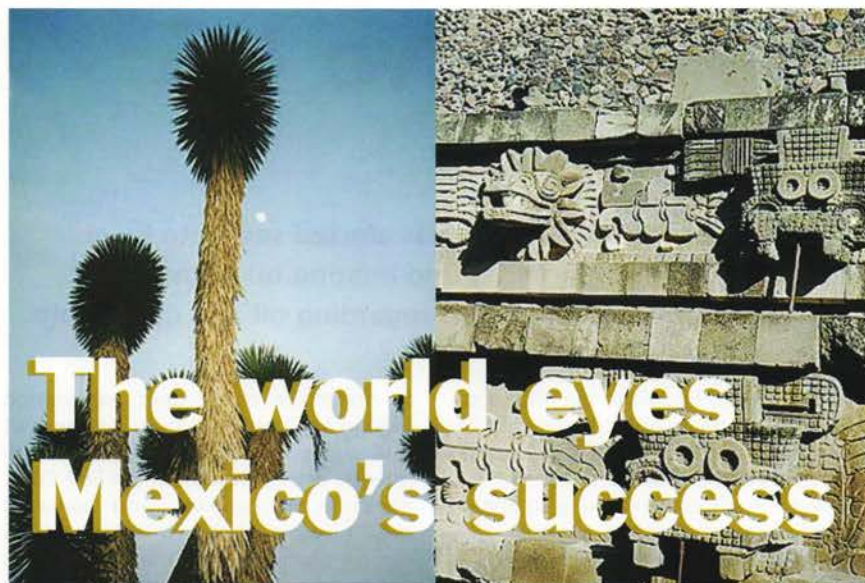
As with all successful IT-led business transformation projects, there are a number of common critical success factors which need to be managed. They include:

- preparation of a credible business case, supported by key stakeholders which includes a defined plan for identification and realisation of cost savings.
- the development and implementation should be led by the business (not the IT team).
- use an incremental approach and build on early successes.
- use technology partners capable of delivering the vision with the commercial strength and flexibility to share both the risks and rewards.
- where possible use solutions based on open technologies – this will ensure future flexibility and resilience.

Conclusions

'Is sweating the asset the right business strategy?' It is the author's view that increasingly it will not be enough. With more and more transparency in the marketplace, supply chain operational excellence will be a pre-requisite to stay in business. Straight through processing can deliver significant cost reduction, without a corresponding increase in risk, when implemented with workflow over a secure and reliable carrier ensuring the consistent application of controls and limits across the enterprise. The future winners in the downstream marketplace will be those that leverage the optionality of their assets; trading this flexibility to maximise the benefit of the whole supply chain and managing the impact of market changes on the earnings at risk (EAR) of the asset base. Success will be facilitated through the adoption and implementation of integrated IT solutions, based on a robust, secure and scalable infrastructure, that meet current and future business requirements and are aligned with the company's workflows and business processes. ●

The views expressed in this article are those of the author, Tony Wood, Global Marketing Manager for IBM Chemicals and Petroleum Industries, and do not necessarily reflect those of the IBM Corporation. The author would like to acknowledge the contributions of his colleagues, Kirk Williams and Patrick Rowe, to this article.



The world's largest nitrogen injection project, in the Cantarell field in the Gulf of Mexico, is helping Petroleos Mexicanos (Pemex) dramatically boost offshore production. Simeon Tegel reports from Mexico City.

When the nitrogen plant began functioning in May 2000 it more than doubled the world's generation capacity for the gas. Pumping 1.2bn cf/d into Cantarell, Pemex's giant field of heavy crude, it prompted raised eyebrows and not a little curiosity from industry insiders.

Now, after more than two years, Pemex is able to declare the US\$1bn project to be an unqualified success. According to Carlos Morales Gil, deputy director of planning of Pemex's exploration and production arm, pressure in the field at 2,300 metres below the shallow sea bed is now at 105kg/cm², 10 more than without the nitrogen.

'The nitrogen injection process has registered excellent results,' Morales Gil told *Petroleum Review*. 'Cantarell's pressure has stabilised. It has stopped falling. It has all gone very smoothly with no serious problems.'

Indeed, as Cantarell, which is roughly halfway through its 40-year life, begins to dwindle, Pemex plans to use nitrogen injection in its myriad other fields in the Gulf of Mexico and Bay of Campeche and even increase the plant's generating capacity.

'We hope to use the same technology given that gas is very much in demand and we want to improve the recovery from our fields. The most viable alternative is nitrogen injection,' said Morales Gil, who also foresaw new smaller nitrogen plants being built further up the Gulf coast to service fields further away.

The plant comes as part of Pemex's plans to dramatically increase its exploration and production. Pemex's offshore production currently totals 2.7mn/b of crude and 1.5bn cf/d of gas a day. Pemex wants to raise those offshore totals to 3.2mn/b and 2.5 bn cf/d by 2006.

In late June, Pemex opened its first production well in Sihil, a major new field of light oil discovered below Cantarell. The company is now drilling a series of exploratory wells to determine the size of Sihil, while at the same time trying to decide the reserves contained in Lankahuausa, which was discovered last year and, according to some Pemex insiders, is potentially massive.

At the same time, Pemex, which has until now rarely drilled in seas more than 100 metres deep, is gearing for a major deepwater drilling programme for the first time ever. The company has already recently opened one test well in 400 metres of water at Chukta, a field of heavy crude about 100 miles from the Campeche coast.

Future projects

Over the next decade, Pemex is planning to drill at least another four exploratory wells in between 600 metres and 1,400 metres in a range of still unnamed locations in the Gulf. 'It is something we are analysing,' said Morales Gil. 'We have to decide what are the exploratory opportunities for us and it will be necessary to enter into a very intensive programme of prepara-

tion for our personnel. We will also surely need outside consultants.'

To a large degree, the success of Pemex's offshore development over the next few years will depend, ironically, on what happens on land at the Burgos Basin, a natural gas field perched just below the Texas border. Barred by the constitution from signing risk contracts with foreign oil companies, the cash-strapped state oil monopoly unveiled a series of 'multiple service contracts' in late June for Burgos (see p7).

If the contracts survive the legal and political controversy they are likely to generate in Mexico, where the date of the 1938 expropriation of British and US oil companies' assets is still a national holiday, and if they attract major international players, then the framework is likely to be extended to offshore development.

'Burgos is the first step but we will have to wait to see how things develop,' said Morales Gil. However, should Pemex fail, then the company, which hands over virtually all of its profits to the federal treasury, will once again be facing the prospect of a capital shortage preventing it from correctly developing its huge reserves.

'Lankahuausa has been described as the sort of field you only find every 20 years but people are speculating that Pemex could have more just like it,' said George Baker, of Houston-based analysts Mexico Energy Intelligence. 'It is a very promising environment for Pemex. The obstacle to its development is the finance.'

Environmental benefits

Meanwhile, Pemex has killed two birds with one stone by drastically reducing the flaring of associated gas in the Gulf of Campeche. In 2000, the company was flaring 500mn cf/d a day of natural gas in its offshore facilities. That figure has already been halved.

Apart from unnecessarily contributing to global warming and Pemex's reputation as one of the least environmentally-friendly oil companies in the world, the flaring was also more than a little surprising in a country setting out to boost natural gas production. 'Our goal is by 2004 to only be emitting into the atmosphere 2% of our production,' said Morales Gil.

With offshore production making up 80% of the national total, Pemex will stand or fall by the sector's success. The company has the government's backing for major reforms. Pemex executives will be keeping their fingers crossed that they will finally be able to team up with foreign oil companies on a massive scale to continue developing Mexico's marine reserves. ●

Deepwater oil to solve US energy crisis?

The energy crisis which loomed so large when President Bush was elected seems to have been forgotten in the wake of acceptable gasoline, electricity and heating oil prices. Overlooked would be a more accurate description, as questions regarding oil and gas supply have not gone away, writes *Judith Gurney*.

With reliance on imported oil now over 50 percent of US consumption, the main hope for increased future domestic production lies in the deepwaters of the Gulf of Mexico. Despite the absence of any major deepwater discoveries since late 1999, and a decrease in drilling activity last year, the US Department of the Interior's Minerals Management Service (MMS) remains optimistic, insisting in an April report that 'the future of deepwater Gulf of Mexico exploration and production is very promising'. It anticipates that deepwaters will yield ultimate reserves of approximately 71bn boe, of which 56.4bn remain to be discovered, and that production of 3.5mn b/d in 2010 will be more than half of all US domestic crude production.

This year so far has yielded only one notable discovery – the 400-to-500mn barrel Tahiti field in 4,017 feet (1,225 metres) of water in Green Canyon – by ChevronTexaco and partners. Estimated reserves of finds by Kerr-McGee and Ocean Energy in Atwater Valley, by Unocal in Alaminos Canyon, and by Amerada-Hess and partners in Garden Banks have not yet been determined.

There were 51 deepwater projects in production at the beginning of the year, with 14 start-ups in 2001, and 13 planned for 2002. Proximity of existing production systems is an important factor in the decision to bring a new field into production. All but two of last year's start-ups involved subsea systems which now account for about 20 percent of deepwater oil production and about 25 percent of deepwater gas production. In some cases, several systems are tied to a single central hub. Shell's Auger tension leg platform, for instance, gathers subsea output from the Macaroni, Oregano and Serrano fields.

A new production system for the Gulf is an open truss spar, with six such spars scheduled to be operational in the area in the next few years. Kerr-McGee and Ocean Energy recently installed the first truss spar in their Nansen field in the East Breaks area, and plan to develop their Garden Banks Gunnison field with another. Murphy Oil and partners plan to produce their Medusa field with a truss spar and as does Dominion-Williams its Devils Tower

field, both fields located in the Mississippi Canyon. The latter, in water depths of 5,610 feet (1,710 metres) will be the world's deepest dry-tree platform to date.

El Paso Partners is planning to install a tension leg platform in exceptionally deepwaters - 4,300 feet (1,311 metres) - in Green Canyon to serve as a production hub, initially producing Anadarko Petroleum's Marco Polo field in 2004.

In time, it is expected that floating production and storage offshore vessels (FPSOs) will be used to develop deepwater fields as the MMS has agreed to their use, although with restrictions in some areas. It has also approved the use of shuttle tankers for transporting oil from platforms to shore. Given that, by law, vessels operating totally in US waters must be constructed in the US, Seahorse Shuttling and Technology, a unit of Conoco, has completed the design of a shuttle tanker for the Gulf. There are also several new pipelines planned for deepwater oil production.

An important reason for the lack of dramatic action in the Gulf's deepwaters is the fact that the scene is dominated by Shell, BP, ExxonMobil and ChevronTexaco – companies which have attractive deepwater exploration and development projects elsewhere. In addition, there is still a shortage of drilling rigs capable of working in deep, and especially ultra-deep waters.

Many Gulf deepwater prospects will probably not be drilled before their leases expire – currently only 5 percent of the deepwater leases issued in 1996 and 1997 have been drilled.

One issue for the Gulf is that the high well-flow rates, which have been a driving force behind the success of deepwater operations, have the downside of high field-decline rates. Ample new discoveries will be essential if deepwater output is to remain high.

Gas from Alaska?

The current US natural gas scene is a buyers, not a sellers, market. Spot prices began the year averaging \$2.25mn/btu, inventories were robust and production was sluggish, with companies unwilling

to undertake costly, deep exploration drilling or to produce from high-output rate wells. Prices perked up subsequently with a drought in the East Coast affecting hydropower and concerns over possible shutdown of some US nuclear plants after significant corrosion problems were found at the Davis-Besse nuclear reactor in Oak Harbor, Ohio, a prototype for 71 percent of the nation's nuclear power capacity. By summer, prices seemed settled at around \$3.35mn/btu.

There are still concerns voiced in some quarters over inadequate future gas supplies in the face of widely forecast increased demand from the many new gas-fired electric utilities planned. The Bush administration added to these concerns by making the gas reserves believed to exist in the eastern region of the Gulf of Mexico inaccessible to exploration and production. As well as drastically reducing the number of offshore blocks offered for leasing in an eastern region auction held in the spring, the administration forcibly purchased nine of the eleven leases in ChevronTexaco's eastern offshore Destin Dome gas project ostensibly to protect the Florida coast, and effectively killed the project by retaining veto power over development of the remaining two leases.

On the other hand, the government does seem inclined to facilitate the production of the ample gas reserves in Alaska's North Slope and supports the construction of an export pipeline. This position has led to considerable friction with Canada. Early in the year, Canada's TransCanada Pipelines and partners proposed to build a 'northern line' gas pipeline to run east from Prudhoe Bay under the Beaufort Sea to northwest Alberta where it would connect with an existing TransCanada line transporting gas to the Lower 48 States. This pipeline would go to the MacKenzie delta and follow the Mackenzie valley southwards, thus allowing for the development and export of Canada's northwest gas reserves.

The Alaskan government adamantly opposed this proposal, calling for a 'southern line' pipeline going through Alaska, running roughly parallel to the

existing oil Tapline to Fairbanks, and then roughly parallel to the Alaska Highway to British Columbia. It called for support from Washington.

The US Senate responded by banning a northern line beneath the Beaufort Sea for environmental reasons, endorsing a southern line. Included in its energy bill version was an unprecedented 15-year federal guarantee of the price that Alaskan North Slope gas producers would receive as a tax credit when benchmark gas prices in Alberta fell below US\$3.25/mc cf.

Canada retorted that a US guaranteed natural gas floor price for North Slope producers would keep gas prices artificially high and kill Canadian gas exploration that didn't have the benefit of a floor price. Herb Dhaliwal, Canada's energy minister, noting that two-thirds of the southern line would have to come through Canada, threatened to refuse permission for the construction of the pipeline on Canadian soil.

When Senate and House conferees try to reconcile their separate energy bill versions, House members representing gas-producing states are expected to strongly oppose a plan to promote Alaskan gas with a floor price that would endanger Gulf coast gas producers as well as Canadians.

Plans for more LNG

Although it is far from certain if or when an Alaskan gas pipeline will be built, projects for increased imports of LNG seem to be going ahead despite current low gas prices. Most of the focus is on the Mexican province of Baja California where LNG can be landed for supplying both the Mexican northern industrial corridor and the adjacent southern California market. There are several LNG projects for the coastal regions of Baja California. Shell plans to have a regasification terminal in operation there by 2006 with supply coming from Shell's gas projects in the Asia-Pacific region. A significant proportion of the gas is expected to be provided by the 9tn cf Greater Sunrise field in the Timor Sea in which Shell has a 26.56 percent stake. Phillips Petroleum and El Paso are planning a terminal to receive gas, also from East Timor. Sempra Energy and CMS Energy are planning a terminal to receive gas from Bolivia, with construction of a 215-mile pipeline to bring gas to power plants in southern California and northern Mexico already underway. In addition, Marathon Oil and Pertamina are planning a regasification terminal to bring gas from Indonesia. Mexico is said to be considering 18 separate proposals for LNG terminals, with three or four projects expected online in 2005/2006, provided new Mexican regulations governing gas

Field	production system type	block*	water depth/feet	operator
Madison	subsea	AC 24	4,854 ft	Exxon/Mobil
Crosby	subsea	MC 899	4,400 ft	Shell
Marshall	subsea	EB 949	4,375 ft	ExxonMobil
Mica	subsea	MC 211	4,336 ft	Exxon/Mobil
Einset	subsea	VK 873	3,584 ft	Shell
Nile	subsea	VK 914	3,535 ft	BP
Oregano	subsea	GB 559	3,400 ft	Shell
Serrano	subsea	GB 516	3,359 ft	Shell
Brutus	TLP	GC158	2,952 ft	Shell
Typhoon	TLP/subsea	GC 236	2,679 ft	ChevronTexaco
Unnamed	subsea	EW 878	1,585 ft	Walter
Prince	TLP	EW 958	1,493 ft	Argo
Ladybug	subsea	GB 409	1,357 ft	ATP Oil & Gas
Unnamed	subsea	MC68	1,214 ft	Walter

* Blocks: AC = Alaminos Canyon, EB = East Breaks, EW = Ewing Bank, GB = Garden Banks, GC = Green Canyon, MC = Mississippi Canyon, VK = Viosca Knoll

Table 1: Gulf of Mexico deepwater project startups in 2001

Source: US Department of the Interior, Minerals Management Service.

storage and regasification plants are issued in time.

There are also plans to increase the number of LNG terminals within the US. There are currently four existing terminals at Everett, Massachusetts; Cove Point, Maryland; Elba Island, Georgia; and Lake Charles, Louisiana. Proposals have been made for three new terminals in Texas and others in Louisiana, North Carolina and Florida, as well as in New Brunswick, Canada. Following a different route, El Paso Global LNG hopes to test a ship-based regasification vessel in the Gulf of Mexico by 2004. The vessel is intended to be able to regasify and deliver up to 400mn cf/d to a subsea pipeline and sent to shore.

Energy Policy

But what of energy policy, so large a part of President Bush's original program for Congress? The House approved its version of an energy bill last August and the Senate its version this May. The provisions of these two voluminous bills (the Senate's

is 976 pages) must now be reconciled in a joint conference and a compromise bill sent to President Bush for signature or veto. This could happen this summer, or it could be delayed until after the November elections in which the control of both the House and Senate will be decided.

Both bills contain credits for nonconventional oil and gas production and provisions to encourage construction of an Alaskan pipeline, but only the Senate's contains a guaranteed gas floor price. The House bill contains \$8bn in incentives designed to increase US oil and gas production, the Senate bill, \$4bn. The Senate bill mandates the use of ethanol in reformulated gasoline, the House bill doesn't. The House bill allows exploration of a coastal area in the Arctic National Wildlife Refuge; the Senate bill doesn't. It would be a wasted effort to try to work out what will become law at this time. What is more certain is that Congress will come up with a lot of new post-Enron, post-Andersen and post-WorldCom regulations which will affect energy trading and accounting practices.

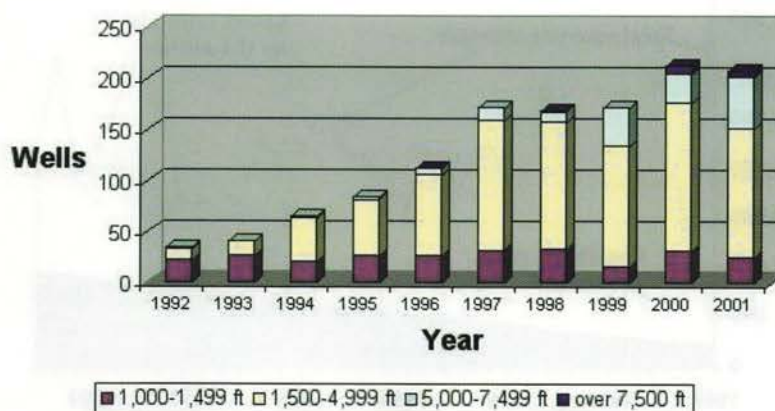


Figure 1: Deepwater wells drilled in the Gulf of Mexico 1992 - 2001 (by depth of water)

Source: US Department of the Interior, Minerals Management Service

Energy security in Europe

Oil production in Europe is starting to decline but will the rest of the world make up the difference?

asks energy supply expert, *Dr Michael R Smith.*

Europe is a region that possessed just 5% of the world's oil reserves before extraction started – the smallest volume of all the seven geographic regions – but it has still witnessed almost constant growth in output since Romania brought its first oil field onstream nearly 150 years ago.

However Europe can currently produce only around 40% of the oil it burns, consuming over 20% of global annual production. The region depends on imported low cost oil to fuel economic growth – oil that makes up a substantial part of global needs as shown in **Figure 1**. Fortunately, the world has easily been able to meet demand to date. Outside of periods of disruption –

usually caused by war – global supplies have been abundant, amply satisfying shortfalls in indigenous supply.

Yet, there is no doubt that global supplies are depleting. Current discovery runs at around 10bn barrels of new oil each year, but last year use was over 26bn barrels. Despite this, many argue that there is plenty of undiscovered oil remaining – especially if you take into account potential reserves growth in which extra volumes of recoverable oil are proven up in producing fields.

Furthermore, new giant fields in the Caspian Sea, offshore West Africa and in the Gulf of Mexico, together with developments in the Middle East

and potentially in Alaska, and new extra-heavy oil mines in Canada and Venezuela, seem to confirm that European oil needs can be satisfied for years to come, barring global political crises.

In fact, the world has produced just under half the oil that has already been found – around 970bn barrels. The reserves/production ratio (R/P), which does not include yet-to-find reserves, is around 38 years at current rates. Given that the world's estimated total original endowment of oil reserves, including yet-to-find, is around 2,200 bn barrels – confirmed by estimates made by many experts over a period of 30 years (as shown in **Figure 2**) – the world has well over a 1,000bn barrels of reserves left. Thus, if you include all conventional oil, we seem to be able to meet demand for around 46 years.

An illusion

Unfortunately, reserves growth and reserves/production ratio are terms that are grossly misleading. Reserves growth is an illusion. Although apparent reserves attributed to the world's portfolio of discovered oil fields have, for a variety of reasons, increased year on year, this is mostly a function of conservative or false reporting in the past. Recovery factors have indeed improved in some fields, but only in those with difficult reservoirs that hold only a small proportion of global reserves. The bulk of reserves additions must be backdated to the date of discovery to get a true discovery profile. Total reserves estimates have remained largely unchanged.

Whilst there are many new fields waiting to be found, especially offshore, there is scant chance of finding more than a few dozen substantial accumulations. In fact, 60% of the world's oil is located in just a few giant fields found before 1970. Without many more giants it is impossible to add substantially to oil reserves and in the last 20 years there has been a massive decline in giant field discovery rates.

Even in our last major frontiers – the deep waters of the Gulf of Mexico and West Africa, and the Caspian Sea – new discoveries are now, on average, much smaller than they were just a few years ago. **Figure 3** shows a truer estimate of annual reserves additions. We already know where nearly all our undiscovered oil is located – none of it is cheap and it is still insignificant compared to the Middle East.

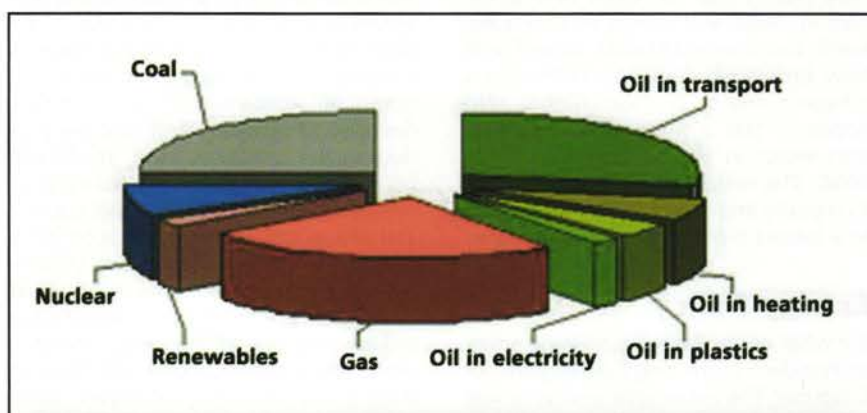


Figure 1: Global energy mix

Source: The Energy Network

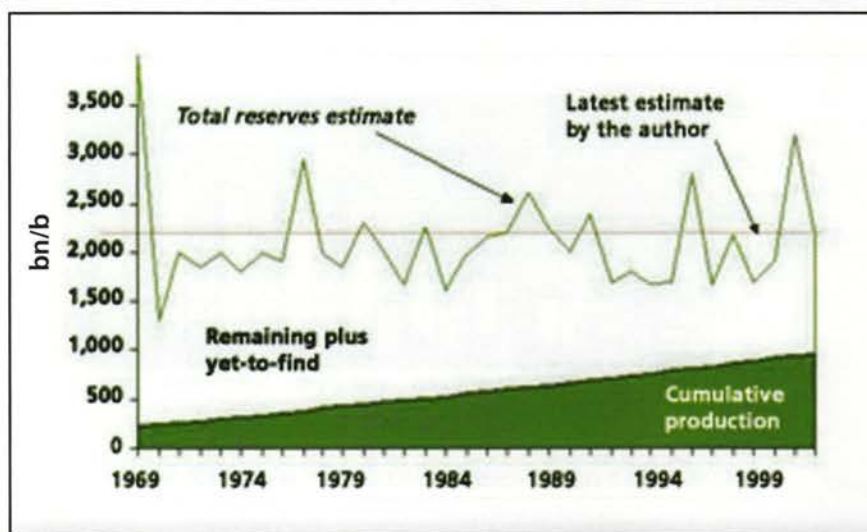


Figure 2: Historic reserves estimates

The term reserves/production ratio is also an illusion. Never mind that demand is rising in parallel with global population, the reserves/production ratio (which, owing to so-called reserves growth, has hardly changed in 30 years), disguises the true critical point – the year of peak production when available supply cannot meet global demand.

Oil will never run out, but there will be critical years, not so far away, when we want more oil than we can immediately get. But in an environment of oversupply – even when demand has been growing rapidly – the critical years have not normally been a concern to those who set the price of oil.

Critical years

There is now no question that oil production, freely extracted from a sedimentary basin, rises to a peak at a roughly steady rate as new fields come onstream, then begins to decline at a roughly steady rate as the first fields begin to deplete and the last few are unable to make up the difference. Increased prices and the presence of infrastructure and technology, both of which lower costs, will stretch decline out in the latter years but will fail to reverse it.

There are 56 countries in the world where production is already in decline and all but a few special exceptions empirically prove that peak year production occurred when between 40% and 60% of total reserves had been extracted. Analysis of cumulative production, remaining reserves and yet-to-find reserves in the remaining producing countries, using the 56 as models, provides the approximate year in which these will also begin to decline. The summed data provides the global peak production year.

The dawning of a global peak is, however, disguised by the actions of Opec – the only organisation over the last 40 years that has conserved oil. Off and on since 1960, Opec has exerted direct control on the world's production levels, making demand fluctuate in a rather unpredictable way. Whilst attempting to keep the oil price higher than market forces would permit, Opec has delayed the global peak year and it is very likely it will continue to do so for as long as it can.

Short-term gluts and shortfalls influence the oil price, in turn influencing global demand. So, to account for the actions of Opec, global peak year must be estimated as a function of different fixed demand levels. As shown in **Figure 4**, it is estimated that, at a 1% demand growth, global peak will be reached in 2016.

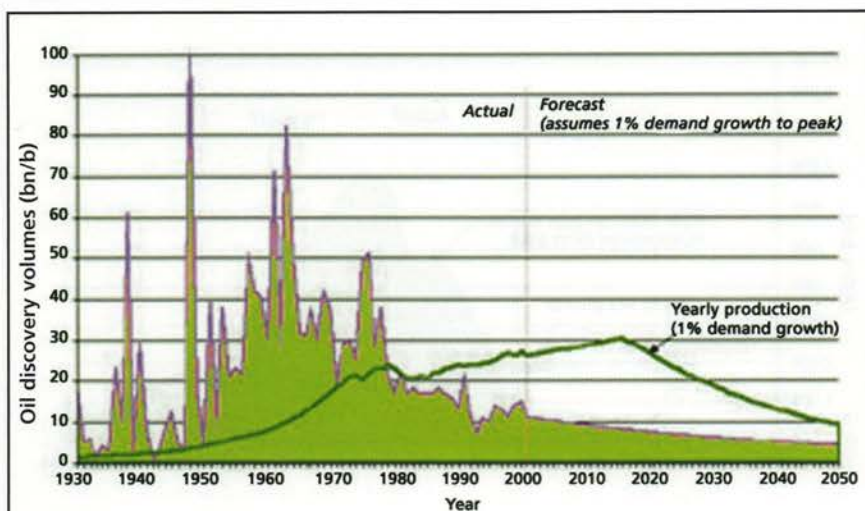


Figure 3: Approximate backdated discovery rate, 1930–2050

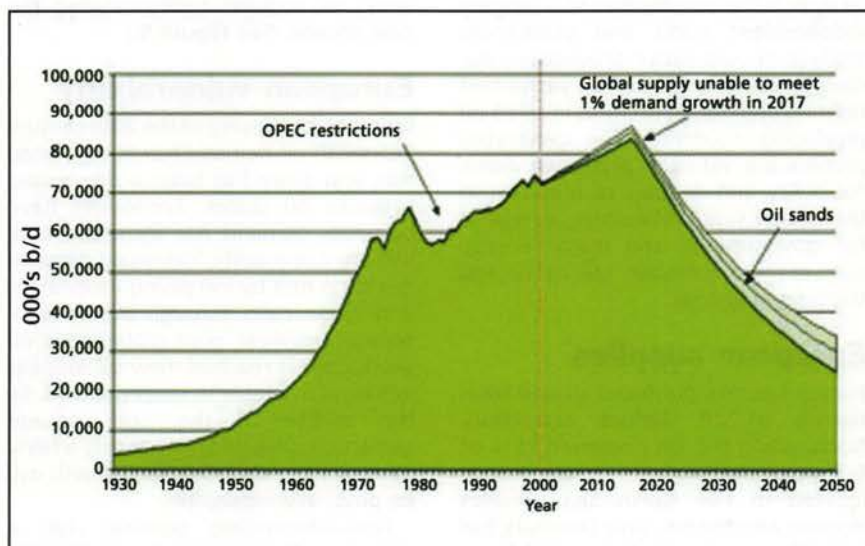


Figure 4: World oil production, 1930–2050, assuming 1% demand growth

Well past peak		Near peak	
Albania	(1982)	Denmark	
Austria	(1955)	Norway	
Bulgaria	(1969)	UK	
Croatia and Serbia	(1981)		
Czech and Slovakia	(1996)		
France	(1988)		
Germany	(1968)		
Greece	(1984)		
Hungary	(1984)		
Italy	(1997)		
Netherlands	(1986)		
Poland	(1909)		
Romania	(1976)		
Spain	(1983)		
		Far from peak	
		Faeroese Islands	

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Note: Does not include Former Soviet Union (FSU) countries.

Table 1: Peak oil production capacity in Europe

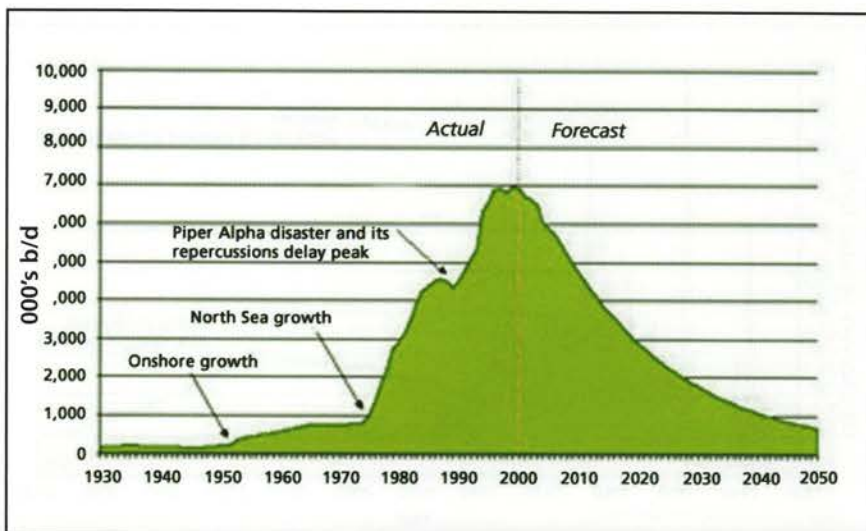


Figure 5: European oil production, 1930–2050

Of course the data are critical. This analysis is the culmination of a lengthy independent audit and grass-roots analysis of cumulative production, discovered remaining reserves, yet-to-find reserves and depletion rates in all 95 oil producing countries. The generated profiles are valuable predictive assets for policy and strategy formulation in the energy supply industries, as well as for governments and major energy users in the automobile, rail, airline and shipping industries.

European supplies

Europe has now produced around 50bn barrels of oil. Before extraction, Norway and the UK possessed 75% of Europe's total original reserves, mostly located in the North Sea. Besides Norway and the UK, only Denmark has a significant volume of reserves (also in the North Sea), whilst Romania, the only other important producer in Europe, peaked back in 1976 and is now in serious decline.

After years of intense exploration and production activity the region is past peak, having produced 57% of its estimated reserves endowment. **Table 1** shows just how mature Europe's oil industry is. Only three of its 20 oil producing countries are not in decline, while Faroese potential has yet to be proved. Overall, the region peaked in 1999.

Europe now needs to import around 60% of its oil needs, mainly from Russia and the Middle East, and it will need to increase imports by around 2%/y just to maintain demand at current levels. Norway and, to a lesser extent, the UK are exporters – but these are massively outweighed by the import requirements of Germany, France, Italy and Spain, as well as many of the other smaller EU countries. Clearly Europe will have major

supply problems to contend with when world oil supplies tighten during the next decade. (See **Figure 5**.)

European vulnerability

From the beginning of the 20th century European oil demand has always been met and there has been a downward pressure on prices. Economies have boomed, demand has increased and, like any commodity, increasing demand has been met by increasing investment and lower costs through better technology. However, once global peak oil production is reached, new oil supplies will be unavailable to meet demand. By the middle of the next decade extracting sufficient oil to satisfy a fairly modest 1% global demand growth will be physically impossible.

Notwithstanding political risk, a global production capacity peak in the next decade will have serious implications for European energy security well before the actual event. Not only will supplies be struggling to keep pace as Opec countries use up their spare production capacity, but also, once the world recognises that a global peak is imminent, there will be early increases in price that will severely hamper economic growth. Furthermore, shortfalls will lead to competition for supply with the US and the Asia-Pacific, inflation, recession and international tension.

Increasing use of Russian gas for power and heat may offset part of Europe's shortfall. The other alternatives such as LNG, heavy oil sands in Canada and Venezuela, gas-to-liquids (GTL) projects, renewables, coal and nuclear power are generally more expensive and have long lead times. Some are environmentally questionable and mostly are, as yet, ineffective as oil substitutes in transport.

European governments are very con-

cerned with environmental threats but it is perhaps surprising that they are not more concerned with improving energy conservation and efficiency in response to supply threats as well. It may be that most European governments and their advising organisations are unaware of an impending global supply squeeze, and this is partly due to the rather optimistic view held by many US geologists and international energy agencies on the future potential of the world to yield more oil.

But lack of opportunity has already forced the major oil companies – who should know the problem better than most – to focus on expensive deep-water projects, cut costs, campaign for the release of protected areas, tinker with alternatives and forge mergers and alliances. Fewer oil companies are already looking for less oil. Of course, with the stock market to think about they don't talk about decline and neither does the International Energy Agency (IEA).

Perhaps under a global scenario of rising prices a new stable energy mix could be achieved with massive conservation, alternative fuels and energy efficiency improvements. However the length of the transition and who suffers least depends on how soon ameliorating measures are implemented by governments and the energy-using industries.

Feeling the pinch

There is insufficient space here to offer policy options and strategies but, suffice it to say, by the middle of the next decade it will not only be Opec that will be rationing oil.

At least a first step for European governments and concerned organisations must be to fully understand the problem and determine just where the world's oil will be coming from over the next 20 years, how much of it will be available and who will want it.

Oil-poor Europe will feel the pinch more than most unless remedial strategies are implemented very soon indeed. ●

All figures courtesy of the author.

A comprehensive, independent and detailed analysis of oil supply, sources, substitutes and price, together with a supply forecast to 2050 for every country and region in the world is contained via a commercially available report. Please contact the author at glow@lineone.net for more information.

Worse things happen at sea

Accident prevention and survival through a combination of safer working, improved performance standards, targeted training, and better equipment, were the themes of a two-day Offshore Emergencies conference held in Aberdeen at the end of June. Delegates from six countries participated in two workshops, and heard of the latest developments from industry specialists writes *Brian Warshaw*.

Speaking as chairman of the UKOOA leak reduction task force, Ian Morrison told the audience that by the simple expedient of targeting 'hotspots', major and significant hydrocarbon leakages had been reduced by 25% in the two years since 2000. By concentrating on vibration-induced fatigue, better corrosion management, bolted flange connections, and compression fittings, the industry was well on the way to achieving the HSE's target of a 50% reduction of leaks by 2003–2004.

Morrison said that Joint Industry Project (JIP) groups for these 'hotspots' had, through the task force, raised awareness amongst the operators, addressed the issues of competency and training, and by networking and sharing good practices, brought about the first improvement since 1995. Two new JIP groups had been established, one to look at flexible hoses, the other to provide guidance on reporting issues, and Morrison anticipated that these would help to maintain the momentum of improvement.

In addition to protecting personnel, Shell Expro has promoted its minimum facilities unmanned Trident platform design. Alastair Mudie and Doug Graham discussed the platforms, which are accessed by boat, and employ high-reliability equipment with an annual requirement of less than 100 man-hours. The platform is without helideck, shelter, lighting, lifeboat, gas detection or alarms, and since implementing the Skiff platform, two more of similar design have been installed.

Collision course

Not all incidents start on the platform. According to George Boothby of the HSE, between 1975 and 2001 there

were 557 incidents of a collision between a ship and a platform, with an 11% statistical risk of a fatality. The majority of these collisions have involved supply and other attendant vessels, and were within the control of the platform's management risk system. Eight of the incidents, however, were attributed to passing vessels, similar to an accident in May 2002, when the fishing boat *Marbella* struck and damaged a leg of the Rough 33 accommodation platform, causing 109 personnel to be evacuated.

Reducing the potential for collision had been addressed, according to Boothby, by the International Maritime Organisation, and all new-build vessels must now include the Automatic Identification System (AIS). By July 2008, all ships above 500 Grt must be so equipped, and he anticipated that the shipboard transponder, transmitting identification, position, course, and speed, could become a significant aid in platform collision risk management. However, Boothby's contention was disputed by a later speaker, Dave Cheadle of SML Technologies.

While accepting that the AIS will improve the current situation, Cheadle doubted the efficacy of a single standby vessel equipped with a ship-borne radar and Automatic Radar Plotting Aid (ARPA), to provide an effective warning system for a multiple set of platforms. Cheadle claimed that the X-band radar carried by the standby vessel would miss, according to a study commissioned by the HSE, most approaching vessels during normal and adverse weather and sea-state conditions. The solution, he suggested, was for one or more of the platforms to have radar, which would transmit the scan directly to the support vessel, where software would remove clutter, and overlay the

multiple scans on the screen. This would enable the standby ship to have an overall picture of the potential for a collision.

If in doubt... OIMs

If it all goes wrong, there is always the Offshore Installation Manager (OIM) to take command, and delegates were given an insight into the stringent training in emergency response (ER) the OIM undertakes. Bill Taylor, a consultant to the survival-training centre, RGIT Montrose, explained how the potential OIM attends lectures, receives coaching and mentoring, and uses a simulator to expose him to developing emergency conditions.

The OIMs are assisted by a raft of regulations, guidelines, the Safety Case, and extensive academic studies. Dave Menarry of Mensafe, reviewed the revised UKOOA guidelines for managing ER which provide prescriptive responses from the detection of an incident through to its control, or the evacuation from the platform. These rule-based procedures are at variance with the findings of Professor Rhona Flin, a psychologist at Aberdeen University. Flin's studies show that the skill most desirable in a strategic ER commander is an analytical approach.

The work of António Simões Ré, of the Canadian National Research Council, suggests that the design of the TEMPSC twin davit lifeboat system is not without its problems. His scale model experiments in launching the TEMPSC have shown that the location of the lifeboat, and weather and wave conditions, can affect performance on the day.

Conference delegates heard how the design of safety management systems was affected by technical, human, organisational, and social factors, and Jeremy Daniel discussed how these systems could be validated to ensure that performance standards are achievable.

The role of rescuer was also discussed. Nick Bryant of the Maritime and Coastguard Agency described how a major offshore rescue operation would be co-ordinated, and Flight Lieutenant Colin Dempster outlined the capabilities and limitations of the RAF maritime search and rescue helicopters.

Alan Graveson from the trade union NUMAST, ended the conference by speaking of the problems faced by the Masters of Emergency Response and Rescue Vessels, and the efforts made to overcome them.



East Timor gains independence

As dignitaries from more than 80 nations gathered on East Timor to celebrate its independence day, a more modest celebration was taking place on the US\$1.9bn Bayu-Undan gas re-cycle project, with the start of production drilling, a major project milestone. There was also reason to celebrate progress on the gas project which is now starting to move ahead after it was put on hold last July to allow time for the resolution of legal, fiscal and taxation issues. However, a delay to the ratification of the new Timor Sea Treaty could cause yet another set-back for the proposed liquefied natural gas (LNG) plant at Darwin reports *Jeff Crook*.

The Australian prime minister, John Howard, and Dr Mari Alkatiri, leader of the parliament of East Timor, signed Timor Sea Treaty documents during the independence ceremony in Dili on 20 May 2002. These documents included the treaty itself, an Exchange of Notes, and a memorandum of understanding (MOU) based on an International Unitisation Agreement for the Greater Sunrise field. The Exchange of Notes ensures that existing arrangements continue until the new treaty comes into force. Once the new treaty has been ratified by each national government, and enforced, it will be applied retrospectively to 20 May 2002.

The documents signed in Dili include the draft agreements reached last summer under which East Timor was awarded 90% of the revenue stream from the 'Joint Petroleum Development Area' (JPDA), rather than the equal 50:50 split under the previous treaty with Indonesia. The Australian government hopes that this revenue will underpin East Timor's viability as a national economy. In addition, the new treaty establishes a comprehensive regulatory framework covering development and production; health and safety

of workers; and the application of taxation and criminal law.

One issue, which could yet de-rail the ratification of the treaty, is the question of maritime boundaries. East Timor has expressed the desire to extend its boundary, and this will have an important bearing on the unitisation of the Greater Sunrise fields, which are currently considered to lie 80% in Australian waters, and 20% in the JPDA. Renegotiation will be a lengthy process, particularly in view of complexity that would arise from the presence of small Australian islands to the north of its coastline.

Bayu-Undan field

The Bayu-Undan field located in the JPDA lies in relatively shallow water, just 80 metres deep, and 500 km north-west of Darwin. Although the field is relatively close to East Timor - it lies just 250 km from the south coast port of Suai - it is not thought practical to land the gas in this newly independent nation. Aside from the lack of any industrial infrastructure on East Timor, it would be difficult to lay a gas pipeline across the Timor Trough, where the seafloor rapidly plunges to depths of

over 2000 metres.

The first phase of field development involves production of gas liquids for export to Asian markets by shuttle tankers. This gas re-cycle project involves stripping the condensate, propane and butane from the gas stream, and then re-injecting the lean natural gas back into the reservoir, where it will be exploited at a future date. Liquids production is scheduled to start in late 2003, with first commercial production in the first quarter of 2004. Natural gas is due to be produced from 2006, barring delay, during a second phase of the project, by means of a pipeline to Darwin, in northern Australia.

The field has estimated recoverable reserves of 400mn/b of gas liquids together with 3.4tn cf of natural gas. It is operated by Phillips Petroleum (91-12) Pty Ltd, a subsidiary of Phillips Petroleum Company. Phillips originally held a 58.6% stake but reduced this to 48.52%, during March 2002, when it sold a 10.08% interest to The Tokyo Electric Power Company, Inc. (TEPCO) and Tokyo Gas Company Ltd. (TG). These two Japanese companies had separately agreed to purchase most of the field's gas reserves. Other field partners are Santos (11.8%), Impex (11.7%), Kerr McGee Group (11.2%) and Agip (6.7%).

Bayu-Undan gas recycle project

The field, which measures approximately 25 km by 15 km, will require around 26 wells to produce its reserves over an estimated 25-year lifespan. The overall facilities for the gas re-cycle project include an unmanned wellhead platform; a central production and processing (CPP) complex (this consists of a drilling, production and processing platform bridge-linked to a utilities and quarters platform); and a floating storage and offloading (FSO) vessel.

The start of development drilling on 17 May 2002 was regarded as an impor-



tant project milestone because it followed the installation of the wellhead jacket. The wellhead jacket needed to be in place because the jack-up rig is operating in the cantilever mode over the base structure of the platform. Now that drilling has got underway, it will take around 730 days to complete the 11 production and 5 gas injection wells needed for production start-up.

The two jackets for the CPP complex arrived at the field site on 26 May for installation during June 2002. The next important milestone is the completion of the decks at Hyundai Heavy Industry's yard in Ulsan, Korea, to allow hook-up and commissioning to start in the first quarter of 2003. Phillips says that this work is now seen as a 'significant focus area'. The FSO vessel, which is being built at Samsung Heavy Industry's yard in Koje, Korea, should have been ready for launching on 28 July 2002.

The project implements the Phillips Petroleum Company Process for Safety and Environmental Excellence Management System (PSEE-MS). This is a process which integrates Health, Environmental and Safety (HE&S) management into every aspect of Phillips Petroleum business. A key aspect of the PSEE-MS process for Bayu-Undan project is the development of a Safety Case for each stage of the project life-cycle. This is a statutory requirement in both Australian waters and in the JPDA. The safety case regulations were introduced into Australian waters during the 1990s as a result of the lessons learned from the Piper Alpha disaster in the North Sea, in which 167 workers lost their lives in 1988.

Bayu-Undan gas project

The Bayu-Undan partners are also moving ahead with a \$3bn scheme to develop the Bayu-Undan gas reserves by means of a 500-km pipeline to a new LNG export terminal in Darwin. Although full approval awaits ratification of the new Timor Sea Treaty, there is now greater confidence that this project will get the go-ahead following two announcements from Phillips.

In the first of these announcements, towards the end of 2001, the field partners welcomed a decision by the East Timor Council of Ministers to endorse an understanding on a tax and fiscal package that would allow the Bayu-Undan gas development to proceed. As part of this agreement, the field partners will develop certain onshore infrastructures, and will offer help with training programs as well as community health issues.

One of these initiatives involves upgrading the airport facilities at Baucau, East Timor. This will be used as the staging location for offshore air support and transportation for the Bayu-Undan field. Work here will focus on upgrading terminal facilities, transit accommodations and hangar space.

In the second announcement, during March 2002, the Phillips Petroleum Company subsidiary, Darwin LNG Pty Ltd said that it had signed a Heads of Agreement (HOA) with TEPCO and TG for the sale of three million t/y of LNG. This agreement commits nearly 100 percent of the Bayu-Undan field's proven reserves, and extends over a 17-year period, with the first cargo scheduled for January 2006.

Phillips said that signing of the HOA paved the way for construction of an LNG facility at Wickham Point, near Darwin. This new plant would use the company's own proven Optimised Cascade LNG process. Phillips added that the HOA would also justify investment in the pipeline infrastructure required to move Timor Sea gas into Australia.

There are, however, some potential obstacles to the project go-ahead. One of these is the ratification of the Timor Sea Treaty, and the other is the tax and fiscal package agreed with the East Timor authorities that also have to be agreed by the Australian government.

Floating LNG for Sunrise fields

Gas production from Greater Sunrise (Sunrise, Sunset and Troubadour) will now almost certainly be delayed

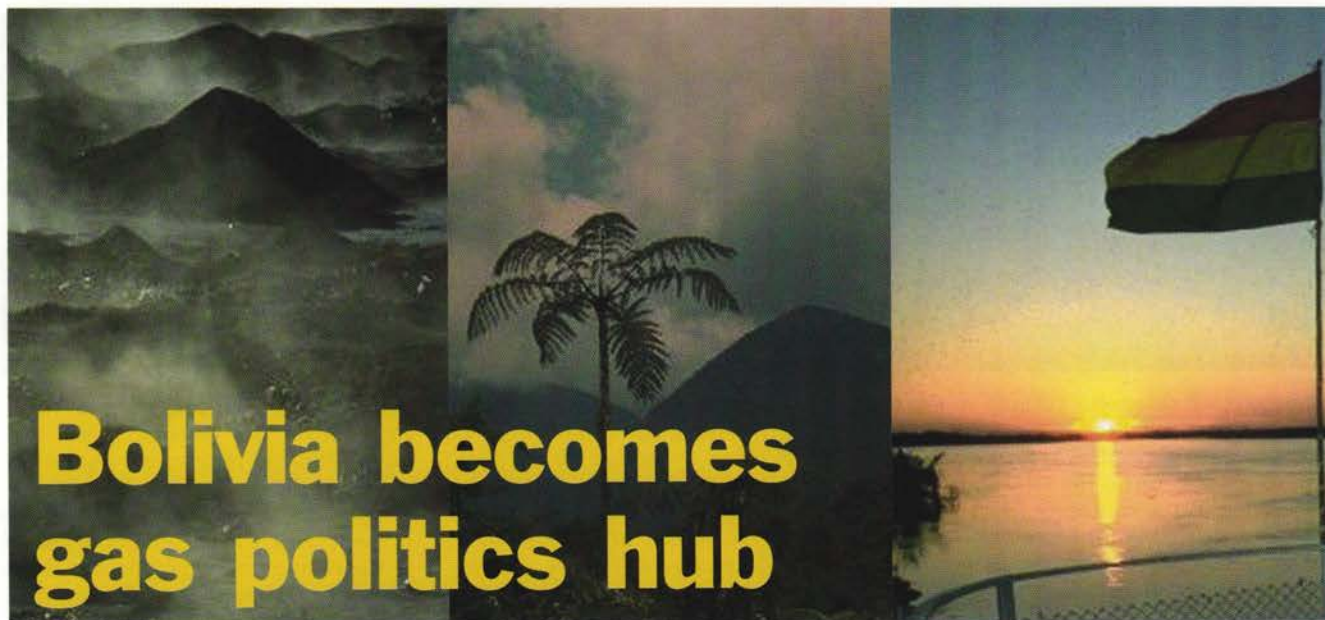
beyond 2006, as first envisaged. These fields lie in the Bonapart Basin and have estimated recoverable reserves of over nine trillion cf of gas, and 300mn/b of condensate. Approval of the development project awaits the outcome of the unitisation negotiations, but could be further delayed by a dispute over the development solution.

The Greater Sunrise partners of Woodside Petroleum (33.44%), Phillips Petroleum (30%), Shell (26.56%) and Osaka Gas of Japan (10%) have been studying Shell's proposal to develop the gas reserves by means of the world's first floating LNG (FLNG) facility against the pipeline solution. The Shell proposal, which was tabled during August 2001, involves piping gas from an unmanned wellhead platform to a 450 metre-long, turret-moored FLNG facility. Subsea wells could later be connected back to the wellhead platform.

Up to five million t/y of LNG would be produced on the floating facility, and gas could also be supplied to Darwin, either by an independent pipeline or by a spur to the proposed Bayu-Undan gas pipeline. The massive FLNG facility would be equipped with a 300-megawatt power plant and would be capable of processing up to one billion cubic feet of gas per day. It would have capacity to store 200,000 cm of LNG with facilities to offload this product for export by LNG carriers. There would also be facilities to offload up to 30,000 b/d of condensate to shuttle tankers.

While it is believed that Woodside Petroleum might be willing to support Shell's FLNG proposal, Phillips is thought more likely to favour a pipeline to Darwin. However, the adoption of the innovative FLNG technology would be an exciting step forward, with the potential for application in many other locations.

From far left: The Samsung yard in South Korea, where the Bayu-Undan floating storage vessel is being built; the jackets and decks of the Bayu-Undan gas-recycle project



Bolivia becomes gas politics hub

Bolivia's hopes to export surplus gas in the form of LNG to northern Mexican and US West Coast markets have developed into a major issue during the country's presidential election campaign, reports *Maria Kielmas*. A pending decision by the incoming administration to choose between Peru and Chile as a location for LNG export facilities is also changing Bolivia's relations with its neighbours. If the project succeeds in capturing a share of the US gas market it could alter significantly gas market dynamics in the Latin American region.

Exploration in the 1990s increased Bolivian gas reserves to 18.5tn cf proven – a figure that rises to 70tn cf if probable and possible reserves are taken into account, making it the second largest reserves base in Latin America after Venezuela. However, simultaneously the Brazilian gas market – for which the Bolivian product has been targeted over the last decade – has collapsed because of that country's regulatory uncertainties relating to the construction of gas-fired power generation plant and the uncompetitive price of gas relative to other energy sources, notably hydro.

As a result, gas producers in Bolivia turned their attention to the US and Mexican markets – estimating that if these were contemplating LNG imports from Russia (Sakhalin), Indonesia and Australia, then Bolivian LNG departing from a Pacific port would also be competitive in these markets. The US Department of Energy has forecast that LNG imports will grow from 1.3% of US gas consumption in 2002 to 3% by 2008. Various government and industry forecasts estimate the US could import between 4bn and 6bn cf/d of gas by 2010.

LNG exports

Gas producers in Bolivia announced two LNG export project proposals last year, each costing an estimated US\$5–6bn. Repsol-YPF (operator), BG and Pan American Energy (a joint venture between BP (60%) and Argentina's Bidas (40%)) formed the Pacific LNG consortium, while TotalFinaElf and ExxonMobil formed LNG Pacific. Both projects hoped to sell an initial 28mn cf/d, rising to an average of 800mn cf/d

to the US and Mexican markets. If agreement on export facilities could have been reached by mid-2002, the projects could be up and running by 2006 or 2007.

Pacific LNG intends to use gas from the Margarita field (6.4tn cf in proven reserves, 13.4tn cf proven and probable, and 24.1tn cf proven, probable and possible reserves) in the Caiependi licence area in Bolivia's Altiplano, while TotalFinaElf hopes to export gas from the Itaú field (proven, probable and possible reserves of 10.36tn cf). So far, the Pacific LNG project has made the running and TotalFinaElf has pondered publicly about joining the consortium. The French company has also been mulling joining the Camisea gas field development consortium in Peru.

Bolivia is anxious to find a major gas customer to act as a counter-weight to Brazil. La Paz so far has resisted mounting pressure from Brazil – in particular from Petrobrás, which claims to account for 20% of the Bolivian economy – to cut gas export prices. Over the April–June quarter gas prices to Brazil were \$1.34/mn Btu, compared with \$1.36/mn Btu for the 1Q2002, plus transportation charges of \$0.33/mn Btu in Bolivia and \$0.84/mn Btu in Brazil. The reference price was fixed at \$1.66/mn Btu in April, but has been falling since in line with the drop in crude prices.

Lack of progress in the construction of gas-fired power generation plant has meant that São Paulo gas distributor Comgás, whose principal shareholders are Shell and BG, has no market for its take-or-pay commitments from both Petrobrás and BG Bolivian gas production via the Bolivia–Brazil gas pipeline. In 2003 total exports of Bolivian gas to Brazil were to reach 40mn cm/d, but in May this year gas exports to Brazil totalled only 10.2mn cm/d.

The Bolivian Government estimates it could earn up to \$400mn annually from LNG exports. The gas sales price is to be set at \$1.34/mn Btu, with a minimum wellhead price of \$0.70/mn Btu and a price of \$0.94/mn Btu at the Bolivian border. The consortium return on investment is estimated at 18%. However, the second country involved in the project could make considerably more through a combination of transit fees and taxes – a matter that has greatly preoccupied La Paz during the presidential election campaign. Bolivia lost its Pacific coastal territory after the 1879–83 Pacific War and is eager to tie its choice of LNG export route to a cession of coastal territory from either Peru or Chile. Neither of these countries is eager to accede to La Paz' wishes because of the domestic ramifications. But local authorities in

both countries have said they are willing to grant the Bolivian Government a 99-year lease on port facilities. The terminal needs to have an area of at least 200,000 sq metres to host a liquefying plant and a harbour with water depths of at least 16.5 metres.

Chilean relations

Chile's northern cities of Antofagasta, Mejillones, Tocopilla and Iquique have not only signalled their interest in the LNG project, but are fighting a diplomatic war among themselves to find favour with Bolivia. Major Chilean industrial groups such as Von Appen, Claro and Yuraszek, as well as state copper company Codelco, are each lobbying on their own behalf, as they already own loading facilities at two of the ports.

Chilean President Ricardo Lagos, who received a drubbing in legislative elections late last year, is trying to remain neutral in the face of this internal rivalry – especially as Chile has not had diplomatic relations with Bolivia since 1978. However, Foreign Minister Soledad Alvear signalled in May that diplomatic relations could be restored. This initiative followed understated efforts to repair relations with La Paz in response to Chile's increasing nervousness at what it views to be an expansion of Brazilian interests to the west. It also followed moves by the centre-right opposition Unión Democrática Independiente (UDI) party to send representatives to La Paz to negotiate with Bolivian President Jorge Quiroga's governing Acción Democrática Nacional (ADN) party. The UDI and ADN are part of a regional centre-right grouping, Unión de Partidos Latinoamericanos (UPLA), while the UDI leader and effective Chilean opposition leader, Joaquín Lavín, is using the LNG export issue to heighten his international profile ahead of presidential elections in two years time.

Peruvian response

Pacific LNG project prompted contradictory responses in Peru. President Alejandro Toledo publicly offered Bolivia the use of Ilo and Matarani ports as part of his policy of 'preferential associations' with neighbouring countries.

Toledo expressed hopes that the Bolivian project and Peru's development of the 11tn cf Camisea gas field, operated by Argentina's Pluspetrol, could become a joint enterprise. This was quickly dismissed by Energy Minister Jaime Quijandria who remains adamant, as do Pluspetrol and its partners, that Camisea must become a stand-alone project if it is to export to the US market.

Quijandria believes that Camisea gas could arrive at the US market at least

one year ahead of the Bolivian product. Halliburton is conducting a \$8.5mn feasibility study for a LNG facility on the Peruvian Pacific coast that could see exports to the US by 2006.

Royalties and tax reductions

Comparison between the Bolivian and Peruvian projects has prompted operating companies to urge royalty and tax reductions. Pluspetrol executives noted that should Bolivian gas enter Peru it would be cheaper for Peruvian buyers than Camisea gas, because of the much lower royalties gas producers pay in Bolivia.

Bolivian companies pay royalties of 12% plus a 6% share for the state. Post royalty profits are subject to variable income tax, a higher 'surtax' and VAT. In Peru the Camisea development contract stipulates a royalty of 37.24%. But Pluspetrol Chief in Peru, Alberto Moons, opened a Pandora's box when he said publicly that the contract the Camisea consortium signed with the government contains a special clause, number 8.6, allowing for a cut in royalties should the gas produced be exported, as is now the project plan. The Lima Government has been taking every opportunity to deny that a royalty cut is imminent in what would be its biggest export revenue earner, while in Bolivia politicians are calling for a sharp increase in royalties paid by foreign oil and gas companies.

Export routes

The Chilean ports of Iquique and Mejillones are both closer to the Margarita gas field in Bolivia's Tarija Province that will provide the first gas for export. The logical downside is that a 42-inch gas pipeline route over the Andean Cordillera would have to scale altitudes of between 3,500 and 5,500 metres. The route through the Bolivian Altiplano to Ilo in Peru would be mostly at 1,850 metres, with the exception of one point where altitudes reach 4,300 metres – but access routes around this exist. The Chilean route does not pass through any towns with more than 20,000 inhabitants while the Peruvian route passes by the cities of Potosi, Sucre, La Paz as well as Cochabamba in Bolivia, and Moquegua in Peru before reaching Ilo.

Most pundits in Bolivia view the route to Peru as superior, partly because of antipathy towards Chile and partly because of its potential to provide more jobs at home and to promote a wider distribution of gas to domestic users. But a gas distribution concession licensing round held earlier this year drew no bidders at all. No Bolivian politician

endorses the development of a similar gas distribution market in northern Chile should a southern route be chosen. Chilean gas buyers are eager to diversify from what they view as insecure supplies from Argentina. These have been interrupted by labour unrest at Argentine gas fields and ruptures of the northern Tractabel-operated Norandino gas export pipeline which exports Argentine gas to northern Chile.

Elections and expectations

Of the candidates only the pre-election third runner, former President Jaime Paz Zamora of the leftist Movimiento de la Izquierda Revolucionaria (MIR) party has come out in favour of a Peruvian export route. He has been advocating the recreation of a state oil company through effectively nationalising private pension funds created by receipts of 1990s privatisations, and which would hold a share in the LNG project. He also wants to create a national gas commission to oversee the industry as a whole. Front runner Manfred Reyes, a four-term Mayor of Cochabamba and head of the populist Nueva Fuerza Republicana (NFR) party, and second-placed former President Gonzalo Sánchez de Lozada representing the more market-friendly Movimiento Nacionalista Revolucionario (MNR), originally supported the Chilean option but became non-committal as the elections approached.

'Sánchez de Lozada and Reyes came respectively first and third in the 30 June elections. A surprise close second was Evo Morales, leader of the leftist Movimiento al Socialismo party who is also an Aymara Indian and leader of Bolivia's coca farmers. With no outright winner the Bolivian constitution states that the legislature must choose the president by August. Shifting party alliances within the legislature favour Sánchez de Lozada since Morales is keeping his MAS out of the horse-trading. Sánchez de Lozada has strong contacts with Chile's top business families and Chilean pundits are predicting that he will favour the Chilean gas export route eventually. But Bolivian public opinion remains overwhelmingly against a Chilean port as numerous commentators rake over historical grievances against Chile.'

No one will be able to ignore growing expectations at home that increased gas production should be used to provide the population with cheap gas, rather than profits for foreign investors. Populist rhetoric has governed the campaign. Manfred Reyes made his reputation by confronting and eventually forcing the expropriation of a water distribution contract in Cochabamba from UK-based International Water fol-

lowing the company's decision to raise domestic tariffs sharply. Public sensitivities have been sharpened further by a government investigation into the history of Enron in Bolivia, its relationship with governments and its role in the Bolivia-Brazil gas pipeline project. The investigation has shown that Enron was only a promoter for this project and did not secure any of the investment finance. With no outright winner in the 30 June election, the Bolivian constitution states that the legislature must choose the President in August. Manfred Reyes has ruled out his party's support for Sánchez de Lozada, and shifting party alliances mean that there is no guarantee that the front runner will succeed.

Mexican worries

At the beginning of 2002 President Jorge Quiroga said a decision on the export route would be made by mid-2002. But, as a transitional head of state who assumed office following the late President Hugo Bánzer's illness, he will not be able to make a final decision without consultation with his successor. The political delay endangers Bolivia's prospects in the North American market.

In December 2001 Pacific LNG and Sempra Energy signed a Memorandum of Understanding (MoU) to supply Bolivian LNG to a receiving terminal being developed jointly by Sempra and CMS Energy on the Pacific Coast north of Ensenada, Baja California, Mexico. The receiving terminal will have send out capacity of 1bn cf/d and the gas will be transported to the Mexican and south-west US markets by pipeline. The MoU expected that agreements among the companies and government approvals would be in place by the end of 2Q2002.

However, not only is no government approval likely before the third quarter this year, there are signs of dissent among the partners on export routes. BG states on its website that the gas would be sent initially to a Chilean port, but spokesmen insist no decision has been made. TotalFinaElf, although not yet part of the consortium, has made no secret of its desire for a Chilean export route. This would tie in with the company's interests in gas transportation pipelines in Argentina where it is the technical operator of the GasAndes export pipeline to Chile. But some Repsol-YPF executives have been leaning towards a Peruvian solution.

The situation is no clearer at the Mexican receiving end. There has been rising opposition to energy projects along the US-Mexican border in both countries as politicians and activist groups seek to enforce common environmental standards. Officials working

for Californian Senator Diane Feinstein have warned US energy companies in Baja California that energy imports from Mexico would be banned if they did not comply voluntarily with US clean air standards.

There is also regulatory uncertainty in Mexico about the construction of four receiving and regasification terminals planned in Tamaulipas state as well as Ensenada. Shell plans to construct a receiving terminal here for Asian LNG heading for the US market. Following a ruling by the Mexican Supreme Court in May that the government's plans for electricity sector reform are unconstitutional, the government decided to delay publication of the regulations and permits required for the regasification terminals until the legal situation was clarified. The Supreme Court decision has also stalled state oil company Pemex plans to fund new co-generation projects and investment in new gas-fired power generation plant. The political gridlock has exacerbated difficulties in introducing multiple service contracts for foreign investors in gas exploration. With Pemex' own exploration in the northern gas-prone Burgos basin faltering, there are now worries that expansion of the Mexican gas industry may stall.

Uncertain future

Such delays should open the way for new Caribbean LNG producers into the US market. But aside from Trinidad's Atlantic LNG, which sells some of its output to the US East Coast, no project has moved beyond the feasibility study stage. In early June the Venezuelan Government announced that state company PdVSA, Shell, Mitsubishi and Qatar General Petroleum Corporation (QGPC) would participate in the \$2bn Mariscal Sucre LNG project, formerly known as the Golfo de Paría project and, prior to that, Cristóbal Colón.

But this undertaking is full of uncertainties. PdVSA will have severe difficulties in financing its share, a minimum of 51% under hydrocarbon legislation passed last year but was inexplicably cut to 49% in the June government announcement. The exclusion of ExxonMobil from the project and its replacement by QGPC has raised the issue of compensation for the US company's exclusion from the scheme. ExxonMobil was an original partner in the Cristóbal Colón scheme.

Venezuela's fragile political situation suggests that its LNG project will be delayed further. But Latin America's gas producers and governments have to resolve their differences quickly if they are not to lose their potential export markets in the US to competition from Asia and Russia.

The quality of aviation fuel available in the UK Annual Survey 2000*

Surveys relating to the specification properties of aviation turbine fuels supplied in the UK have been carried out by QinetiQ Fuels and Lubricants Centre since 1974. The 29th report covering the year 2000 survey has just been published and a copy of the report has been placed in the IP Library.

The report contains a summary of the data of the specification properties of 2246 batches of aviation turbine fuel complying with Defence Standard 91-91 Turbine Fuel, Aviation Kerosine Type, Jet A-1, Issue 3. The information has been supplied by oil companies releasing main batches of aviation turbine fuel in accordance with Defence Standard 91-66 Segregation, Handling and Quality Assurance of Petroleum Fuels, Lubricants and Associated Products Issue 2. The data is expressed in the form of histograms and mean values. Graphical comparisons of the mean values over the period 1986 to 2000 are also made.

A number of changes and trends

Trend data	
Properties where the mean value has a rising trend	Properties where the mean value has a decreasing trend
Smoke point	Aromatic content
Distillation 90 % recovery temperature	Naphthalenes
	Flash Point

Significant changes from 1999	
Property	Change
Aromatics	Down 0.4% V/V
Specific Energy	Up 0.03 MJ/kg
Density	Down 2.0 kg/m ³

have been identified (see above). ●

* This survey, conducted by Garry Rickard of QinetiQ, was part funded by the IP as part of its Test Method

Technical Development programme and the report has been produced on behalf of the Ministry of Defence and the Institute of Petroleum.



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Filling the global energy gap in the 21st century

A growing body of opinion among energy experts suggests that global oil supplies will only meet demand until global oil production has peaked sometime between 2013 and 2020. A subsequent decline in oil production will then cause a global energy gap to develop, which will have to be filled by unconventional and renewable energy sources. However, *Dr Mamdouh G Salameh** believes that the peak in global oil production may occur much earlier, probably between 2004 and 2005, causing a serious energy shortage to develop sometime between 2008 and 2010.**

Energy conservation, improved energy efficiency, expanded production of both conventional and unconventional oil, and conversion of natural gas to liquids (GTL) may help extend the time of peak production by a few more years. However, the long-term solution to world energy supplies and protecting the environment lies in the transition from fossil fuels to renewable energy sources such as hydrogen, solar, wind, hydro-electricity and biomass.

In 2000, fossil fuels supplied 90% of global energy, with crude oil accounting for 40% of the total, coal 25%, natural gas 25%, nuclear energy 7% and hydro-electricity 3%.¹ But fossil fuels are exhaustible resources. Future oil reserves will be mainly generated from improved recovery systems and huge unconventional resources such as heavy and extra heavy oil, tar sand oil, shale oil and GTL – known collectively as synthetic fuels (synfuels). That said, conventional oil will still be available throughout the 21st century, albeit at exorbitant prices.

Demand drivers

Economic growth and population growth are the most important drivers behind increasing global energy demand. The global economy is projected to grow by 3.2%/y, on average, to 2025. Global gross domestic product (GDP) is projected to rise from \$49tn (2000 \$ppp (purchasing power parity)) to \$108tn in 2025 and \$196tn in 2050.² The developing countries have significantly better growth prospects, with their share of global GDP rising from

46% in 1997 to 52% in 2010 and 58% in 2020.³ Expanding industrialisation and improving standards of living in these countries will contribute significantly to the growing global energy demand.

World population is expected to grow from 6bn in 2000 to 8bn in 2020. The population growth among the 4.8bn people living in developing countries is estimated at 1.7% pa, adding 81mn mouths to feed annually. This compares with an average 0.3% pa in the developed countries. Moreover, the bulk of global industrial growth is expected to occur in these countries. In view of these trends, providing access to commercial energy in the developing countries will be an increasingly large and urgent challenge.

At present the developed countries produce roughly one-third of global oil but consume two-thirds, whilst the developing countries produce two-thirds but only consume one-third (see **Table 1**). Annual per capita oil consumption in the developing countries is 2 b/y. This contrasts with 14.2 barrels in the developed countries and 25 barrels in the US (see **Table 2**). During the first quarter of the 21st century, global oil demand is projected to increase by 1.9%/y, reaching 95.8mn b/d in 2010 and rising to 115mn b/d by 2020. Most of the projected incremental oil demand over the next two decades will come from the transport sector.⁴

Ultimate oil reserves

World ultimate conventional oil reserves are estimated at 2,000bn barrels.⁵ This is the amount of production which would have been produced when production

eventually ceases. Different countries are at different stages of their reserve depletion curves. Some, such as the US, are past their mid-point and in terminal decline, whilst others are close to mid-point, such as the UK and Norway. The UK sector of the North Sea is currently at peak production and set to decline at about 6%/y. However, the five major Gulf producers – Saudi Arabia, Iraq, Iran, United Arab Emirates (UAE) and Kuwait – are at an early stage of depletion and can exert a 'swing' role, making up the difference between world demand and what others can supply. They can do this only until they themselves reach their mid-point of depletion, probably by 2013.⁶

The expert consensus is that the world's mid-point of reserve depletion will be reached when 1,000bn barrels of oil have been produced – that is to say, half the ultimate reserves of 2,000bn barrels. With 935bn barrels already produced, this will come in two to three years' time, probably between 2004 and 2005. The yet-to-find oil reserves are estimated at 280bn barrels (see **Table 3**). As the world production peak approaches, the oil price will soar.

However, if we include the potential global reserves of unconventional oil such as tar sand oil, heavy and extra heavy oil, amounting to 572bn barrels, then the mid-point of depletion could be delayed for a few more years – but not beyond 2010.

In 1956, the geologist M King Hubbert predicted that US oil production would peak in the early 1970s. Almost everyone, inside and outside the oil industry, rejected Hubbert's analysis. The controversy raged until 1970, when US production of crude oil started to fall. US crude oil production peaked at 9.64mn b/d in 1970 and has been falling since, reaching 5.89mn b/d in 2000. Hubbert was proved right and his bell-shaped curve has become a useful tool in oil production analysis.⁷

Around 1995, several analysts began applying Hubbert's method to world oil production. Based on his pioneering work and an estimated 1.8–2.1tn barrels of ultimate reserves, they established that the peak production year will be sometime between 2004 and 2008. Other published estimates, using variations on Hubbert's methods, give peak years between 2004 and 2009. However, it will take a lot of major new oil discoveries to postpone the peak to

2010 or beyond. If the predictions are correct, there will be a huge impact on the global economy, with the industrialised nations bidding against one another for the dwindling oil supply.

Promising provinces

Today, one promising oil province that remains unexplored is the Spratly Islands in the South China Sea, where exploration has been delayed by conflicting claims to the islands by six different countries. Potential reserves in the disputed territories are estimated at multi-billion barrels of oil and gas. However, although the South China Sea seems to be an attractive prospect, there is little likelihood that it is another North Sea.⁸

Another promising province is the Caspian Basin. Fanciful estimates have claimed that Caspian oil reserves rival those of the Gulf and some sources have gone as far as to ascribe potential recoverable oil reserves of 200bn barrels to the area. The Caspian Sea's proven reserves are at present estimated at less than 17bn barrels, or 1.5% of the world's total proven reserves.⁹ However, estimates of between 40bn and 60bn barrels as the ultimate reserve base of the Caspian region are judged to be reasonable by most geologists familiar with the region. Apart from the limited size of the reserves, Caspian oil is very costly to find, develop, produce and transport to world markets.¹⁰

Today, a fully built-up cost for the Caspian barrel of oil is roughly \$12–\$15/b.¹¹ This could eventually fall to \$10/b. Caspian oil production is projected to reach 2.34mn b/d in 2010, rising to 3.6mn b/d by 2020.¹² However, progress in Caspian oil development is still heavily dependent on a sustainable \$20/b (real) oil price. It is from within this price that a minimum of \$2/b profit margin for the oil companies can be secured, with the share of profits being 80% in favour of the host governments. Oil prices will be the key factor in the expansion of Caspian Sea oil.¹³

Supply and demand

Global conventional oil production is projected to peak sometime during this decade. After the peak, the world's production of crude oil will fall, never to rise again. The world will not run short of crude oil, but developing alternative energy sources on a large scale will take at least 10 years and will necessitate huge capital investments.

It should be noted that no initiative put in place and starting today can have a substantial effect on the peak production year. No Caspian Sea exploration,

Region	Production (bn barrels)	Share (%)	Demand (bn barrels)	Share (%)
Developed countries	8	29	18	64
Developing countries	19	71	10	36
World	27	100	28	100
US	2	7	7	25

Table 1: World crude oil production versus demand in 2000

Source: BP Statistical Review of World Energy, June 2001; US Energy Information Administration (EIA), June 2001.

Region	Population (mn)	Oil per capita (b/y)
Developed countries	1,200	14.2
Developing countries	4,800	2.0
US	281	25.0
Total world	6,000	4.6

Table 2: Per capita oil consumption per year

Sources: UN Populations Statistics, 2000; BP Statistical Review of World Energy, June 2001.

Volume	Description
Ultimate reserves (bn barrels)	2,000
Produced so far (bn b)	935
Yet-to-produce (bn b)	1,065
Discovered so far (bn b)	1,720
Yet-to-find (bn b)	280
Discovery rate (bn b/y)	7
Depletion rate (%)	3

Table 3: Ultimate global reserves of conventional oil and depletion rate (end of 2001)

Sources: United States Geological Survey (USGS); BP Statistical Review of World Energy, June 2001; author's calculations.

no drilling in the South China Sea, no renewable energy projects can be brought on at a sufficient rate to avoid a bidding war for the remaining oil.¹⁴

The world is consuming nearly four times more oil than it is finding, a situation that is ultimately unsustainable (see **Table 4**). However, this level of shortfall could be maintained for a number of years with no sign of reversal before it develops into a serious crisis.

The race for reserves is, therefore, on. With the demand for oil envisaged for the next ten years, the world will consume an average of 30bn b/y of oil over that period. If the oil industry wants to replace this consumption with new reserves without diluting the world's existing proven reserves of some 1tn barrels, the exploration sector must find an additional 300bn barrels of new oil in the next decade – a daunting challenge.¹⁵

The global reserve depletion rate is generally calculated at 3%. This means that to sustain the world's current 76mn b/d consumption at that level, around 2.28mn b/d of new capacity is needed each year. Add in the long-term oil demand growth rate of 1.9% (1.44mn b/d/y) and the annual requirement for new capacity rises to 3.72mn

b/d, or 5%. Against this, the global production capacity has remained static or even declined while consumption has been increasing.

It could, therefore, be argued that the anticipation of shortages is bound to lead to a radical increase in the price of oil in the next few years. That would be likely to curb excessive increases in demand so that actual physical shortages could be delayed for a few years, although this delay will depend on the Middle East producers. However, by 2010 they will be supplying 48% of the world's needs and by 2013 they will be close to the mid-point of their own depletion. Although much higher prices will cushion the effect, chronic shortages of conventional oil would be predicted to develop from around 2010 onwards.

Unconventional potential

The view is often expressed that technical progress will soon make up for the increasing natural scarcities in oil reserves by developing acceptable substitutes and/or lowering the extraction and exploration costs of new reserves. While some – and possibly a great deal – of unconventional oil (synfuels) will eventually be available, there will not

Year	Added in year	Annual consumption	% of consumption
1992	7.80	23.87	33
1993	4.00	23.91	17
1994	6.95	24.34	29
1995	5.62	24.79	23
1996	5.24	25.38	21
1997	5.92	26.16	23
1998	7.60	26.97	28
1999	13.00	27.27	48
2000	12.60	27.81	45
1992–2000	68.73	230.50	30
Average	7.64	25.61	30

Table 4: Global crude oil reserve additions* versus consumption, 1992–2000 (in bn barrels)
 Sources: IHS Energy's 2000 World Petroleum Trends Report (WPT); BP Statistical Review of World Energy, 1993–2001; author's calculations. * (excluding the US and Canada)

	2000	2001	2005	2010	2020
World demand	76.2	76.1	83.5	95.8	114.7
World supply:					
Non-Opec	45.2	46.1	44.7	43.6	49.6
Opec	29.3	30.0	36.0	45.9	51.1
Stock change	– 1.7	–	–	–	–
Synfuels	1.2*	1.3*	1.8*	2.7*	4.2*
Total supply	76.2	76.1	80.7	89.5	100.7

Table 5: Projected world oil demand and supply, 2000–2020 (in mn b/d)
 Sources: US Department of Energy (DOE); BP Statistical Review of World Energy, June 2001; IEA; author's projections.
 * Synfuel oil production is already included in non-Opec supply figures.

be enough to replace the shortfalls in conventional oil.

By 2010, global demand is projected to rise to 95.8mn b/d, with the Middle East producers accounting for 48%, or 45.9mn b/d, and non-Opec producers providing 43.6mn b/d – of which 8.9mn b/d is supposed to come from synfuels, rising to 20mn b/d by 2020.¹⁶ This is not only an exceptionally daunting task, but virtually impossible (see **Table 5**).

Unconventional oil production is projected to grow from 1.2mn b/d in 2000 to only 2.7mn b/d in 2010, rising to 4.2mn b/d in 2020.¹⁷ This will create a global oil supply deficit of 2.8mn b/d in 2005, 6.3mn b/d in 2010 and 14mn b/d in 2020, which need to be filled by renewable energy sources.

The technology for extracting oil from tar sands and heavy oil exists, but extraction costs are high – currently between \$9 and \$10/b.¹⁸ However, the real problem is the slow oil extraction rate. It is estimated that only 5–100 b/d can be extracted from a single producing well of unconventional oil compared to 10,000 b/d from a conventional oil well of similar size.¹⁹ Only 790,000 b/d of tar sand oil were produced in Canada in 2000.²⁰ Synfuel oil is usually three times as labour-to-energy intensive and ten times as capital-to-energy intensive as conventional crude oil.

Potential global productive capacity

of GTL is estimated between 1mn b/d and 2mn b/d, necessitating a total global investment of between \$15bn and \$20bn over the next 15–20 years. The technology for GTL can be economic at 50,000 b/d plant sizes and above, with Brent crude oil prices of \$20/b or more. However, one problem with GTL is that there are usually losses incurred in converting natural gas-to-liquids, which run up to 40% – ie only 60% of the natural gas energy is converted. Moreover, GTL economics is highly dependent on location factors and gas costs, with only selected gas fields providing acceptable returns.²¹

By 2010, some 3mn b/d of synfuel oil could be produced, necessitating a global capital investment estimated between \$37bn and \$42bn. This is too huge an investment for the mere production of 3mn b/d when less than one-third of that capital outlay will enable Opec's Gulf members to expand their productive capacity by 5mn b/d in a shorter space of time.²² Synfuel oil will be hard pressed to meet 2% of the global oil demand in 2005, and 3% and 4% in 2010 and 2020 respectively, because of the slow extraction rate and the huge investments needed.

However, to ensure the continuous flow of energy to the world's increasing population and expanding economies, a transition from fossil fuels to renewable energy sources is inevitable. This will also

help reduce the quantities of carbon dioxide (CO₂), sulfur dioxide (SO₂) and nitrous oxides (NO_x) in the atmosphere.

Renewable energy sources

A 'renewable' energy source is one that does not depend on finite reserves of either fossil or nuclear fuels. The energy upon which the various renewable sources draw is the sun as in the case of solar energy, wind energy, wave energy, biomass and hydro-electric power. All of these renewable sources involve the generation of electricity.

In 2000, renewable energy sources contributed 1% to the global primary energy demand. However, by 2025 they are projected to contribute 6%, rising to 13% by 2050 (see **Table 6**).

Hydro-electric power

In 2000, hydro-electricity contributed about 3% to world energy supplies.²³ Hydro-electric power, though renewable, has a finite limit to its development potential, unlike some of the other renewable sources, and will never contribute a great deal more to world energy than it does at present.

Global hydro-electricity use is projected to rise some 50% by 2020. Hydro-electricity's share in the global primary energy mix will, nonetheless, decline to 2% by 2020.²⁴ Hydro-electric power will make only a modest dent in the global need for electricity.

Nuclear power

Although not strictly renewable, nuclear energy is one of the cleanest energy sources. It has the ability to generate enormous energy from a small volume of fuel. One tonne of nuclear fuel is estimated to produce the energy equivalent of 2–3mn tonnes of fossil fuels.²⁵ Nuclear power produces no atmospheric pollution. Waste volumes are comparatively smaller than fossil fuels; fossil fuel systems generate hundreds of thousands of tonnes of gaseous and solid wastes, but nuclear systems produce no more than 1,000 tonnes of high and low waste per plant per year.²⁶ Nevertheless, the public perception of nuclear power is still negative. Hanging over it is the question of radioactive waste and how to dispose of it safely.

In 2000, nuclear power contributed 7% to world energy supplies.²⁷ After peaking around 2010, production of nuclear power is projected to decline to 5% of the global primary energy mix by 2025.²⁸ Nuclear power must, however, expand before 2025 to help supply the increasing world demand for electricity. Modular, fail-safe, economically competitive nuclear power plants, with zero emissions, can be built to replace coal-fired power plants.²⁹

Solar energy

Another major renewable source of energy is solar energy. In one way or another almost all the world's energy resources derive from the sun. Of the 75,000bn toe of solar energy that reaches the earth, only 2.3 btoe is converted to useful energy by man.³⁰

The low energy density in solar and wind power requires large energy collectors. A normal-size nuclear or fossil-fuel power plant generates 1,000 MW. At typical efficiencies around 10%, a solar or wind collector has to occupy five square miles to deliver 1,000 MW. The capital cost of paving five miles with solar or wind collectors makes it less cost-effective than fossil-fuel or nuclear power plants.³¹

Solar energy development and use has been on the upswing, notching worldwide growth of about 20%/y for the past decade. But the installed base remains small, with only about 1,000 MW of power being produced through solar energy in Japan, the US and Germany, the three leading countries.

When solar power can be converted directly into electricity it becomes more usable. The photovoltaic cell is, at present, the object of a great deal of research and investment, but progress must yet be made in bringing down costs before this method becomes economical. Looking into the future, however, some significant advances in the storage of electricity must be made before solar generation comes into its own.

Hydrogen

Hydrogen is the ultimate sustainable, non-polluting, renewable fuel for the future. The interest in hydrogen comes from one simple fact – when it produces energy, it produces only water as waste. The real advantage lies in using it as a fuel for fuel cells.

Hydrogen-powered fuel cells will, in the future, supply an increasing percentage of commercial and residential electricity. But it is in transport that fuel cell motor technology will eventually leave its mark on future energy needs. Petroleum-based fuels that provide more than 96% of transportation energy are key culprits in greenhouse-gas emissions. Transportation produces some 28% of the world's total CO₂ emissions and the figure is growing according to the International Energy Agency (IEA).³²

Yet hydrogen is not freely available. Pure hydrogen is expensive to produce and difficult to store. If hydrogen is to become a fuel for the 21st century, these issues need to be addressed.

However, the big argument about hydrogen-powered fuel cell cars of the future is how to fuel them. Replacing the world's gasoline and diesel retail sites with hydrogen-fuelling stations

	1975	2000	2025	2050
Primary energy	5,830	8,845	16,194	19,679
Oil	2,617	3,504	5,135	5,288
Natural gas	1,079	2,164	5,119	6,927
Coal	1,649	2,186	3,526	2,748
Nuclear	330	669	1,061	1,937
Hydro	155	230	314	299
Renewable	–	92	1,039	2,480

Table 6: Primary energy consumption, 1975–2050 (in mn toe)

Sources: Shell International's Scenarios to 2050; Opec Annual Statistical Bulletin, 1988–2000; BP Statistical Review of World Energy, June 2001.

would require such vast investments in new manufacturing and refuelling infrastructures that only a prohibitive rise in crude oil prices would make the switch economically viable.

Fuel-cell motor technology will eventually have a great impact on the global consumption of gasoline and diesel. But it will take decades before fuel-cell cars dominate the highways and certainly not before they are able to compete with today's cars in terms of range, convenience and affordability.

Biomass

Biomass is another source of energy that offers a great potential. The immense amount of solar energy that growing plants capture by photosynthesis and convert into chemical energy – some 30bn toe/y – is almost four times the global annual primary energy consumption, or alternatively nine times the global annual crude oil consumption.

Although alcohol is the most obvious example of a biomass fuel, others would include methane from sewage, which could be used in the internal combustion engine as well as a chemical feedstock.

Wind power

Wind-power capacity is increasing fast, particularly in Europe. Wind power generation capacity in Europe totalled 17,000 MW at the end of 2001 out of a total of 24,000 MW of capacity worldwide. Wind power generation could reach 60,000 MW in 2005, enough to power 75mn homes. It already supplies about 18% of Denmark's electricity and 3.5% of Germany's electricity rising to 5% by 2005. The figure for the UK is just 0.3%.³³

At the moment, solar and wind power are developing in specialised areas. Neither is an immediate, large-scale solution to the energy problem.

Facing the future

The world could face an energy gap probably between 2008 and 2010 once global oil production has peaked sometime between 2004 and 2005. This gap will have to be filled by unconventional and renewable energy sources. However, unconventional oil will be hard pressed to meet 4% of the global oil demand in 2020 because of the slow

extraction rate and the huge investments needed.

A transition from fossil fuels to renewable energy sources is, therefore, inevitable if we are to fill the energy gap and create a sustainable future energy supply. Nuclear, solar and hydrogen are destined to become major energy sources during the 21st century – but only if their enabling technologies improve significantly enough to ensure affordability and convenience of use. Even then, their contribution to global primary energy demand may not exceed 7% in 2025, possibly rising to 13% by 2050.

Fuel-cell motor technology will eventually have a great impact on the global consumption of gasoline and diesel. But it could take decades before hydrogen-powered cars dominate the highways, and certainly not before they are able to compete with today's cars in terms of range, convenience and affordability.

Fossil fuels, with a growing contribution from nuclear energy, will, therefore, still be supplying the main share of the global energy needs for most – perhaps all – of the 21st century. ●

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The Test Method Standardisation Section held a very successful workshop on the maintenance of engines used to determine the octane number of petrol and the cetane number of diesel fuel. The workshop also dealt with procedures to follow when 'things go wrong'. It was attended by some 40 delegates, representing oil companies and test-houses, from Belgium, Eire, Holland, Singapore, South Africa, Sweden and UK.

With the incremental cost to producers of some \$5 per tonne per whole octane number it is vitally important that the results from tests on blend components and the final product are as accurate as possible. This requires that the engines are well maintained, operated in accordance with the prescribed test procedure and that the operators are aware of potential prob-

lems that can arise that can cause incorrect values to be determined.

In order to obtain the best advice on engine maintenance and operation from the widest field the IP invited experts from the USA to give presentations at the workshop.

On the first day presentations dealt with both the Octane Number and Cetane Number Engine Maintenance and Operation. Archie LeClair, formally of Waukesha Engines, opened with Crankcase Overhaul. Then with Dan Bemis, Waukesha Engines, talked about Top End Overhaul. Tom Jones, Oncet Technology, dealt with Fuel Delivery Systems and Carburettor Maintenance. Norman Esau, formally with Amoco, gave a presentation on what to look out for when 'things go wrong', pointing out some of the reasons for getting incorrect results and their remedies.

Then Dan Bemis gave a presentation on the maintenance of the Cetane Engine. The day closed with a questions and answer session with very good audience participation.

The following day Tom Jones, Oncet Technology, gave a presentation on Safety, Environmental and General Health of the CFR Test Instrument. This was followed by a further discussion period. Then after lunch all the delegates attended a meeting of the IP's CFR Engine Operators and Experimental Panel ST B-1.

Those who attended the workshop, particularly those from overseas laboratories, agreed that the presentations were most informative and that the question and answer discussion periods had enabled them to share the problems that they had encountered and discuss and discover solutions to them. ●

John Phipps



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Tuesday 10 September 2002

Improving Safety in Petroleum Product Deliveries and Petrol Filling Station Operations

Wolverhampton Science Park, Wolverhampton, UK

Following its successful inaugural seminar in September 2001, IP's Distribution and Marketing Safety Committee presents a full day seminar on topical developments to further improve the sector's safety performance in:

- Petroleum product deliveries
- Petrol filling stations operations

Hear from our panel of expert speakers from regulators, industry and consultancies about:

- Implications of the new DSEAR Regulations
- Making safer deliveries
- Risk assessment tools
- Contractor management
- Lessons learned from incidents

The seminar will be of interest to those managing:

- Petroleum product distribution
- Petrol filling stations

A themed exhibition featuring companies that support the sector will accompany the seminar.

For further information and booking details, please contact: Laura Viscione, IP Conference Department.
T: +44 (0) 20 7467 7174 F: +44 (0) 20 7580 2230 e: lviscione@petroleum.co.uk

Booming in oil spill contingency planning – a guidance document for developing operational coastal estuarine booming plans in the UK

In 1998 the Environment Agency published a series of technical reports which assessed and quantified the contingency plans that currently exist for the protection from oil pollution, by booming, of tidal rivers and estuarine areas. This included ports and harbours. One clear conclusion from this exercise was that booming plans and their place within overall contingency planning are not handled consistently across the United Kingdom.

The Institute of Petroleum, supported by the Maritime and Coastguard Agency (MCA) and Environment Agency (EA), subsequently sponsored a workshop on booming plans. This was widely attended by Local Authorities and Port and Harbour Authorities, and served to reinforce the view that considerable inconsistencies existed in the layout, content and effectiveness of operational booming plans. It established the need for some generic template or model plan and guidance to address operational booming and its place within an overall contingency plan.

This new publication builds on the discussion at the workshop and aims to set out a model operational booming plan based on best practice. It recognises that an operational booming plan is not a stand-alone document, but is an integral working part of an overall spill contingency plan. It is supported by a number of annexes that cover, in more detail, aspects such as health and safety, boom selection and weather considerations.

These new guidelines will be essential for local authorities, industry, ports and harbours and anyone responsible for producing a booming plan as part of a wider oil spill contingency plan.

ISBN 0 85293 355 X

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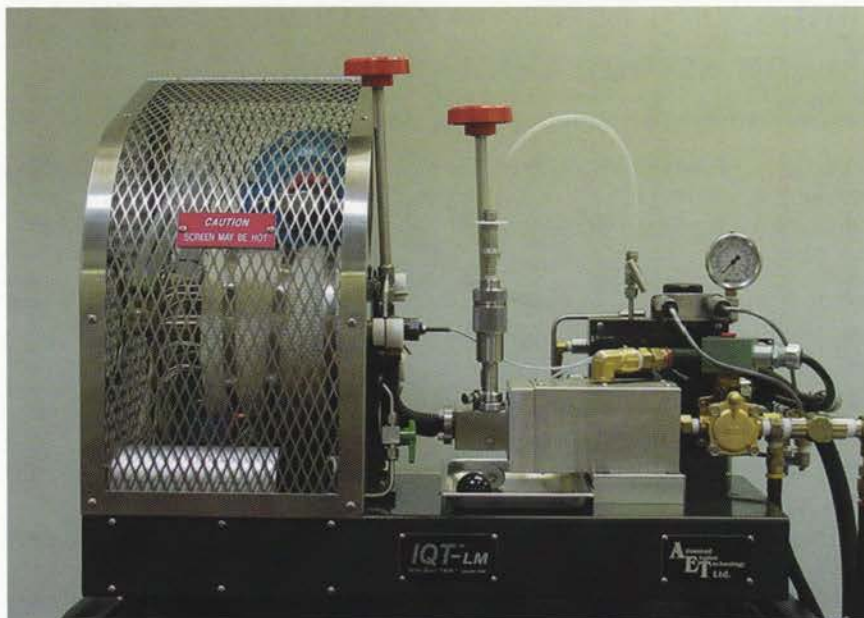
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Diesel fuel measurements made in minutes

Stanhope-Seta has been selected as Canadian company Advanced Engine Technology's exclusive distributor in Europe for its Ignition Quality Tester (IQT™), a new automated analytical instrument that allows precise measurement of the ignition delay and cetane number (CN) of diesel fuels in just minutes.

The instrument's design is based on the US' Southwest Research Institute constant volume combustion technology, which received a Research & Development '100' Award last year. It is reported to be suitable for use with most diesel and alternative fuels (including cetane improved diesel fuels) and to provide rapid and cost-effective results with minimum operator skill or training.

The IQT method, being jointly developed with the Institute of Petroleum and other international regulatory bodies, has participated in several round-robin tests, and results are reported to have satisfactorily correlated with the existing IP 41 method. It is planned that IQT will soon be widely



adopted as an approved alternative method in most international diesel fuel specifications, including ASTM D975 and EN 590.

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e: sz@stanhope-seta.co.uk
www.stanhope-seta.co.uk

Compact well shuttle

Reeves Oilfield Services has introduced a new compact well shuttle for the safe and fast deployment of open hole logging tools into high angle/horizontal wells and wells with bad hold conditions.

Well Shuttle is a hybrid deployment system for compact open hole logging tools. The tools are 'garaged' at surface inside the drill pipe where they are fully protected while running into the well. They are released into open hole only when the shuttle nears the bottom, after which they remain anchored to the pipe and acquire data on the way out.

'The system does not use a wireline, so the shuttle runs-in at tripping speed. Pipe can be rotated and reciprocated to assist reaching bottomhole, and circulation can be maintained to help clean the hole and control the well,' says the company. 'Logging can also be integrated with a wiper trip to further reduce rig time.'

'The system replaces wireline pipe-conveyed logging (PCL) in high angle wells, and provides an efficient alternative to logging-while-drilling (LWD) in wells that can be drilled without real time formation evaluation. It is also an intervention technique delivering formation evaluation data when other logging solutions have failed.'

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Fax: +44 (0)115 945 7921

Hand-held hot-spot finder

A new intrinsically safe hand-held device for locating sources of heat, claimed to cost just a fraction of the price of a thermal imaging camera, has been developed by Product Innovation.

The HotSpotter™ uses infrared heat detection technology and enables the user to scan an area to find any hot spots, such as the seat of a fire in dense smoke, or any apparent fire risk situation such as an overheating bearing or junction box. The unit incorporates both visual and audible signals and is of use not only to professional fire-fighters but also those concerned with safety and maintenance, particularly in hazardous environments such as the petrochemical industries and mining.

The 'gun sight' and operating trigger enables the sensitive Fresnel lens in the device to target and scan the area in question. It sees infrared from a cone around 7° either side of its axis – which means that at 10 ft it scans a 'disc' of around 30 inches diameter. The sensor signal is converted into sounds and lights by a micro-processor; the higher the frequency, the hotter the spot. LEDs also provide an indication of how hot the object in sight is – lighting up in green, amber and red sequence.

There are four operating modes, depending on the sensitivity of operation required. The unit's microchip



memory provides a 'compare' function, allowing the user to look at the temperature of one object and compare it with another. For example, it can establish whether one fluorescent tube is hotter than another or if an electrical relay is running hotter than another.

Tel: +44 (0)20 8452 3968
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e: Enquiries@productinnovation.com

Pan-tilt cameras see the whole picture

HSS Safe & Sure, the specialist safety and surveying equipment division of HSS Hire Service Group, offers pan-tilt cameras suitable for the inspection of pipelines, including EEx-approved equipment for use in potentially hazardous environments.

The cameras provide a complete panoramic view of the area to be inspected, in full colour.

The range includes a number of different cameras to suit clients' requirements for use in identifying blockages, cracks or other faults in pipelines, drains, ductwork and difficult to access areas.

Remotely operated waterproof CCTV inspection cameras relay an accurate picture back to a TV screen. Pictures can be recorded on video, which can also be

hired from HSS. The cameras can travel to a rod length of up to 150 metres, depending on the model used.

The cameras can also be hired with generators to allow them to be used in isolated 'off road' areas away from a main power source.

The cameras are delivered to the customer by one of the company's Technical Support Units, with a Specialist Driver Technician who will provide a full familiarisation with the product on handover. The Technical Support Units will also provide onsite back-up and advice when needed while equipment is on hire.

Tel: +44 (0)845 608 8811
e: custserv@hss.co.uk
www.hss.com



Cost and time-saving well visualisation

AnTech Oilfield Software has launched StringView® Millennium SDK (software developers kit), a well visualisation software program that interfaces with existing IT programs to produce custom reports and well diagrams of a broad range of wells.

'One of the key challenges faced by those in the oil and gas industry who are responsible for producing visually striking well diagrams and effectively-presented reports is that the corporate IT infrastructure they work within isn't compatible with well diagram drawing or reporting software programs,' comments the manufacturer. 'They waste valuable time when reduced to using a variety of unrelated software programs, often recreating drawings and spreadsheets.' The new software is claimed to offer 'a simple solution to this problem

by offering a way to use all existing data – whether it is an engineering drawing, database or spreadsheet – to create outstanding well diagrams and reports.'

Designed for the well engineer, the software can create customised string diagrams of multi-lateral, vertical, deviated and horizontal wells, as well as single and dual completions and multiple strings. StringView Millennium SDK also features a non-linear scaling algorithm that enables the user to enlarge small components by increasing their plotted length whilst maintaining their linear positions relative to components featured in other strings.

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e: stringview@stringview.com
www.stringview.com

Low torque actuator

Auma has extended its actuator product portfolio with the development of the SG.3, a low torque solution for the automation of small open-close, part turn valves. Designed as a lightweight, minimum maintenance product for small valve applications, the company hopes the new product will broaden its market penetration across the petrochemical sector.

Produced from lightweight aluminium alloy, the unit is supplied with IP 67 enclosure protection as standard, and IP 68 as an optional purchase. Electrical connections for motor and control cables are made on a 50-pole Auma plug/socket connector, ensuring the correct wiring remains undisturbed if the actuator is removed for maintenance.

Other features include manual operation via a handwheel to provide an over-riding gear arrangement, while patented ellipto-centric gearing enables a reduction ratio of 80:1 in one stage.

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Reinforcing pressure equipment directive message



Pressure-relief systems manufacturer Elfab claims to have become one of the first companies to receive approval for CE marking of both metal and graphite bursting disc devices under the European Union's Pressure Equipment

Directive (PED) 97/23/EC (Category IV).

The Directive requires demanding conformity assessment by a notified body of all bursting disc products supplied after 29 May 2002. From this date, all pressure equipment falling within the scope of the PED must comply with the new regulations. Any attempt to supply or put into service such equipment for use within the European Community without a properly applied CE mark will be considered an offence.

There are exceptions where the PED may not apply – Elfab says it can clarify areas of concern.

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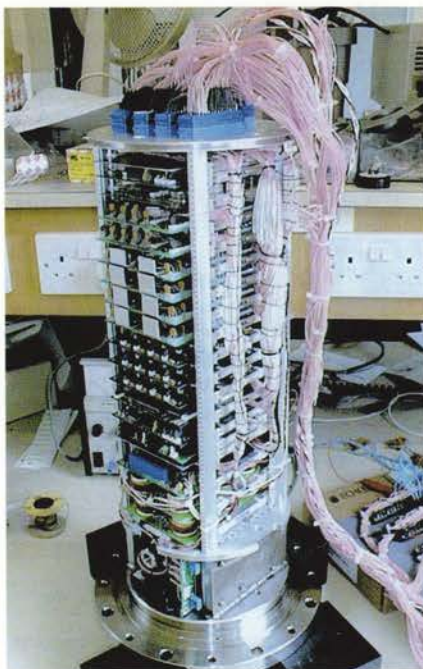
Improving links with subsea manifolds

EA Technology has developed a new subsea electronic module to provide more efficient links between offshore host platforms and wellhead manifolds. Commissioned by offshore system specialist eProduction Solutions, it is designed to provide a full range of control, data acquisition diagnostics and communications facilities via existing dual redundant umbilical power supply connections, without the need for expensive communications cabling.

The module is part of a new multiplexed electro-hydraulic control system that is claimed to be much smaller than the hydraulic equipment traditionally employed in wellhead subsea manifold installations. As a result, it can be deployed/retrieved from a standard workover/diver support vessel.

In its first installation, the module utilised a 3,000 metre electro-hydraulic control umbilical, which linked an offshore production platform to the wellhead manifold. To ensure high availability and reliability the system employs dual signalling, using power line transmission, together with dual low and high pressure hydraulic supply hoses.

The module enables the host platform to communicate with the dual-redundant subsea process control system, using an industry standard protocol. It also performs data acquisition of down-



hole pressure, temperature and diagnostics via a communication gateway module to standard subsea industry supplied gauge cards.

Tel: +44 (0)151 339 4181
Fax: +44 (0)151 347 2404
www.eatechnology.com

Streamlining the E&P workflow

Landmark Graphics, a wholly owned business unit of Halliburton, has just released a new version of its Oilfield Workstation/client server (TOW/cs™) production data management system. This latest release enables streamlined workflows through the provision of zone-level allocation, enhanced data import and export capabilities, and customisable user desktops.

Claimed to be a robust and flexible solution for production data capture, allocation, retrieval and analysis in today's cost-driven oil field environment, TOW/cs also incorporates migration to the latest Microsoft Windows® 32-bit architecture. Zone-level alloca-

tion provides users the capability to assign total volumes of produced oil, gas and water to individual producing layers, enabling reservoir engineers to proactively manage their assets.

Commenting on the new release, Bill Sanstrom, Vice President of Drilling and Production said: 'Field operations now have accurate, real-time and near real-time data at their fingertips. This leads to a reduction in well downtime and timely surveillance, both of which deliver improved profitability to the customer's bottom line.'

Tel: +1 3 839 3728
e: lbabec@lgc.com

Workstation enhances reservoir imaging

CGG has unveiled the latest addition to its Vista portfolio of high added value processing services and software. The new VectorVista 4C seismic data processing workstation aims to enhance reservoir imaging by 'seamlessly integrating converted waves into the interpretation workflow.'

The VectorVista 4C processing workstation is designed to help the interpreter gain greater understanding of the seismic data acquired with the multi-component technique. It offers a full range of 4C data analysis and interpretation tools. Compressional wave (PP) and converted wave (PS) data can be displayed simultaneously. A compressed function to display squeezed PS sections is also built in. The workstation offers a number of ways to compute the PP/PS ratio, or Gamma function, which is a fundamental issue in 4C processing. As well logs are commonly used to correlate the work done in 4C processing, the workstation also offers well log data management functions, including derivation of velocity models based on Vp and Vs-derived values and AVO plots on synthetic offset displays.

Rather than develop the workstation alone, CGG has formed a consortium with Anitec, a UK consulting company. Two sponsoring companies, Norsk Hydro and Eni, have also joined and agreed on the specifications of the first phase of software development. As the project is being developed by a consortium, the platform-independent Java-based toolkit, J/GeoToolkit from INT, has been selected. This geophysical graphical development environment means developers can focus their efforts on the geophysical functionality that gives the most benefit to understanding 4C data, comments CGG.

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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
or e: petrev@petroleum.co.uk**

Quality, Reliability and Maintenance QRM 2002

(Professional Engineering Publishing, Northgate Avenue, Bury St Edmunds, Suffolk IP32 6BW, UK. Tel: +44 (0)1284 763277; Fax: +44 (0)1284 718692; www.pepublishing.com) ISBN 1 86058 369 5. 348 pages. Price: £189 (plus 10% for delivery outside the UK).

Much greater focus has been placed on quality, reliability and maintenance (QRM) by industry, commerce and education since the early 1990s. Most major professional engineering institutions have a quality exercise from the top administration to the members and continuous professional development (CPD) is now a normal and essential discipline for every chartered engineer. This publication brings together a collection of international papers that provide examples of current research, practice and implementation of QRM in industry, education, training and the medical profession in the present and the future. The essentials of QRM are included and will be of interest to all concerned with condition monitoring, maintenance management, modelling and design.

Pipe Drafting and Design

Roy A Parisher and Robert A Rhea (Butterworth Heinemann, Linacre House, Jordan Hill, Oxford OX2 8DP, UK. Tel: +44 (0)1854 314423; Fax: +44 (0)1865 314572; e: philip.pritchard@repp.co.uk; www.bh.com) ISBN 0 750674 393. 368 pages. Price: £34.99.

Pipe designers and drafters provide thousands of piping drawings used in the layout of industrial and other facilities. The layouts must comply with safety codes, government standards, client specifications, budget and start-up date. Now in its second edition, this book provides step-by-step instructions to walk pipe designers and drafters, as well as students in engineering design graphics and engineering technology, through the creating of piping arrangement and isometric drawings using symbols for fittings, flanges, valves and mechanical equipment. Over 350 illustrations and photographs provide examples and visual instructions. Drawings are systematically arranged, beginning with the layout of the structural foundations of a facility, through to the development of a 3D model. Advanced chapters discuss the customisation of AutoCAD and AutoLISP, and detail the use of third-party software to create 3D models from which elevation, section and isometric drawings are extracted, including bills of material.

Performance of Cross-Country Oil Pipelines in Western Europe*

(CONCAWE, Boulevard du Souverain 165, B-1160 Brussels Belgium. Tel: +33 2 566 91 60; Fax: +33 2 566 91 81; e: info@concawe.be). 19 pages. Price: euros 15 (can be downloaded for free from website at www.concawe.be).

The latest in a series of annual reports, this study reviews the performance in 2000 of 30,870 km of onshore pipelines in Western Europe with regards to hydrocarbon spillage. Incidents are analysed by cause and the effectiveness of the clean-up is recorded. Direct repair and clean-up costs are also reported, as are annual pigging inspection statistics.

Of associated interest, is another recent CONCAWE publication (also priced at euros 15 or free download), a 48-page report entitled *Western European Cross-Country Oil Pipelines: 30-Year Performance Statistics*. This report shows how today's 30,870 km of pipeline in the region, which transports some 672mn cm³ of oil and oil products, has developed over the past 30 years. Data on safety-related incidents are covered, as well as levels and trends in spillage incidence, gross and net spillage volumes, and the significant features of individual cause categories (mechanical failure, operational, corrosion, natural hazard and third party).

* Held in IP Library

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YOUR OFFICE AWAY FROM HOME

Consultants database on the IP website

If you are looking for an expert in any field of the petroleum industry this database is a good place to start. All the consultants on the IP Consultants database have been contacted and their details verified with effect from 30 June 2002. Any IP member offering consultancy services can have an entry for free, and any existing entry can be updated at any time. Please contact Catherine Cosgrove for details.

New editions to library stock

- *Arab Oil & Gas Directory 2002*. Arab Petroleum Research Center (APRC), Paris, France: 2002. 656pp ISBN 29032920912.
- *The EIC Guide to the UK Environmental Industry 2001/2002*. Environmental Industries Commission (EIC), Macclesfield, Cheshire: September 2001. 204pp. ISBN 1842530011.
- *Industry Guidelines for the Management of Emergency Response for Offshore Installations*. UK Offshore Operators Association (UKOOA): Issue no 2. London, England: May 2002. 82pp. ISBN 1903003138.
- *Petroleum Provinces of the Twenty-First Century*. Downey, Marlan W, ed; Threet, Jack C, ed; Morgan, William A, ed. AAPG Memoir 74. 1st ed. Tulsa, Oklahoma: The American Association of Petroleum Geologists, 2001. 573pp. ISBN 0891813551.
- *Technical guidance on the safe use of lifting equipment offshore*. Health and Safety Executive (HSE): HSG221. 1st ed. Norwich, Norfolk: HSE, 2002. A4 72pp. ISBN 0717621006.
- *World Oil and Gas Review 2002*. ENI: Rome, Italy: 2002. 204pp.

This is but a small selection of what has recently been added to the IP Library's stock. Please visit the IP website at www.petroleum.co.uk for a complete list of our holdings. IP Members are welcome to suggest potential purchases – please contact Catherine Cosgrove (see below).

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Membership News

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Mr B O Mangodo, Nigeria
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NEW FELLOW

Professor P D Park JP, MPhil, LLB, F Inst Pet
Professor Park is Head of the Law Research Centre at Southampton Institute, which includes the supervising of six PhD candidates in the area of Energy and Environmental Law. She has produced four books, 30 publications and numerous conference papers. Her most recent book is *Energy Law and the Environment*, and she is currently writing a monograph on UK Energy Law for the International Encyclopaedia of Laws. Professor Park carries out consultancy work for international companies and agencies. Her special interests include the legal aspects of rig decommissioning, marine pollution and the use of economic instruments in the form of the Climate Change Levy and Emissions Trading Scheme.

NEW CORPORATES

Lancaster Maclean LLP, 10 Oxford Street, Malmesbury, Wiltshire, SN16 9AZ UK.

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e: info@lmaci.com www.lmaci.com

Representative: Simon Graley, Senior Partner
Consultant auditors and accountants with over 20 years experience of the oil, gas and petrochemicals industry worldwide.

Onarep, 34 Avenue Al Fadila, BP 8030 NU-AGDAL, Rabat, Morocco.

T: +212 37281616 Fax: +212 37281626 www.onarep.com

Representative: Amina Benkhadra, Directeur General
Petroleum exploration.

IP awards

Presentation of the ASTM's Award of Appreciation to Les Mehew

Les Mehew, who works at TotalFinaElf's Lindsey Refinery, is Chairman of the IP's CFR Engine Operators and Experimental Panel. Mehew was awarded the ASTM's Award of Appreciation at the recent DO2 committee meeting in Montreal. He received the award for his outstanding work on CFR engine test method development and his contribution to test method standardisation.

The Tony Fox Memorial Studentship Award



The 2001/2 prize was awarded to Katie Stott (above centre). Katie is in the final stages of her last project as part of the MSc course in petroleum geoscience at Imperial College and has received consistently high marks throughout her course – well done Katie!

An award ceremony was held at the IP on 10 July with Katie's parents in attendance who watched her receive her certificate from Mrs Fox (above right) and Jeff Pym, IP Director General (above left).

Katie is now keen to enter the industry – with such an excellent background we are hoping that it is not too long before Katie is snapped up by one of the industry majors. It is also very rewarding for the Institute, and the award, to have such a high calibre new member.

IFEG

INFORMATION FOR ENERGY GROUP

A joint IFEG/Managing Information seminar

Wake-up Call – Changes in Copyright

Thursday 3 October 2002

Afternoon Seminar, 2pm – 5pm (1.00pm buffet lunch)

Held at the Institute of Petroleum,
61 New Cavendish Street, London W1G 7AR

Attendance is FREE for IFEG members, £10 to ASLIB members,
£25 to non-members of either organisation

THIS IS IMPORTANT – DON'T FALL FOUL OF THE NEW LAW!

Do you or others within your organisation photocopy published material? Changes in the copyright law will affect you and your organisation. The EU Copyright Directive must be implemented by 22 December 2002. There are major implications for the commercial sector. By the date of this seminar the draft Statutory Instrument for changing the UK law will have been issued.

Attend this seminar to hear from and question the experts.

Our speakers are: Anthony Murphy, Director, Copyright Directorate, The Patent Office, Judy Watkins, Copyright Office Manager, The British Library, Peter F Shepherd, Chief Executive, The Copyright Licensing Agency Ltd

Graham Coult, Editor, Managing Information, will chair the seminar

Please contact Sally Ball, IFEG Secretary by Friday 27 September 2002 to confirm your attendance.

T: 020 7467 7115 F: 020 7255 1472

e: ifeg@petroleum.co.uk

(All details are correct at time of going to press, but IFEG reserves the right to make alterations if necessary)

EVENTS

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11-13 London
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 Details: Abacus International
 Tel: +44 (0)1953 497099
 Fax: +44 (0)1953 497098 or +44(0)870 052 2235
 e: info@abacus-int.com
www.abacus-int.com

12-13 Amsterdam
Commercialising Wind Energy
 Details: Vision in Business Ltd
 Tel: +44 (0)20 7839 8391
 Fax: +44 (0)20 7839 7531
 e: booking1@visioninbusiness.com
www.visioninbusiness.com

16-17 Houston
OPT USA 2002: IBC's 2nd annual Offshore Pipeline Technology conference & Exhibition
 Details: IBC Global Conferences
 Tel: +44 (0)1932 893851
 Fax: +44 (0)1932 893893
 e: cust.serv@informa.com
www.ibcenergy.com

16-18 London
Underwater Acoustics
 Details: Imperial College Centre for Continuing Education
 Tel: +44 (0)20 7594 6884
 Fax: +44 (0)20 7594 6883
 e: cpd@ic.ac.uk
www.ad.ic.ac.uk

16-17 London
Bulk Liquid Metering and Meter Proving
 Details: Abacus International
 Tel: +44 (0)1953 497099
 Fax: +44 (0)1953 497098 or +44(0)870 052 2235
 e: info@abacus-int.com
www.abacus-int.com

IP EVENTS

Conference & Exhibition
Improving Safety in Petroleum Product Deliveries and Petrol Filling Station Operations
 Tuesday 10 September 2002
 Wolverhampton Science Park, Wolverhampton, UK
 Contact: Laura Viscione
T: +44 (0) 20 7467 7174
F: +44 (0) 20 7580 2230
 e: lviscione@petroleum.co.uk

Discussion Group Meeting
Comparative Insolvency Regimes of the United Kingdom and America
 Speaker: Stephen Gale, Herbert Smith
 Wednesday 2 October 2002
 Institute of Petroleum, London
 Contact: Laura Viscione
T: +44 (0) 20 7467 7174
F: +44 (0) 20 7580 2230
 e: lviscione@petroleum.co.uk

Hazardous Area Classification - IP15
 Tuesday 17 September 2002
 Heath Conference Centre, Runcorn, UK
 Contact: Andrea Fulton
T: +44 (0) 20 7467 7106
F: +44 (0) 20 7580 2230
 e: afulton@petroleum.co.uk

Metalcutting Fluids
 Thursday 10 October 2002
 Manchester United Complex, Old Trafford, Manchester, UK
 Contact: Andrea Fulton
T: +44 (0) 20 7467 7106
F: +44 (0) 20 7580 2230
 e: afulton@petroleum.co.uk

17-19 London
Real Word Taxonomies: structuring content in context
 Details: Ark Group
 Tel: 020 8785 5900
 Fax: 020 8785 9373
 e: hanson@ark-group.com

18-19 Aberdeen
Introducing Subsea Pipeline Engineering
 Details: Trevor Jee Associates
 Tel: +44 (0)1892 544725
 Fax: +44 (0)1892 544735
 e: admin@tja.co.uk
www.tja.co.uk

MOVES *People*

Stig-Arne Kristofferson is to head up Ødegaard's Norwegian operation as Business Development Manager and General Manager following the opening of a new office in Stavanger.

John Gary Moore has joined the Board of Northern Petroleum plc as a non-Executive Director. Moore is currently Director of Sunningdale Oils (Ireland), Medusa Overseas Holdings Ltd and Medusa Hydrocarbons. In addition, he was a director of Gary Moore & Associates until April 2002.

Steve Williams has been appointed to the position of Executive Vice President Corporate Development and Chief Financial Officer of Suncor Energy. He replaces **Mike O'Brien** who retired at the end of June.

*The Association for Specialist Fire Protection has announced that **Brian Robinson**, Commissioner for the London Fire and Emergency Planning Authority, has succeeded **David Woolley** as the Association's President.*



Stolt Offshore has appointed **James B Hurlock** to the Board of Directors. Hurlock replaces **Pierre Laborie** who resigned in February. Hurlock is a retired partner of law firm White & Case and served as Chairman of its Management Committee. He participated in the formation of and served on the Board of Northern Offshore which, during the 1970s operated diver lockout submarines and provided other services to the offshore oil industry.

Weatherford International's Board of Directors has named **Lisa W Rodriguez** as the company's Senior Vice President and Chief Financial Officer. Rodriguez joined the company in 1996 and has served in several positions, including Vice President Accounting and Controller.

ChevronTexaco has announced that **R Bruce Marsh**, General Tax Counsel has elected to retire after 31 years with the company. Marsh will be succeeded by **Thomas R Schuttish**, currently Assistant General Tax Counsel. Schuttish will assume his new responsibilities on 1 September.



*Sigma Aerospace has made two senior appointments in a move to expand its industrial engine overhaul and repair business throughout the world markets. **Keith Jones** (left) joins the company from Air Canada as Managing Director and **Rick Meopham** (right) joins as Director, Marketing and Sales from Derco aerospace.*

*The new Managing Director of Emerson Process for the UK and Ireland is **Steve Brown**. Brown's previous roles include working for Fisher-Rosemount (now Emerson Process Management) as UK Managing Director.*



Frontier Engineering Solutions (Asia-Pacific) has appointed **Mel Foster** as Operations Director. With associated offices in Aberdeen and London, Perth-based Frontier serves clients primarily in Australasia and southeast Asia.

Peter Nicholson has been appointed Group Head of Human Resources of Wood Group. He joins the company from Smith International where he was Vice-President of Human Resources.

***Kenny Watt** has been promoted to Area Manager – Middle East Region for BJ Tubular Services. Prior to his recent appointment Watt served as Manager of Completion Services for the company based in Aberdeen. He is now based in Dubai and reports to **Neil Gordon**, General Manager of BJ Tubular Services.*



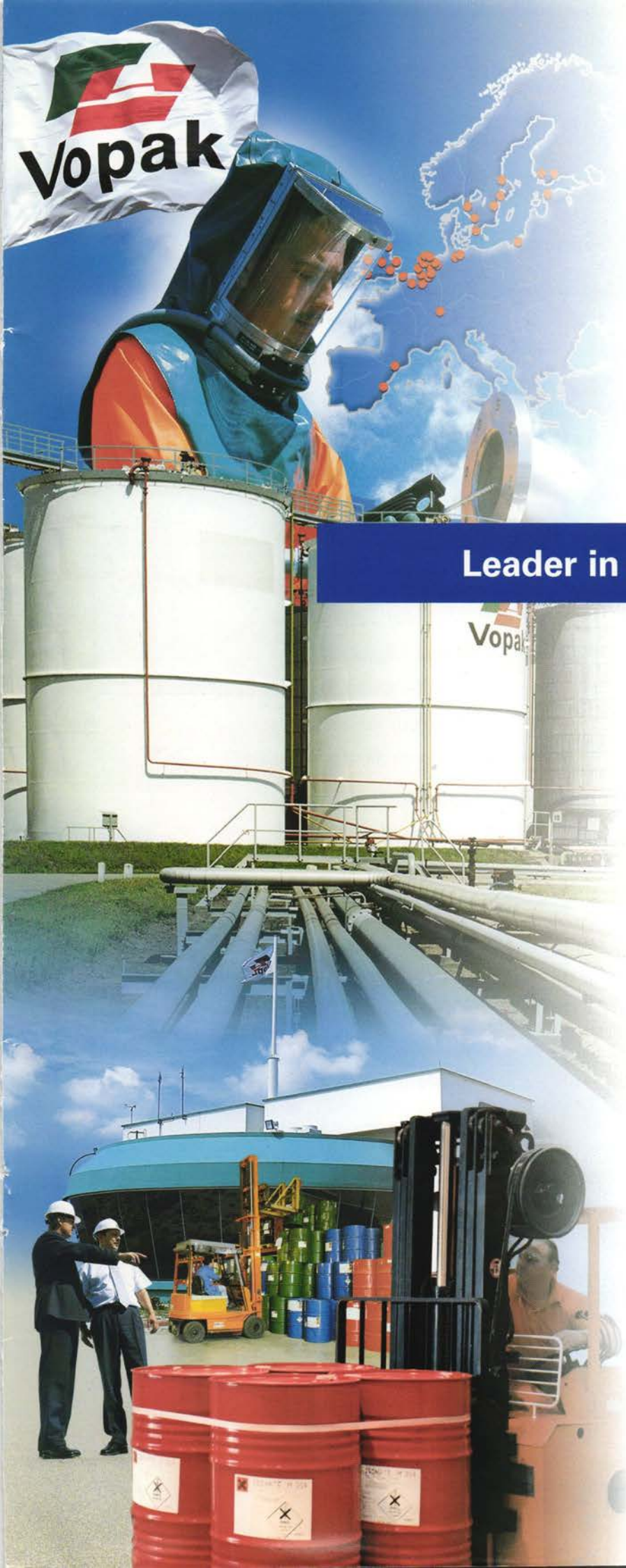
Alan Osborne has been appointed Head of Vehicle Inspection Services for the Freight Transport Association. Osborne joins from ZeTek Power where he was responsible for Business Development. He will report to **Steve Agg**, Business Services Director.

It has been announced by Celerant Consulting that **Steve Keigher** is to head up its European Energy Practice as Vice-President. Keigher has joined the company from PricewaterhouseCoopers where he was a partner and CRM leader in their Energy and Utilities Practice.

IT and business consultancy Real Time Engineering has strengthened its presence in Scotland's oil and gas market with the appointment of **Graham Beattie** as Business Development Manager for the company's oil and gas division.

***Malcolm Gray-Stephens** has been promoted to Technical Services Manager – Middle East & Asia Pacific Region for BJ Tubular Services. Prior to joining the company in 1992 Gray-Stephens was employed by Lucas Automotive in Wales and worked in a variety of engineering roles. He is based in Dubai and reports to **Neil Gordon**, General Manager of BJ Tubular Services.*





Koninklijke Vopak N.V. (Royal Vopak) based in Rotterdam, The Netherlands is the leading international provider of independent tank storage and related logistic services to the chemical and oil industries throughout the world. Formed in 1999 following the merger between the two Dutch tank storage companies Royal Pakhoed and Royal Van Ommeren, Vopak has a tradition as provider of logistic services starting close to four hundred years ago when a group of cargo bearers started servicing vessels in the Dutch ports, a tradition unbroken since.

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Saudi Aramco will conduct interviews in London & Aberdeen in early September.



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