Petroleum review

JULY 1999

Forecourts

Forecourts of the future

Customers drive C-store development

Refining

Growth prospects in China

AGM

President reflects on year of IP achievements

Gas

Finding a home for stranded gas

Trinidadian LNG exports begin

Covering the international oil and gas industry from field to forecourt – exploration, production, refining and marketing

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Training Courses 1999

The IP is extending its range of learning events in 1999 by acting as the 'commissioning partner' for industry related training in the fields of economics, business and management, working with a number of different organisations and groups, each of which has recognised sectoral expertise and a proven track record as a training supplier.

Planning and Economics of Refinery Operations (PERO)

organised in association with ENSPM Formation Industrie

London: 20–24 September 1999

This intensive five-day Training Course will cover: Technical Resume Refinery Simulation Present Situation of the Refining Industry Refinery Margins and Costs Optimisation of Refinery Operations Scheduling of Refinery Operations How to Improve Refinery Profitability

Who should attend?

- Technical, operating and engineering personnel working in the refining industry
- Trading and commercial specialists
- Independent consultants
- Process licensors
- Catalyst manufacturers and refining subcontractors

Trading Oil on the International Markets (ITO)

Cambridge: 4–8 October 1999

INVINCIBLE

Delegates become part of Invincible's fictional trading team, taking decisions about the company's activities to maximise profits through an understanding of the economics of trading and the management of inherent price risks. They trade the live crude oil and refined product markets worldwide, reacting to events as they happen using real-time information provided by Reuters and Telerate, as well as industry publications such as *Platt's* and *Petroleum Argus*.

Delegates negotiate and cost deals, calculate profitability, charter a ship and examine the legal and operational aspects of trading. They also learn to identify and manage price risks using futures, forwards and over-the-counter markets.

Operations Practice in Supply Trading (OPST)

Newbury, Berks: 1–5 November 1999

KENNET OIL LOGISTICS

This new and unique five-day residential Training Course is designed primarily to teach the skills employed in the operation of supply trading contracts in the international crude oil and product markets. Delegates will achieve an understanding of the refining process and selection of the most profitable crude oils together with the basic principles of oil trading followed by their respective trading groups.

Who should attend?

- Operational and trading professionals who have recently acquired positions within an oil trading function
- Managers, administrators and other professionals within an oil trading company
- Vessel operators, ship brokers, banks, solicitors, oil brokers, independent inspectors, insurance brokers, cargo underwriters, vessel P&I clubs and storage companies
- Managers and professional staff from Government departments and agencies
- Professionals from energy related and news publications and consulting groups

For a copy of the programme and registration form for any of the above Courses, contact:
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***or view the IP website:* www.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
		b/d	= barrels/day
t/y	= tonnes/year	t/d	= tonnes/day

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

Front cover: MTA Design's 'futuristic' service station developed for Italiana Petroli incorporates many innovative ideas including cantilevered dispensers and moving image promotional displays.

CONTENTS

NEWS

SPECIAL FEATURES

FEATURES

REGULARS

ROUNDUP

From the Editor

Demand is really the key

First the good news – oil prices continue to rise, Opec continues to restrain production, and Far East economies continue to improve. Like a supertanker turning, the move to higher prices is slow but likely to have great momentum.

The best cure for low oil prices is low oil prices as these should curtail production and stimulate demand. However, so far, the move back to a better balance has predominantly come from the supply side – Opec cutbacks, production shut-ins, deferred or cancelled development plans. In contrast, the stimulus to demand from lower prices is being diluted by high consumer government taxation, environmental policies, rising efficiency and fuel switching.

The just published *BP Amoco Statistical Review of World Energy 1999* records that in 1998 world energy demand fell by 0.1% – the first fall since 1982. In terms of oil, global consumption grew by just 0.1% while production rose by 1.4%. The result: high stocks and weak prices. Surprisingly, Opec production grew 3.2%, yes 3.2%, which meant its output of 30.7mn b/d accounted for 42.1% of global oil production in 1998.

Reviewing the statistics, Peter Davies, BP Amoco's Vice President and Chief Economist, drew attention to the way economic growth and energy demand appear to have decoupled in 1998. He pointed to the US where, despite a booming economy, primary energy demand was virtually unchanged and oil demand grew by just 0.5% in 1998 over year-earlier levels. Similarly in China, where primary energy demand fell by 3.2% and oil growth fell to 2.5% in 1998 compared with 6.4% in 1997.

Davies suggested that the fuel substitution and the closure of energy intensive, coal-fuelled industries was the explanation in China. For the US, mild weather was the main reason (gas demand fell by 3%).

All over the world the combined-cycle gas-fired turbine (CCGT) is now the preferred electricity generation route. The thermal efficiency of the fuel to electricity conversion is now approaching 60% compared with 40% for the best conventional oil or coal-fired stations. As the least efficient plants are retired and new CCGT stations open, energy demand growth from the power sector will decline. In the UK, National Power has just announced that it is to close one oil-fired and two coal-fired stations while Enron Europe recently received permission to build a gas-fired combined heat and power unit (CHP units have thermal efficiencies of over 80%). This major change will have increasing impact over the next few years; at much the same time as direct injection gasoline and diesel engines (up to 15% more fuel efficient) and an increasing move away from coal really start to impact.

As if this was not enough uncertainty about future demand trends, there are two other wildcards; totally new motive power sources – fuel cells (hydrogen and electric) – and demography. Population trends appear to be changing and the age profile of populations is skewing. Will elderly populations be as fuel intensive as youthful ones? (See review of new book *Agequake*, p51).

The oil industry is currently working very hard to increase value (and profits) on the forecourt and appears very aware of the need for chance and the impact of societal change (see p22 and p26).

In contrast, governments seem almost blissfully unaware of the impact current changes could have on their revenues and on their ability to provide jobs. The North Sea, even at recent rather higher prices, has become an economically marginal province for new developments. However, the Norwegian government appears to want to renationalise Norsk Hydro once it takes over the only Norwegian independent Saga. It also remains reluctant to improve terms and taxation levels (see p41 and p46).

The UK government appears somewhat more flexible but has still not fully resolved the conflict between its environmental policies, tax raising requirements and the requirement for oil jobs, particularly in Scotland. In both countries there appears a strange conviction that the oil industry is bluffing; that $16 Brent will bring back the good times. Perhaps they need to consider more carefully what would happen if oil demand continues to fall, if few North Sea projects are viable, if fabrication yards close and if 'green' taxes destroy jobs on the scale some are predicting.

The UK and Norwegian governments may be failing to appreciate the seriousness of the threat but the European Commission appears to be on another planet. Despite the fact that the Commission has been sacked and despite its promise not to initiate new legislation, it has just brought forward an environmental 'wish list' with a euro 7.5bn price tag (see p28). As additions beyond Auto Oil 1 and 2, will these proposals simply 'export' Europe's refineries to Russia or North Africa?

Chris Skrebowski

Web Word

Keeping viruses at bay

While the Internet brings many benefits, such as improved communication and access to information, there are some unfortunate side effects, not least of which is the virus issue.

A virus is a programme file introduced into computer software, usually with the deliberate intent of causing damage to the information held, or even the hardware itself.

Some viruses have had such a devastating effect that they've even made the national press. 'Melissa' is one such example. Melissa is a Microsoft Word macro virus that infects your PC when you open its e-mail attachment. It is the most prevalent virus seen to date and crashes mail servers by causing much increased e-mail traffic. Not content with this, it also deletes files and tries to corrupt essential microchips.

If you receive an e-mail with the subject line: 'Important message from [username]' and a message bearing the legend: 'here is that document you asked for, don't show anyone else,' delete it immediately!

Melissa only affects files in Office 97 and 2000, so those of you using other systems can feel really smug. Not too smug, however, as there are many other viruses floating around in CyberSpace. Also, viruses can lay dormant within a system for long periods of time.

There are some measures you can take to protect yourself. Firstly, install anti-virus software. This must be updated regularly – at least quarterly – to ensure that it will detect recent viruses. Viruses are being created at a rate of around 200 per month. You can check for updates and news on various websites, such as Dr Solomon's (**www.drsolomon.com**) and Data Fellows (**www.datafellows.com**). Secondly, disable macros in Word, as this is where many viruses are hidden. However, always remember that viruses are a soluble problem and not a disaster.

We are currently developing a Members' Only area of the IP website (**www.petroleum.co.uk**), with a launch date of 1 September. It will include a searchable database of *News in Brief* stories, along with full-text articles from *Petroleum Review*, statistics and much more. To gain access to this area, please e-mail Catherine Pope (**cpope@petroleum.co.uk**), quoting your full name and membership number.

If you have any questions or suggestions regarding the IP website or the Internet in general, please contact Catherine Pope on **cpope@petroleum.co.uk**

NEWS Upstream

Stolt signs hat-trick of contracts

Stolt Comex Seaway has secured two contracts in Norway and one in West Africa totalling $60mn for work in the latter part of 1999 and beyond.

The company is to install oil and gas transfer risers between Statoil's North Sea Åsgard floating, production, storage and offloading vessel and the semi-submersible Åsgard B production platform as part of a contract valued at $25mn.

Seventeen additional risers will be installed at Åsgard B for production gas and condensate transfer, gas and glycol injection and to provide links to the Midgard and Smørbukk fields. The *Seaway Eagle* will begin installation work in April 2000.

Norsk Hydro has awarded Stolt the frame contract for inspection, repair and maintenance (IRM) for a three-year period plus three one-year options.

Valued at a minimum of $15mn for three years, the contract covers all scheduled IRM work required on both existing and new fields operated by Norsk Hydro in Norway.

Also included in the contract is an option for all major subsea repair work. The contract has already commenced.

In West Africa, Stolt has secured a $20mn contract for the provision of ROVs on a three-year contract, with a further two-year option, to support drilling and maintenance operations on the Girassol field's subsea production facilities.

The contract also includes the provision of support for all similar operations by Elf in block 17 offshore Angola.

All of the ROVs will be identical SCV3000 systems assembled to an SCS specification which will be capable of operating at water depths of 2,000 metres. The contract commences this month.

Åsgard comes onstream

Statoil's Åsgard oil field in the North Sea came onstream in May. Claimed to be the world's largest subsea development to date, the field is expected to reach a production rate of 155,000 b/d over the next few months and to plateau at 200,000 b/d.

The Åsgard A production vessel is capable of storing 910,000 barrels of oil and has a design life of 20 years.

Phase 2 of the Åsgard project, which will produce gas and condensate from the Åsgard B floating gas platform currently under construction in Norway, is due to begin in October 2000.

Once onstream, combined oil and condensate production is expected to reach 300,000 b/d. Gas output is forecast to be 1.3bn cf/d.

Brazilian licensing round

Brazil's first international licensing round is reported to have raised $106mn. A total of 37 international companies bid for 24 of the 27 blocks on offer.

Successful bidders included Agip of Italy which paid nearly $75mn for exploration rights to the shallow water BM-S-4 block and Texaco which paid $15.79mn for rights to BM-S-2, both blocks located in the Santos Basin.

A Petrobras and YPF consortium successfully bid for block BM-CAL-2 in the Camamu/Almada Basin.

Petrobras also secured exploration rights to block BM-C-6 and, together with YPF and Eni, was awarded block BM-C-3; both blocks are located in the Campos Basin.

First gas from Gulf of Mexico Gemini field

Chevron (40%) and Texaco (60%) report that the deepwater subsea Gemini development on Mississippi Canyon blocks 292 and 247 in the Gulf of Mexico has produced first gas.

The field is producing 77mn cf/d of gas and 1,500 b/d of gas condensate from its first well. Drilling of two additional wells is due to complete by the end of the year, boosting production to between 150mn and 200mn cf/d of gas and between 2,000 and 3,000 b/d of gas condensate.

Gas and condensate is transported via pipelines to a Chevron-operated offshore production facility located 27 miles to the north at Viosco Knoll 900 for processing.

Gemini is Chevron's second deepwater Gulf of Mexico project. The first, Genesis, came onstream in January 1999 and is currently producing 28,000 b/d of oil and 28mn cf/d of gas from its first two development wells.

Chevron's third project, Typhoon, is in the development planning stage and is expected to achieve first oil by mid-2001. Together, the three projects are forecast to reach peak production by 2002.

In Brief

United Kingdom

Talisman Energy's sixth development *well on the North Sea Ross field has tested at 19,000 b/d.*

Shell and co-venturer Esso have agreed *to each acquire a 25% interest in part of North Sea block 21/24, outside the existing Guillemot West and Guillemot North West fields, from Veba Oil.*

Ranger Oil (UK) Ltd has applied to the *Secretary of State for Trade and Industry for consent to further develop the Columba 'B/D' Terrace located adjacent to the Ninian field some 120km east of the Shetland Islands by means of five additional extended reach wells.*

Shell Expro has awarded a £20mn, five- *year extension to BJ Services' existing contract to provide services for various Shell-operated North Sea facilities.*

The UK Offshore Operators Association *Drill Cuttings Task Force has selected Det Norske Veritas (DNV) to form a dedicated project management team to carry its initiative forward.*

Wood Group Engineering has secured a *five-year contract worth £35mn to provide engineering and construction services in support of Texaco North Sea UK's Captain, Erskine, Galley, Strathspey and Tartan facilities.*

Europe

The Norwegian government is *reported to have received recommendations from oil companies for 16 North Sea blocks to be included in a licencing round planned for 2000. The blocks are to be announced in 2H1999.*

Enterprise Oil has announced a hydro- *carbon discovery on the Sara prospect offshore Norway, said to 'underline the potential of the whole Skarv-Sara area'.*

North America

Pioneer Natural Resources is under- *stood to be selling $105mn worth of Texan and Canadian oil and gas assets in a bid to reduce its debt.*

Apache Corporation's Gulf of Mexico *natural gas discoveries West Cameron 615 A-4 and High Island 86 No 1 have tested at 35mn cf/d and 17.5mn cf/d of gas respectively.*

ABS guidance shows industry the ropes

ABS has published a comprehensive set of Guidance Notes for the use of synthetic ropes in offshore mooring applications which, as industry ventures into deeper waters – 3,000 ft and greater – are expected to offer improved efficiencies for optimum field development schemes.

'By incorporating lightweight synthetic rope into current-day deepwater technology, a floating production facility can support more revenue-producing equipment as the industry readies for ultra-deepwater basins worldwide,' said Malcolm Sharples, ABS Vice President Offshore Technology. He added that a significant percentage of the buoyancy of a floating production system can be absorbed by a mooring system. The application of synthetic ropes also creates new opportunities.

'Synthetic ropes remove the operational constraints of the more traditional catenary mooring systems which are often dependent on heavy wire and chain components that impact vessel buoyancy and reduce payload capacity,' he explained.

Floating systems – including Spars, tanker-based FPSOs and semisubmersible-based FPSOs – currently operating in 1,000–3,000 ft water depths can now feasibly move into much greater water depths without loss of production revenue due to a reduction in payload, he said.

Synthetic rope, made of polyester or other man-made fibres, is substantially lighter than wire–chain components. It offers the industry several advantages, said Sharples, such as reduced mooring system weight and improved extreme dynamic tensions.

A recent Petrobras deepwater project provided ABS with extensive experience contributing to the development of the Guidance Notes. The company used synthetic rope for its taut-leg mooring system on its Campos Basin P-27 semisubmersible floating production unit. Installed in April 1998, ABS classed the P-27 for some 1,700 ft of water near the Marlim field offshore Brazil. According to ABS Americas' Manager for Offshore Engineering, Todd Grove, the project 'provided valuable practical experience and insight for developing appropriate standards for industry suppliers and operators in the design, manufacture, installation and maintenance of synthetic ropes for deepwater mooring systems'.

The P-27 installation included 12 anchoring lines with polyester ropes and what is claimed to be the industry's first production installation of vertically loaded anchors. The more conventional drag embedment anchors are horizontally loaded and require a more expansive mooring system footprint or spread of mooring lines, explained Grove. 'Operators can achieve improved efficiencies with a reduced footprint, especially where platforms are in close proximity to one another or where subsea installations are extensive.'

For taut-leg systems, anchors are set some 80 ft into the seafloor within a close radius of the installation. A traditional catenary mooring system, however, requires a much greater radius to maintain the required station-keeping capability. For example, a catenary mooring system for an installation in 3,000 ft of water requires a radius spread of some 7,500 ft from the centre of the installation to the individual anchors. In contrast, a taut-leg mooring system for the same water depth requires an approximate 3,000-ft radius, resulting in improved space for flowlines, wellheads and associated lines and anchors.

In terms of dynamic tensions, synthetic moorings are said to improve vessel offset characteristics, a concept relating to the stationary positioning of a floating installation. While lighter-weight, the system reduces the vessel's drift from its static position, which results in less load on the facility's risers and umbilicals and, in general, may allow for less expensive production components.

Synthetic ropes can also be integrated into the traditional catenary mooring system. Hybrid designs where both polyester and chain–wire components are used are said to offer design flexibility for facilities and associated field development schemes.

Whatever the design scheme, however, protection of the synthetic rope from abrasion and wear is critical. Wire chain is necessary at the top and bottom of the mooring system, with polyester lines used through the water column. This approach protects the synthetic fibre from sand along the seafloor and ensures appropriate handling of the rope at the fairlead – the pivot point for directing the mooring line – near the platform water line. While synthetic rope is very strong, with up to a 1,000-tonne breaking strength, careful planning is required to ensure safe use of the polyester fibres for an estimated field life of 20 years.

The Guidance Notes address this issue and other fundamental concerns, such as non-linear stiffness or behaviour, minimum tension requirements, creep phenomenon and effective handling and storage of rope which is more than seven inches in diameter for current typical deepwater applications.

In Brief

Murphy Exploration & Production is *understood to have sold interests in nine blocks in the Gulf of Mexico Mobile Block 864 area to Callon Petroleum, together with an interest in the Mobile Block 864 Unit which Callon currently operates. Callon is to deliver $15mn-worth of gas to Murphy over a 39-month period under the terms of the sale.*

Energen Resources has sold interests *in 40 Gulf of Mexico licences in 20 fields to Bellwether Exploration of Texas for $22.25mn. The assets are currently producing 12mn cf/d of gas and 850 b/d of oil.*

Canadian 88 Energy has acquired two *exploration plays on the Scotia shelf southwest of Sable Island, Nova Scotia, and one in the Stolberg area of west central Alberta. The company is also understood to have been awarded two offshore drilling licenses for an area southwest of Sable Island under which it must invest $30mn on E&P operations over the next five years.*

Petrobras was reported to have cancelled *$560mn-worth of drilling and services contracts with R&B Falcon and Brazil-based Maritima Petroleo e Engenharia in May on the grounds that delivery of R&B's Falcon 100 and two Amethyst-class drilling rigs from Maritima is behind schedule.*

Middle East

British Gas is reported to have been *awarded a number of permits to explore for oil and gas offshore the Mediterranean coast of Israel.*

Iraq's Qurnah oil field is understood to *have come onstream. During phase one of development, production is expected to reach 40,000 b/d. This figure is forecast to double in the 4Q1999.*

Russia & Central Asia

The Russian Duma is reported to have *postponed debating bills applying production sharing licences to the Priobskoye oil field in western Siberia and four oil fields in the Northern Territories in northwest Russia. No reason has been given for the decision.*

Arco is reported to have pulled out of *the Yalama project in the Azeri sector of the Caspian. Lukoil is understood to now hold a 60% interest in the project, the remainder held by Socar.*

UK oil revenues on the up

Daily UK oil revenues in April 1999 were 26.9% higher than the previous month and at their highest level since December 1997, according to the latest Royal Bank of Scotland *Oil and Gas Index*. Average daily revenues reached £26.2mn. Brent crude averaged over $15.60/b during April, a 25% increase on the month. The year-on-year increase of 15.7% was the first for nearly two years.

'The violent swings in prices and revenues during the last 15 months underline the inherent volatility of the industry', commented Stephen Boyle, Head of Business Economics at the Royal Bank. 'Yet despite the evident problems, there are signs of underlying strength.' He indicated that this strength was evident in the results of a recent Royal Bank survey of its customers in north-east Scotland which showed that a considered approach is being taken to cost reductions and that, although volumes and prices are down on 1998, there are no signs of panic and most projects are not being abandoned, only postponed.

Gas output for April showed a decline consistent with the incoming season. The gas index moved to 272.7 in April, a decline of 16.5%. However, compared with April last year, gas production was up by 4.8%. The combined oil and gas index fell by 6.3% on the month to 192.1 for April.

Year Month	Oil production (av. b/d)	Gas production (av. mn cf/d)	Av. oil price ($/b)
Apr	2,571,241	8,844	13.53
May	2,433,059	6,381	14.40
Jun	2,406,521	6,069	12.12
Jul	2,432,040	5,733	12.06
Aug	2,379,644	5,640	12.05
Sep	2,573,882	6,394	13.28
Oct	2,600,813	8,832	12.60
Nov	2,612,843	10,738	11.07
Dec	2,715,056	11,123	9.81
Jan 1999	2,664,121	11,532	11.16
Feb	2,678,138	11,532	10.20
Mar	2,647,295	11,107	12.54
Apr	2,679,926	9,270	15.66

Source: The Royal Bank of Scotland Oil and Gas Index

North Sea oil and gas production

UK/Faroes boundary deal

UK Minister of State at the Foreign and Commonwealth Office, Tony Lloyd; Faroese Prime Minister Anfinn Kallsberg; and Niels Helveg Petersen, Foreign Minister of Denmark today signed the UK/Faroes Maritime Boundary Agreement which ends the protracted dispute over the boundary between the UK and Faroes.

Kallsberg also confirmed that the first Faroese exploration licensing round will open later this year. The Faroese Parliament is due to receive the proposal for the round in October.

In April this year, the Faroese Parliament approved its petroleum tax legislation in preparation for the licensing round. The tax system, focused on corporation tax alone (currently 27% on profits), was positively received by international oil companies and is considered favourable compared to some other regions of the world.

UKCS spends & trends

Hamish Dingwall, Head of the Scottish Enterprise Energy Group, reports that 1,000 companies have requested copies of the group's Spends & Trends dynamic forecasting tool for upstream expenditure on the UK Continental Shelf in the two months since its launch.

Developed in partnership with 40 offshore operators, contractors and SMEs, the tool aims to 'stimulate strategic planning in the oil and gas industry'.

The Energy Group has commissioned Arthur Andersen Petroleum Services Group to produce a six-monthly update of Spends & Trends for launch in September 1999.

The second version of the tool, which will be generated using expenditure data gathered by Andersen's from operating companies in June 1999, will be designed to be used in conjunction with the original version to facilitate data comparisons.

In Brief

BP Amoco has confirmed that it found *hydrocarbons, believed to be gas, in its Shah Deniz test well in the Caspian Sea. The company plans to drill up to two additional test wells before deciding whether the field will be profitable.*

Asia-Pacific

China is reported to have discovered *an oil field containing an estimated 20mn tonnes of low-sulfur reserves in the Hulun Buir grassland area of the Inner Mongolia Autonomous Region.*

Pakistan is reported to have granted a *petroleum exploration licence to a joint venture comprising Oil and Gas Development Company (OGDC) (55%), Novus Petroleum (40%) and government holdings (5%) covering Sulaiman block 2969-4. It has also awarded an exploration licence for Guddu block 2869-9 to a joint venture comprising IPR Transoil (95%) and government holdings (5%).*

Lasmo has made an oil discovery off- *shore East Kalimantan, Indonesia. The Janaka North well discovery is the first in the Rapak production sharing contract area, which is one of three PSCs into which Lasmo agreed to farm in on 1 May 1999. Subject to government and partner approval, Lasmo has agreed with the operator, Unocal, to earn a 10% interest in the Rapak PSC and 20% in the Ganal and Sesulu PSCs. The oil company plans to drill up to 20 wells on the three PSCs by the end of 2000.*

Cairn Energy is understood to have *agreed to take over as operator of Shell's RJ-ON-90/1 exploration block in Rajasthan, India. Cairn is to pay the first $2.1mn for a second exploration well on the block in return for extending its stake to 50% from 27.5%.*

Unocal is understood to have taken *over Occidental's block 12, 13 and 14 operations in Bangladesh for an undisclosed sum.*

Conoco and other West Natuna oper- *ators have awarded J Ray McDermott a $335mn contract to build a subsea pipeline between the West Natuna Sea gas field in Indonesia and Singapore.*

Soco International has signed a Heads *of Agreement (HOA) with Petrovietnam for block 16-1 offshore Vietnam in the South China Sea. Working interests will be held by Petrovietnam (41%), Soco Vietnam (30%) and various non-Vietnamese companies.*

NEWS Upstream

UKOOA seeks CGT rollover tax relief

The UK Offshore Operators Association (UKOOA), the representative body for the UK offshore oil and gas industry, is urging the government to include measures in the 1999 Finance Bill to extend Capital Gains Tax (CGT) rollover relief to transactions of hydrocarbon producing assets in the North Sea.

The Industry believes that the current restriction on rollover relief is inhibiting the transfer of licences between companies which, in a mature sector such as the North Sea, is increasingly frustrating the efficient exploitation of remaining reserves. Although asset trading has always been a feature of North Sea activity, turnover tends to increase as fields mature and cost pressures intensify. Up until the early 1990s, transactions largely involved pre-1982 fields where the impact of CGT was minimal.

These transactions, however, increasingly concern assets which have little or no pre-March 1982 history, and consequently are more exposed to CGT. There is growing evidence that the CGT exposure is now of such magnitude that it equals or even exceeds the value gained from such possible transactions, which, inevitably in these circumstances, do not go ahead.

The industry's concern is that the current restriction of rollover relief for CGT is impeding the rationalisation of asset ownership on the UKCS and that, as a consequence, major opportunities to achieve significant cost savings and attract further investment are being lost.

Go-ahead for Cook field

The UK government has given the green light for development of Enterprise Oil's Cook field in the UK sector of the central North Sea. First oil is planned in 2H2000. Cook – which lies within UK block 21/20a, 180 km east of Aberdeen in 94 metres of water – is expected to commence production at 10,000 b/d with a peak rate of 20,000 b/d being achieved in 2001.

The development plan includes two subsea production wells. Initial production will be via a single well, with the second planned for 2001. Its location will be determined with the benefit of production data from the initial well. The subsea wells will be tied back via a single 8-inch flowline to the Shell/Esso owned Anasuria FPSO. A three-inch service line will also be available for chemical injection and gas lift services. Oil will be exported by offshore loading via shuttle tanker. Gas will be exported by pipeline through the Fulmar gas pipeline to St Fergus.

Scottish fellowships

Scottish Enterprise has revealed plans to fund 18 fellowships over the next three years, including two oil and gas fellowships, as part of its ongoing commitment to assist Scottish companies develop and exploit new technology.

The first of the oil and gas fellowships is due to be awarded in June, with a focus on drilling and well services, and subsea engineering/applications.

The fellowships are aimed at graduates, academics and research staff presently working within a Scottish Higher Education Institution or Research Institute on oil and gas, digital media, biotechnology and optoelectronics based projects that are ready for commercialisation.

The 12-month fellowships include a formal business training element aimed at reducing barriers such as a lack of understanding of finance and funding routes and how to investigate potential markets.

World subsea tree firsts for ABB Vecto Gray

ABB Vecto Gray has secured a contract from Amerada Hess for what it claims is the world's first 15,000 psi Horizontal Trees (HT™) for deployment on a high pressure field in the Gulf of Mexico.

Three 4-inch by 2-inch 15 KSI diverless Subsea Production Trees, rated to 250°F, will be installed on the Conger field in 1,450 ft of water on Garden Banks block 215 N/2. The trees are scheduled to be delivered in September 2000.

The field, which is to be developed using flowlines taking produced fluids to the nearby Shell Salsa platform, is due onstream in 4Q2000.

The contract also includes what is said to be the first application of a Horizontal Tree Installation Package which has been developed by ABB Vecto Gray as part of its Well Intervention and Test System (WITS) programme.

ABB claims to be the first subsea tree vendor to offer complete HT™ installation and workover services.

In Brief

Latin America

***A Petroleos Sudamericanos-led consortium** is to develop the 34.5mn barrel Palanda Yuca Sur and 20.3mn barrel Pindo oil fields in Ecuador.*

***TOTAL and Tesoro Bolivia have** discovered 'major' gas reserves on block XX West, located in the Tarija area of south Bolivia's Gran Chaco province. The ITAU X-1 (A) exploration well flowed at 865,000 cf/d of gas and 830 b/d of condensate. Under normal operating conditions the well is expected to yield 2mn cm/d of gas and 2,000 b/d of condensate, states TOTAL.*

***TOTAL is to sell its 70% stake in the El** Huemul field in Argentina to US-based Vintage Petroleum for $93mn. The field currently produces 10,000 b/d of oil and 800,000 cm/d of natural gas.*

***Elf Petroleum Trinidad has announced** a gas discovery on the BHP-operated block 2C offshore Trinidad and Tobago. The Angostura-1 discovery well has flowed 30mn cf/d of gas.*

Africa

***Exxon has signed a production sharing** contract covering the Stabroek block offshore Guyana. The oil company has a 100% interest in the block.*

***State-owned Sonatrach of Algeria is** reported to have signed two oil exploration contracts, valued at $22mn, with Italian company Agip. The first covers seismic acquisition over 1,000 sq km and the drilling of two wells on block 222B near the Libyan border over the next five years. The second covers the acquisition of 200 sq km of seismic and drilling of two wells on block 403D in the Borma region to the east of the Hassi Messouad oil field over two years.*

***BP Amoco has signed a production** sharing agreement with Angolan state oil company Sonangol for block 31 in Angola's deep water acreage. BP Amoco will act as operator of the block with a 26.67% interest.*

***Dana Petroleum has announced the** signing of three new production sharing contracts (PSCs) offshore Mauritania, West Africa, relating to blocks, 1, 7 and 8, extending over the continental shelf and into deep water. The company has been awarded operatorship and an 80% interest in the PSCs.*

NEWS Industry

Exporting UK industry expertise

According to Scottish Enterprise, although the expertise built up by oil and gas training providers on the UKCS is a saleable commodity, only a relatively small proportion of training providers actually service the overseas market at present. In a bid to stimulate interest in export markets, the Group recently embarked on a three-phase project.

The first phase involved interviews with operators, contractors and training providers with first-hand knowledge of overseas markets to obtain their views on the markets which offered the 'best fit' with Scottish capability. The exercise identified 11 priority markets: Azerbaijan, Kazakhstan, Saudi Arabia, United Arab Emirates, Kuwait, Qatar, Oman, Malaysia, Brunei, Vietnam and Western Australia. A series of overview reports outlining the general opportunities, trading norms and buyers in these markets was subsequently commissioned and are due to be made available on CD-Rom in June 1999.

The final element of the project involves the production of a Directory of Scottish Oil & Gas Training Providers – in conjunction with the Offshore Petroleum Industry Training Organisation (OPITO) and with the support of the Infrastructure & Energy Projects Directorate of the UK Department of Trade and Industry – to stimulate awareness and take-up of training among UK and overseas buyers.

Amec launches new partnership initiative

Amec has launched a new initiative in a bid to identify strategic partners from its key suppliers and subcontractors across all the company's areas of activity. Around 20 partners are expected to be identified in the first phase of the initiative. Final selection is due in late summer.

The 'strategic partners' initiative aims to develop new ways of working with the group's key providers of critical goods and services which 'incorporate the philosophies, benefits and advantages of longer term partnering for all companies engaged in the supply chain' explained Amec. According to George Payne, Executive Director, 'continuous measurable improvement to maximise performance will be a key requirement' in the long-term strategic partnerships. 'We have worked successfully on a partnering basis with clients in many sectors of the industry and the benefits to all parties are inescapable. We have also worked on a similar basis with a number of suppliers and have seen the results possible in terms of quality, cost and time improvements', he said.

'With our selected suppliers, we will develop more creative solutions and better, more profitable, ways of doing business. We will focus on delivering continuous safety improvements and increased efficiency, quality and predictability of project delivery with associated cost reductions. Innovation, standardisation, cost reduction, enhanced quality and improved delivery are some of the key areas we will address in cooperation with these strategic partners.'

Proposals invited for funding projects

Proposals are now invited under the second round of the EPSRC/DTI Oil and Gas Extraction programme which will commit funding of around £2mn to new projects. The programme aims to:

- take forward the recommendations of Foresight, the UK government programme to clarify important pointers for industry and research;
- focus on key research issues for the oil and gas industries;
- allow the development of collaborative (larger) programmes of research;
- encourage networking between academia and industry.

The second round will incorporate an outline proposal step into the assessment process. Only those proposals shortlisted by the Programme Advisory Panel will be invited as full submissions.

The deadline for proposals is 30 July 1999. For more information contact Dr Alyson Thomas, EPSRC Engineering Programme, Tel: +44 (0)1793 444441 (Mon–Wed), or John Foote, DTI Infrastructure and Energy Products, Tel: +44 (0)1224 254003.

Birthday honours

The Queen's Birthday Honours List for 1999 included the award of two OBEs to William Campbell, Plant and Transport Manager, Esso Exploration and Production UK, and Reginald Harry Shipman, Technical Advisor, Gas Association.

In Brief

United Kingdom

***The Office of Gas and Electricity** Markets – OFGEM – is the new name for the combined Office of Electricity Regulation (OFFER) and Office of Gas Supply (OFGAS).*

***Speaking in Aberdeen in May,** Halliburton's Chief Executive Officer, Dick Cheney, indicated that restructuring in the oil and gas service industry had run its course following a number of mergers last year, including that between Halliburton and Dresser Rand. However, he suggested that some smaller-scale mergers may be in the offing and intimated that Halliburton had not ruled out further acquisitions itself.*

***Shareholders of Lasmo have voted in** favour of the company's takeover bid for Monument Oil and Gas.*

***Montrose Scota Training International** (MSTI) has been awarded OPITO accreditation for two key offshore training courses provided at its Aberdeen facility.*

***Aberdeen University has been awarded** £775,000 to help build a centre for testing materials and instrumentation used in the offshore industry.*

***The UK parliament's Commons Trade** and Industry Committee has launched an investigation into government plans for an energy tax on business, prompted by protests from energy intensive companies. Martin O'Neill (Labour) will chair the committee.*

***TWI Certification has been accredited** as an Awarding Body for National and Scottish Vocational Qualifications.*

Europe

***Statoil and Norsk Hydro appear to have** beaten off rival Elf Aquitaine with a paper-and-cash offer which guarantees a price of NKr135/share, up from the NKr108 previously offered, and above the NKr125 bid made by Elf. Saga Petroleum has appointed Vice Chairman Jannik Lindbaek as Acting Chairman following Wilhelm Wilhelmsen's resignation as Chairman in protest at Norsk Hydro's bid for the company.*

***BP Amoco and Elf Atochem are understood** to have formed a 50:50 polypropylene joint venture.*

Scottish oil and gas industry 'Oscars'

The success of six oil and gas service companies was recognised at the 1999 Scottish Offshore Achievement Awards, the annual industry 'Oscars' organised by Scottish Enterprise Energy Group in May. The award-winners were as follows:

- Overall Performance (sponsored by the *Press & Journal*) – RDS Resource (technical subsurface consultancy and operational asset management)
- Small Company (sponsored by Offshore Europe Partnership) – Tritech International (high-tech subsea products)
- Innovative Technology (sponsored by the DTI's Infrastructure and Energy Projects Division) – Tritech International (awarded for the company's complimentary range of ROVs and autonomous underwater vehicles' tools and sensors)
- Export Achievement (sponsored by British Airways) – Hydrovision (its ROVs are found in 28 countries around the world)
- Knowledge-based Company of the Future (sponsored by Texaco) – Petrotechnics (business process innovation via the intelligent application of IT)
- Safety Excellence (new award sponsored by BP Amoco) – Baker Hughes Inteq

PES (International) was commended in the Innovative Technology category for developing an innovative SCRAMS system that allows operators to manage reservoirs to maximum effect. Elmar Services, which specialises in wireline equipment and perforation guns, was commended in the Export Achievement category for its record of consistent growth in international markets.

The Alick Buchanan-Smith Memorial Award for personal achievement and contribution to the Scottish offshore industry was presented to Aberdeen University oil and gas economist Professor Alex Kemp.

Halliburton Chief Executive Officer and former US Defense Secretary Dick Cheney presented all but the Memorial Award, which was presented by Mrs Janet Buchanan-Smith. He said: 'Tonight's Scottish Offshore Achievement Award winners epitomise the outstanding levels of flair, creativity and innovation that have earned Scottish companies a worldwide reputation for being at the leading edge in our industry...I am confident that the display of forward thinking vision we have seen here tonight will ensure Scotland continues to play a major role in meeting the challenges and demands of our environment as well as in securing the long-term competitiveness of our industry worldwide.'

He also commented that while the industry had recently been going through difficult times with the downturn in the business, the rapid drop in the rig count, the fall in prices and the overall reduction in demand for the product during the course of 2H1998 and 1H1999, things were now 'looking up'; but he cautioned against industry 'overdoing the recent upturn in prices'.

Cheney also said that he was 'impressed' by the extent to which 'Opec seems to have got its act together with the degree of compliance that appears to be in the offing there', and commented that 'for the first time in a long time there is some cause for optimism in terms of the overall price situation'.

He told the assembled audience that it was important 'to recognise that the competitive pressures that have been there for us as an industry now for the last several years are going to continue. In the future the emphasis is still going to be on recruiting and training first class people, upon developing and applying new technology, finding ways to improve our performance and improve the performance of our customers.' He forecast a 'robust level of activity in the oil and gas business on a global basis' and stated that 'we will all be tested based on our competitive instincts and our competitive capabilities'. Ending on an upbeat note, Cheney concluded by saying: 'I for one am very optimistic about the long-term outlook for our business.'

Also speaking at the awards, John Wood Group Chairman and Chairman of Scottish Enterprise, Sir Ian Wood, added a cautionary note, predicting that it would be a while before fortunes for the North Sea oil and gas industry took a turn for the better. He warned that $10–12 oil would be used as the benchmark for future prospects and said that this would lead to a downgrading of UK reserves and attractiveness. He also predicted that even at $16, UK prospects would not be out of the woods.

The European Commission is launching *an investigation into the proposed BP Amoco and Arco merger amidst fears that a small number of companies may end up with global control of oil exploration and production.*

TOTAL reports that it has secured *94.3% ownership of PetroFina following its public exchange offer. TOTAL is now to extend the share offer in Belgium and the US.*

Spanish power group Iberdrola is *understood to have bought a 3.5% stake in Repsol for $525mn.*

Daily German inland oil pricing and *freight rate data produced by OMR of Germany is now available electronically via the Saladin Information Service.*

The European Commission is reported *to be urging EU member countries to strengthen measures to cut greenhouse gas emissions, warning that such emissions could rise in the next few years.*

North America

Talisman Energy is reported to have *made a $90mn takeover bid for Highridge Exploration which holds assets in Alberta, many adjacent to Talisman's Whitecourt properties.*

PennzEnergy and Devon Energy are *understood to be planning to merge their operations to create one of the top-10 US oil and gas production companies in terms of reserves and production. The new company – Devon Energy Corporation – will have a market capitalisation of $2.6bn. Cost savings following the merger are expected to be between $50mn to $60mn.*

Middle East

Iraq signed another six-month MOU *of the United Nations oil-for-food exchange in May. Iraq is allowed to export up to £5.26bn worth of oil from 25 May to 20 November.*

Asia-Pacific

The Indonesian government is understood *to be planning to begin privatisation of state oil and gas monopoly Pertamina in 2001 – once the company has calculated its assets and a new oil and gas law opening parts of the industry to foreign participation is ratified.*

New UK gas trading arrangements

UK gas industry watchdog Ofgas has revealed details of new gas trading arrangements in the UK that aim to more realistically reflect the costs of balancing supply and demand in the national gas pipeline system. The reforms are to be introduced from 1 October 1999.

A key feature of the opening phase of the new regime will be screen-based, on-the-day commodity market (OCM) which will replace the present flexibility mechanism – the arrangements used under the Network Code by Transco, the pipeline operator, to balance the system. It will also support shipper-to-shipper, within-day trading. An operator of the OCM was due to be announced in June.

The new proposals also include changes to the way shippers buy entry capacity to the high-pressure national transmission systems.

Unlike the existing arrangements where shippers can buy as much capacity as they want, entry capacity sold by Transco will be limited to that which is actually available.

One of the principles underlying the reforms is more accurate cost targeting. Shippers will have stronger incentives to balance their portfolios through reductions in balancing tolerances, and there will be specific incentive schemes for Transco to make more efficient balancing decisions.

These new incentives should reduce the overall costs of balancing the system, says Ofgas.

Commenting on the new trading arrangements, Callum McCarthy, Director General of Electricity and Gas Supply, said that '[they] are designed to bring about a more liquid and competitive wholesale market which will mean lower prices for customers.

He also stated that the new arrangements give shippers a 'greater incentive to balance and bring gas trading more into line with normal trading'.

David McLean expands Shell forecourt contract

UK civil engineering company David McLean, which signed a £46mn, three-year 'partnership' service station construction contract with Shell at the end of 1996, has been appointed to install retail outlets for auto LPG at 200 Shell forecourts throughout the UK. The first of these new sites opened recently at Dover South Services off the M20 going into Dover.

Peter Richmond, Operations Director at David McLean, believes the contract to 'be one of the only true exclusive partnering agreements in operation'.

The initial tendering and packaging of the construction and refurbishment work resulted in Shell UK making a saving of 13% on its benchmark prices, reports the engineering company. Shell set targets of a further 15% reduction over the three-year period of the contract, no health and safety incidents, zero defects, and reductions in contract periods.

In total, 222 development projects were completed at Shell service stations throughout the UK in 1997, and 368 sites in 1998. Shell's purchase of Gulf's UK operations added a further £12mn of work to be completed over a 12-month period.

According to David McLean, a number of design trends are developing at present. These include:

- The development of larger shops – more than 200 sq metres, some even up to 250 sq metres.
- Making room for large refrigerated display units selling fresh vegetables and a wider range of frozen foods.
- Increasing focus on the 'food on the move' aspect of service stations, with more site designs including a seated area for eating.
- Shell has opened a number of Burger King restaurants on the forecourt, self service and with seating.
- There is increased demand for car washes that work in all weathers – from drought to below freezing – and that have recycling systems, heating, automatic doors, etc.
- Nearly all sites are now of timber frame construction, which is more economic than pre-constructed modular buildings. Such constructions are also easier to work with – alterations being simpler to make.
- There is a constant drive to improve speed and efficiency in any forecourt construction project, with closure times and disruption kept to a minimum. For example, tanks are delivered with pipelines and pump islands already attached.

McLean also reports that it is currently looking at 'radically different' ideas for the future. For example, canopies with a single skin that can be more flexible in terms of design, producing curvy or umbrella shapes that are more 'aesthetically pleasing'.

United Kingdom

New regulations requiring environmental impact assessments for certain underground gas pipelines in the UK are due to enter into force on 15 July.

Texaco reports that lead replacement gasoline will be on sale at its forecourt sites in the UK and Ireland this autumn. The fuel will include a pre-blended potassium-based additive.

UK Energy Minister John Battle has given Enron Europe the go ahead to build a 45-MW gas-fired combined heat and power station at the Teesside gas processing plant at Seal Sands, Cleveland.

National Power has announced that it is to cut dividends by half and is reported to be considering the closure of the Blythe A and B coal-fired power stations in northeast England, together with the oil-fired Fawley facility in Hampshire, in a bid to end growing over-capacity in the UK electricity generating sector.

Shell UK Oil Products and Irish Shell have signed a Memorandum of Understanding with FT Everard & Sons agreeing in principle for the provision of a contract for the exclusive procurement of coastal shipping services in the UK and Ireland.

Abbey National is to install 250 cash-point machines in Shell service stations in the UK.

The UK became the first country in the world in May to offer all its gas and electricity customers a choice of who will supply their energy.

Europe

Norwegian oil company Statoil and Fortum (ex Neste and Evo) of Finland are planning to merge their service station networks in Estonia, Latvia, Lithuania, Russia and Poland by 2000. The strategic alliance will also cover direct sales of fuel to industrial clients and oil terminals.

Kuwait Petroleum is understood to have acquired 105 Belgian service stations from German company Aral for an undisclosed sum.

Four international oil companies are reported to be bidding for a 58% interest in Bulgarian oil refiner

Low-cost methanol for power generation

Foster Wheeler Corporation has entered into an exclusive agreement with Starchem Technologies of Houston, Texas, to develop and commercialise a large-scale production technology that will produce methanol as a low-cost liquid fuel for the power generation market. According to the companies, the methanol produced can be used by power generation companies without any substantial capital modification to their present sites.

The technology is based on the reforming of natural gas using air extracted from a gas turbine and enriched in membranes. This is said to eliminate the need for an air separation unit which is normally required to supply oxygen to the process. An additional innovation is the use of a series of reactors arranged in a cascade in lieu of the conventional methanol synthesis loop.

The technology will be licensed under the Starchem name and is already available for commercial application.

The agreement between Starchem and Foster Wheeler will allow the latter to offer standardised onshore and offshore versions of Starchem production plants that will deliver methanol to power markets throughout the world as an economically priced fuel. Foster Wheeler says that it believes the methanol process 'will meet clean power generation needs for the future, especially in regions of the world where sources of low-cost energy are not available. There is an abundance of stranded natural gas worldwide, both offshore and onshore, and this technology will cost-effectively convert it into a useable power generation fuel.'

The methanol produced can be burned in combined cycle power stations using commercially proven combustion turbines with minor adaptations to accommodate the fuel change from natural gas or petroleum fuels. 'It is an inherently safe fuel and can be handled conventionally at the user's site without the substantial capital investment in special purpose tankers or unloading facilities required by other fuel systems', says Foster Wheeler. 'Methanol is a clean burning fuel containing no sulfur or nitrogenous materials and produces power with very low emissions compared with those of a natural gas-fired, combined-cycle unit'.

In addition to the application as a power station fuel, several emerging markets for low-cost methanol are expected to develop in the future, particularly with fuel cell-based vehicles. Foster Wheeler states that the Starchem technology positions it to 'take advantage of these markets as they develop'.

Two more sign up for Dolphin gas initiative

The Oman government has signed a Memorandum of Understanding with UAE Offsets Group (UOG) under which Oman will participate in Dolphin – a major strategic initiative designed to enhance economic development in the Gulf region and beyond. Dolphin is said to be the largest programme of its kind ever undertaken anywhere in the world. It will require investment of between $8bn and $10bn over the next six to seven years. It encompasses activities along the whole 'gas value chain', from the development of gas in Qatar's North Field to the creation of new industrial zones fuelled by power generated by gas transmitted from those fields.

Under the terms of the Memorandum of Understanding (MoU), Dolphin will construct one or more pipelines in Oman. It will also cooperate with UOG in the development of industrial and commercial initiatives in partnership with the local and international private sector.

The signing marks the start of a process aimed at formalising a long-term arrangement to supply Oman with between 300mn and 600mn cf/d of gas.

Pakistan has also signed a MoU with UOG covering the supply of between 1bn and 1.5bn cf/d of gas to Pakistan as part of the Dolphin programme.

EC challenges Finland fuel laws

Finland's liberal fuel laws, which allow the charging of a reduced rate of excise duty where heating oil is used to run motor vehicles, is to be the subject of a case at the European Court of Justice, brought by the European Commission, reports *Keith Nuthall*.

Brussels considers the Finnish law as breaking a European law which seeks to harmonise the way that excise duty is levied on fuel. If it persuades the court's judge that its view is correct, an order may be made forcing Helsinki to scrap the loophole.

The Commission claims that these excise rates break Directive 92/81/EEC 'on the harmonisation of the structures of excise duties on mineral oils'.

Neftochim. Bidders are: Lukoil Petrol-Bulgaria and Balkan Oil Consortium of Russia; Logomat Services of Cyprus; and Akmay Sanaji VR Ticaret of Turkey.

North America

***Texaco and Rentech are reported to** have signed a technical services agreement to research the integration of Rentech's Fischer-Tropsch technology with Texaco's gasification process with the aim of producing a clean-burning, sulfur- and aromatic-free diesel fuel.*

***BG plc has accepted a $630mn cash** and shares bid for its 24% holding in US energy trader Dynegy Inc which is to merge with Illinova Corporation of Decatur, Illinois.*

***Ultramar Diamond Shamrock is** reported to have unveiled plans to close its Alma refinery as part of the disposal of its Michigan marketing and transportation assets.*

***Shell is reported to have sold US gas** transportation and processing company Transok – part of the group's US downstream Tejas Energy operation – for $700mn to OGE Energy Corporation.*

Russia & Central Asia

***Tyumen Oil and Texaco are understood** to be forming a joint venture to produce lubricants at Tyumen's Ryazan refinery for marketing via the companies service station networks in Russia, Belarus and Ukraine.*

Asia-Pacific

***Nippon Mitsubishi Oil Corporation is** understood to be planning to close 4% of its Japanese service station network by the end of the year. Japan Energy Corporation is expected to close 300 sites this year while Idemitsu Kosan Company has announced plans to close 600 outlets.*

***A 100-km subsea pipeline is being** planned by British Gas to supply natural gas from Pipavav port in Gujaret, India, to two gas-based power plants of the National Thermal Power Corporation in inland Gandhar and Kawas at an estimated cost of $150mn.*

***Exxon's Chinese affiliate, Esso** (Zhejiang) Company Ltd, has opened its $25mn, 250,000 b/y lube oil blending plant located in the Ningbo Economic Development Zone (EDZ),*

Chevron and Sasol forge ahead with GTL deal

Sasol, already leading the field with announced gas-to-liquids (GTL) projects, has enlisted the enthusiastic support of Chevron in its drive to exploit its Fischer-Tropsch expertise, writes *Fred Thackeray*. The two companies signed on 9 June an MoU 'to create a global alliance to implement ventures based on Sasol's gas-to-liquids technology.' This important step – the commitment of a major international oil company – comes at a time when fainthearts have doubted GTL viability in the face of low oil prices.

Lest there were any question of Chevron's commitment to GTL, Richard Matzke, President of Chevron Overseas Petroleum, declared at the signing of the deal that 'gas-to-liquids technology is so promising that its development could create an entire paradigm shift throughout the petroleum industry'.

Sasol, for its part, was equally gung-ho. Pieter Cox, Managing Director and Chief Executive Officer of Sasol Ltd, said 'we are excited about the myriad of opportunities made possible via a global alliance with Chevron.' Although the agreement is designated only as a memorandum of understanding, Sasol tells *Petroleum Review* it is very detailed, including the terms of a comprehensive 50:50 split.

The two companies have already been working together since early last year on a joint GTL project in Nigeria expected to cost in the order of $1bn. The Nigerian plant forms part of the proposed third phase of Chevron's Escravos projects to utilise an additional 300mn to 500mn cf/d of natural gas. The gas will be both non-associated gas and the associated gas that is expected to be produced along with new oil production from offshore fields in the Niger Delta. The GTL plant will take about 300mn cf/d to produce 30,000 b/d of high grade, environmentally friendly, diesel and other petroleum products. Pieter Cox said the companies 'are confident the project will be sanctioned before the end of 1999, when design work should commence to allow the plant to come onstream in 2003'.

Sasol noted that 'Chevron has invited Sasol to participate in several upstream oil and gas exploration opportunities.' Where these might be, neither company is prepared at present to reveal. One possibility that has been mentioned is the development of the large gas discoveries that have been made in Papua New Guinea (see p32, this issue). Chevron, along with other companies, is seeking ways to utilise reserves there – described as 'stranded gas' – of some 6tn cf.

Chevron's contribution will not be confined to finding and developing GTL feedstocks in remote or otherwise uneconomic locations. It will also – as in Nigeria – provide its isocracking technology for the third phase of the GTL process, to produce diesel, naphtha and other products from the synthetic crude obtained in the Fischer-Tropsch phase.

Sasol has two other announced GTL projects currently under way, and it 'is involved in advanced stages of feasibility studies for several GTL ventures'. These 'several ventures', Sasol says, are additional to those so far publicly announced.

It seems likely that the Nigerian plant will be the first to get final authorisation. But not far behind, probably, will be a proposed 20,000 b/d GTL plant in Qatar. Equity in this plant will be Sasol 34%, Phillips Petroleum 15% and QGPC (Qatar General Petroleum Corp.) 51%. The feasibility study for this has been completed; it has received strong public endorsement by QGPC; financing is under investigation; and Sasol says it hopes a decision to go ahead will be made during this year.

Sasol's third publicly announced international project is with Statoil, for a floating plant to commercialise small natural gas deposits offshore Norway. It may be surmised that Statoil is currently not in a frame of mind for radical new ventures. However, Sasol assures *Petroleum Review* that the project is not 'on the back burner' but is being actively pursued. The technical feasibility has been confirmed and the partners are looking for the right application.

Yanggongshan, Ningbo. The plant produces lubricants for the central and southern Chinese markets.

Latin America

***The US Overseas Private Investment** Corporation (OPIC) has approved a $200mn loan to finance construction of the Bolivia–Brazil gas pipeline being developed by Enron and Shell.*

***PdVSA is understood to be planning** $1bn of chemical and petrochemical projects as part of its programme to process oil and gas derivatives from its refineries in Venezuela.*

***The President of Brazil, Fernando** Henrique Cardoso, is to sign Terms of Commitment Documents covering the supply of up to 5mn cm/d of gas from the Urucu oil and gas producing region of the Brazilian Amazon to the cities of Manaus and Porto Velho to be used in the generation of 900 MW of electricity.*

UK Deliveries into Consumption (tonnes)

Products	†Apr 1998	*Apr 1999	†Jan–Apr 1998	*Jan–Apr 1999	% Change
Naphtha/LDF	214,034	249,602	989,452	1,124,906	14
ATF – Kerosene	687,767	740,670	2,623,671	2,786,777	6
Petrol	1,668,246	1,754,244	7,029,915	6,945,192	–1
of which unleaded	1,293,369	1,494,475	5,360,522	5,806,757	8
of which Super unleaded	29,459	27,776	138,626	113,200	–18
Premium unleaded	1,263,910	1,466,699	5,221,896	5,693,557	9
Burning Oil	333,894	298,883	1,417,421	1,564,435	10
Automotive Diesel	1,115,829	1,159,619	4,955,193	4,959,590	0
Gas/Diesel Oil	595,950	573,918	2,530,569	2,403,003	–5
Fuel Oil	229,912	170,920	1,074,550	812,879	–24
Lubricating Oil	72,351	68,034	286,480	257,666	–10
Other Products	665,168	620,312	2,723,618	2,861,297	5
Total above	5,583,151	5,636,202	23,630,869	23,715,745	0
Refinery Consumption	552,485	512,738	2,123,154	2,150,303	1
Total all products	6,135,636	6,148,940	25,754,023	25,866,048	0

† Revised with adjustments *preliminary

Norway Inc in trouble?

Despite evidence that Norway's oil and gas industry is heading for a sharp downturn, the Norwegian government is still hoping for the best rather than taking the decisive measures the situation demands, reports *Fred Thackeray*.

A report just published by Norwegian consultants ECON shows that investment intentions of the oil companies in the five years 1999–2003 have been cut, since only last October, by one-third to NKr 159bn ($20.7bn).

More significant still, their expected development expenditures on new fields currently under consideration have been cut 76% to a mere NKr 22.5bn ($2.9bn) over the five years against NKr 93.6bn planned last October.

The ECON report, which was prepared for OLF (the Norwegian oil industry association), says that a point has been reached where there are fundamental changes in the Norwegian oil industry. To cope with the industry's declining prospectivity and high costs coupled with lower oil prices, it recommends that the government:

- reduce taxes forthwith, specifically the oil industry 'special tax', the CO_2 tax and royalties;
- consider reducing SDFI (direct state participation) in new fields;
- initiate a thorough and comprehensive review of the whole system of oil and gas industry taxation;
- initiate a re-evaluation of all the regulations governing the oil and gas industry sector.

Accompanying these steps the oil companies should commence a 'benchmarking process' to compare the cost effectiveness of operations offshore Norway with those in other petroleum provinces.

In support of its proposals on taxation, ECON points out that the marginal tax rate on profits of the oil companies is 'an incredible 78%'. This comprises the normal corporate tax at 28% and the special oil industry tax of 50%. The special tax was originally imposed as a 'windfall tax' in the late 1970s, with the promise that it would be reduced when oil prices decline. The report remarks that such high taxation has the perverse effect of reducing the incentives for companies to control costs as most of the cost savings are sucked away by the government. The State thus incurs the greater share of the risk from cost over-runs, as it is now doing from the dramatic 30% cost overrun on development of the Åsgard field – an event that resulted in the dismissal by the government of the whole of the Statoil board.

The CO_2 tax at its present level constitutes a further major burden, accounting for an average of some 15% of operating costs and as much as 25% in some fields.

Nil point for tax cuts

However, there currently seems to be no intention to reduce profits taxation. It seems that the government is sheltering under the illusion that because oil prices have hesitantly recovered a little, there is no need for major tax cuts. It must be said, however, that once project viability hurdles have been shifted to $10/b it would be a brave and foolish individual who would propose to initiate a project on any other assumption for a long time to come.

The government appeared earlier this year to be making a major policy U-turn. It switched from a previous hard-line of making no concessions, to promises that a wide range of measures would be brought forward to support the oil industry. However, when it came to presentation of the revised National Budget on 10 May, the only tax concession was to 'gradually abolish' royalties. This concession will indeed provide some help to the companies. However, there are only eight fields* which pay royalties. These are the ones which least need tax reductions since they already have marginal costs compatible with low oil prices. It is the new fields now under evaluation for the future which need lower taxation to compensate for their higher costs.

The government announced also that it would not in future impose state participation in new fields with small potential and low profitability. It will, however, as a 'main rule' take participation at 25% and, if there is high prof-

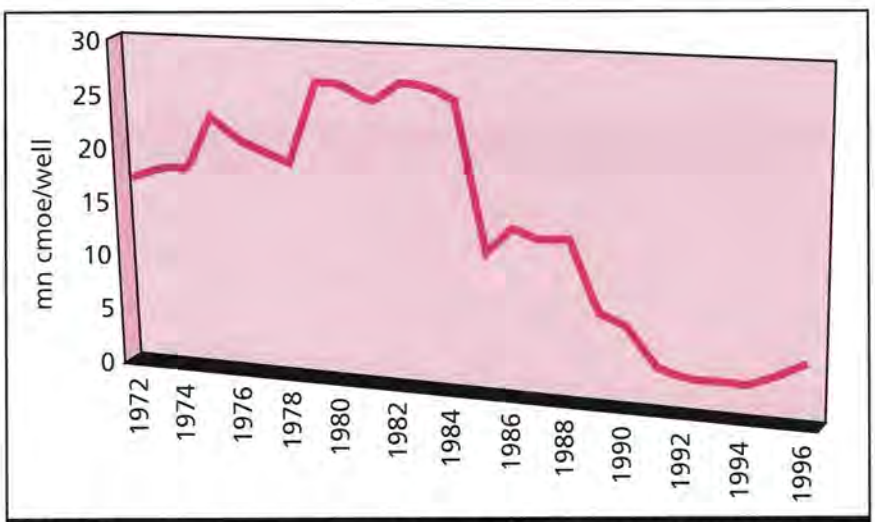

Table 1: Resource availability per exploration well on the Norwegian Continental Shelf, 1972–96

itability or large resource potential, it may take a higher percentage. This intention has been implemented in fact in the 16th round of licenses just issued, for which state participation is fixed at 25%, with the exception of a satellite field at 73%.

Additionally, various changes in the granting, extension and conditions of production licenses are proposed. These will mostly be supportive of the industry but they are not sufficient to make a major impact on the basic question of the commercial attractiveness of Norway to the international oil companies compared to other areas. Indeed, the government's announcements even include a retrograde step that 'for certain licences, specific conditions like a very low state participation and/or large remaining reserves may justify an increase of the State's share or the renegotiation of other conditions as a prerequisite' for the extension of a licence.

Cost-cutting solutions

Much was made in a separate announcement of a government proposal to allocate NKr 100mn ($13mn) in support of project-related development technology in the oil sector. The proposal reflects the government's view that the solution of the industry's problems lies in cutting costs by developing new technology. Its offer of help, however, is coupled with the qualification that 'the government assumes that industry will cover a major part of the programme'.

The ECON report focuses attention on tax issues as the area in which the government could take immediate action to counteract the adverse effects of low oil prices. More fundamentally, however, it recognises that the problems of the Norwegian industry lie in the fact that it is a mature industry with declining prospectivity and associated rising costs. It charts, for instance, the precipitous drop of exploration success from about 25mn cm of oil equivalent per well in 1978–84 to around 4mn to 5mn today. The key issue is not just the rising costs in Norway but the fact that for the development of new fields costs would be increasingly out of line with those in many other major petroleum provinces.

Another symptom of the changed status of Norway's oil and gas industry is the need to bail out Saga, the third of the country's triumvirate of Norwegian oil companies. Each of the other two companies, Norsk Hydro and Statoil, is keen to participate in the takeover of Saga. Following an initial all-paper offer for Saga shares by Norsk Hydro, on 27 May, Norsk Hydro and Statoil reached an agreement which was intended to facilitate Norsk Hydro's bid by eliminating potential competition from Statoil. This agreement rested on the projected sale to Statoil of some of Saga's assets, assuming that Norsk Hydro's bid was successful.

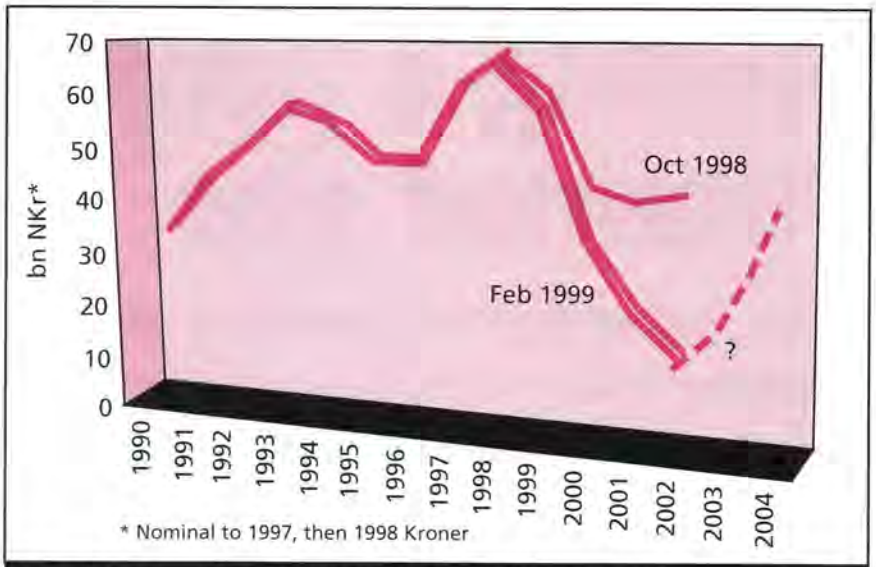

Figure 2: Investment forecasts RNB 99 and February 1999

However, the next day a competing bid was announced by Elf, and was informally greeted by Saga as a good solution. In the event the Elf bid was rejected in favour of an improved offer from Norsk Hydro. The outcome is of greater importance than the direct commercial value of the assets which will change hands. The jointly agreed approach of Norsk Hydro and Statoil having succeeded, retains in Norwegian hands, under even more concentrated state control, the assets and policies of the three Norwegian companies. This contrasts to a reduction of government participation – if the Elf bid had been successful – which would have enhanced inter-company competition.

Effects on other industries

The implications of the developing situation in Norway are crucial, not only for the direct earnings and tax revenues from oil and gas production but also for the health of the country's equipment and services supply industries. As the report puts it: 'the competence existing in Norway's oil-related industries constitutes the most important cornerstone of the Norwegian economy'. If this sector is hit by a sharp reduction of oil and gas industry activity it will have a 'domino' effect, first on the supply industry and in the longer term on the whole community.

Considerations such as these might be expected to have a political impact. Indeed, they still may. Both the ECON report and the government's announcements refer to the 'socio-economic' effects of current developments. This is a typically Norwegian approach to assessing what is for the oil companies essentially a commercial issue. And in Norway it matters. Preliminary rumblings of dissatisfaction with government policy were already signalled on 19 May by a warning one-hour protest strike of workers at Aker, Kvaerner and three other rig-building firms. Their order books for next year are now reported to be virtually empty.

An inherent difficulty for the Norwegian government in coping with the sea of changes in its principal industry is a fear of losing its grip after the close control it has always exercised in the past. It is suspicious that if it gives tax relief the resultant increase in the companies' profits will be invested elsewhere. It has even floated the idea in discussions that tax reductions might be negotiated on the basis of agreements to make new investments in Norway. Such a dirigiste approach, however, fails to take account of the mobility of oil industry capital. This is spurred today more than ever before by the importance of cutting costs in the face of low prices coupled with excess supply potential for both oil and gas.

The Budget presented on 10 May was due for debate in the Storting in early June. It remains to be seen whether the pressures of commercial reality will compel the government, being a minority coalition, to yield to some degree from its present uncompromising stance.

**The eight fields are: Gullfaks, Heimdal, Murchison, Øseberg, Statfjørd, Tor, Ula and Valhall. Their aggregate oil production in 1998 was about 1.2mn b/d or 41% of Norway's total production of 2.9mn b/d.*

Finding a home for stranded gas

Experts calculate that there is as much as 600tn cf of stranded natural gas reserves worldwide that could be profitably exploited. *Petroleum Review* examines alternatives to unlocking this vast resource.

Compared to oil's recent woes, the market for natural gas has remained relatively strong over the last two years. Global consumption is approximately 85tn cf (230bn cf/d), with North America consuming 24tn cf (64.3bn cf/d), slightly over one-quarter of all production. 'Natural gas is a cleaner fuel, with less noxious pollutants and greenhouse gases,' says Roland George, an associate with the international consultancy Purvin & Gertz, 'We predict worldwide growth in the order of 2% per year.'

But, much of the world's reserves are not being produced, simply because they are stranded.

Gas becomes stranded when: it is discovered in a remote location; where there is no market (or a very small one) for gas; the infrastructure to produce and transport the gas is poor or non-existent; or the gas is non-commercial under the existing fiscal conditions. 'The gas ends up being shut-in, suspended or abandoned,' says Charles Lucas-Clements, President of Petroconsultants–MAI, based in Houston. 'If it is associated with oil production, it is flared, vented or reinjected'.

Petroconsultants and Zeus Development Corporation recently conducted an exhaustive survey, entitled 'International Gas Strategy', to determine the whereabouts and amounts of unexploited gas. 'We looked at 1,500 fields in 63 countries,' says Lucas-Clements. 'We determined there is over 900tn cf of stranded gas.'

The largest proportion, 265tn cf, is located in the CIS, with another 221tn cf in the Middle East, 141tn cf in Africa, and the remainder in Latin America, the Far East and Alaska. Despite their geographic dispersion and reservoir differences, they all have one factor in common – they are far from any potential market.

What can be done about my gas?

Transportation costs have traditionally been the key to defining the distribution of various energy sources. 'Oil is a global market, because it costs only $5 to deliver a barrel anywhere in the world,' says George. 'Electricity (with its high load loss over distance) is a regional market, at best. Natural gas is a continental market, because the best way to deliver it is by pipeline.'

Being on the wrong continent is no longer an impediment to gas, however. Thanks to recent technological advances, the ugly duckling of the petroleum industry is starting to look attractive. 'Out of 900tn cf of stranded gas that we've identified worldwide, 500tn cf could be produced for less than 25 cents/mn cf,' says Lucas-Clements. 'The potential for profit is there.'

In addition to economic drivers, changes in environmental regulations are also having an impact. 'If we stopped flaring the 4tn cf of gas that is flared every year, we would reduce global CO_2 emissions by more than one per cent,' says Bob Nimocks, President of Zeus Development Corporation. 'Nigeria and Norway, for example, have imposed carbon taxes on flared gas that is spawning numerous development projects, from methanol and LNG to bio-protein for salmon-feed.'

Industry experts point to six major alternative methods to monetise stranded assets: conversion of gas to liquid natural gas, or LNG; conversion of gas-to-liquids (GTL); conversion of gas to chemical feedstocks; gas-to-electricity; gas-to-aluminium; and social-benefit projects.

LNG

LNG is the best-developed alternative for stranded gas. Approximately 3.8tn cf of gas every year is chilled to –160°C to provide a highly concentrated form of energy that is used primarily for electric power, industrial boilers and peak-load residential use.

For consuming nations that are far from natural gas sources, such as Japan, LNG serves as a cornerstone for electrical generation. The development of low-cost, combined cycle gas turbines (CCGT) raises overall thermal efficiencies to the 60% range, compared to 40% for the best oil- or coal-fired units.

LNG can command a premium as a peak-load fuel. 'We estimate the supply cost of the Trinidad/Tobago (Atlantic) production, which will start US deliveries in the fall, at $2.77/mn btu landed in Boston,' says George. 'A distributor has presold it.'

'Qatar could deliver LNG for $3.80/mn btu to the Eastern US, but they have a better market in Asia,' adds George. 'We estimate the supply costs of a new, grass-roots expansion in Nigeria in the $3.21/mn btu range, landed on the Eastern Seaboard.'

The major drawback to LNG technology is the heavy up-front costs. Economics dictate a minimum liquefaction plant size of between 2.5mn and 3.5mn t/y and proven reserves of 3tn to 5tn cf. When associated facilities, such as dedicated tankers and re-gasification plants are added in, the total investment exceeds $5bn. 'LNG will never go head-to-head with pipeline gas,' says George. 'With LNG, you have to liquefy, transport, store and re-gasify it. Piped gas will always beat LNG.' On the other hand, Nimocks, who estimates the current global market for LNG at between $12bn and $14bn, thinks the long-term prospects for the high-energy fluid are excellent. 'Since 1982, LNG has grown at 7.5% per year. About three-quarters of LNG is traded in the Asia-Pacific region, where it often competes with nuclear power. Due to recent accidents, nuclear power is losing public support in Asia. LNG will rebound quickly once the economic crisis subsides.'

Chemical solution

The second major current use for stranded gas is conversion into chemicals, primarily ammonia and methanol.

Ammonia production consumes approximately 2.1tn cf of stranded gas annually. A typical plant costs between $280mn and $400mn, and generates 2,200 t/d. The feedstock, which is used in fertiliser and industrial chemicals, has an annual market value of $13bn to 17bn. 'Because most ammonia is used in fertiliser manufacturing, the demand grows at the same rate as food consumption, about 2% per year,' says Nimocks.

The relatively low cost for an ammonia plant has spurred the shift of manufacturing away from OECD countries, where the cost of gas feedstock is relatively high, to countries where the price of producing gas is low – Venezuela, Trinidad and Indonesia. 'Canada is the exception,' says Nimocks. 'It has massive amounts of low-cost gas, and it can compete.'

Methanol is a feedstock for hundreds of chemicals, including formaldehyde and acetic acid. A 2,500-t/d methanol plant costs $300mn to 400mn, and needs as little as 500bn cf of gas reserves to be viable. Methanol production consumes approximately 800bn cf annually worldwide, and has a market value of $3.5bn to $5.2bn.

The market for methanol, however, is very volatile, and under stress. One of the major uses for methanol feedstock is conversion to MTBE, an octane booster added to petrol. 'MTBE is in disfavour, because it gets into the water system,' says Lucas-Clements. 'It is in the process of being banned in California.'

Like ammonia, methanol production is also gradually shifting away from OECD countries. 'OECD producers will have a hard time competing with new low-cost plants in Venezuela, Chile and Trinidad,' says Nimocks.

Methanol, however, is a cleaner greenhouse gas than petrol or diesel, and may have great potential in new transportation technologies. 'Methanol use can grow dramatically if it becomes a fuel for fuel cells or combined cycle turbines,' says Nimocks.

Gas-to-liquids

Gas-to-liquids (GTL) has emerged over the last decade as an exciting technology with great potential. Most GTL technology is based on the Fischer-Tropsch process developed in the 1920s to convert coal into fuel. With natural gas, the feedstock is partially oxidised in air to produce a synthesis gas, primarily carbon monoxide and carbon dioxide. The synthetic gas is then injected into a Fischer-Tropsch reactor where it is polymerised into paraffinic hydrocarbons. A hydrocracking reactor then separates the heavy fractions and cracks them back to transportation fuels, primarily diesel, kerosene and naphtha.

Most contemporary research focuses on the catalyst used in the Fischer-Tropsch reactor, and several competing technologies are currently in use or under development. Shell's middle distillate synthesis plant, located in Bintulu, Malaysia, produced 12,500 b/d using a metallocene catalyst. The unit is currently being rebuilt following an explosion and is due back onstream in 2000. Sasol's slurry phase reactor in South Africa produces 22,000 b/d using an iron-based catalyst. BP/Kvaerner's process, under development, uses a cobalt catalyst. Syntroleum Corporation, of Tulsa, Oklahoma, plans to build a plant with Enron that uses a proprietary catalyst to produce 8,000 b/d of lubricants, solvents and chemical feedstocks.

With current technology, a 50,000-b/d GTL plant costs around $1bn, or $20,000 per b/d of capacity.

GTL's major drawback is that, except for niche products such as dry-cleaning fluids and waxes, it doesn't make economic sense at current, depressed oil prices. 'We've looked at a few GTL proposals, and if the oil price goes up to the $17 to $18 range, they are interesting, and if it goes up to the $25 range, it is very interesting,' says Lucas-Clements.

Environmental regulations may have a significant impact on the market for GTL, however. 'The EU and US are enacting sulphur-content restrictions,' says George. 'GTL is very pure, which translates into low air pollutants,' says Nimocks. 'If GTL got a $14/b excise tax abatement that compressed natural gas gets, it would be economical today.'

GTL may come into its own after 2010, regardless. 'I see great potential for GTL middle distillates, especially if we're seeing a peak of maximum production capacity of oil reserves in the next decade,' says Nimocks. 'It's the next most economical alternative to crude oil, and a number of projects are being proposed for stranded gas reserves.'

Scratching a niche

A viable alternative to marketing gas as an energy source is to look at it as an intermediate step in a value-added process. 'A lot of gas is non-commercial using today's fiscal regimes,' says Lucas-Clements. 'But you should look at the upstream and downstream as a unified whole. What is strategically important to a country: upstream, where it is being flared, or downstream, where it can benefit the economy?'

International agencies, for instance, are looking at in-country alternatives to flaring. 'Entities like the World Bank say that $1 invested in gas upstream has the potential for $3 in non-direct benefits if the full industrialisation potential is captured in-country,' says Lucas-Clements. 'If a country lays off the royalties upstream, they collect the benefits in value-added downstream.'

One option being exploited is the conversion of bauxite into aluminium. 'New super-smelters with up to 400,000 t/y capacities are being built in Venezuela, Trinidad and other gas-rich locations,' says Nimocks. Although a smelter may cost as much as $1.5bn, the process is still profitable because the power costs are low. 'Combined-cycle gas turbines are very efficient. A smelter can save up to $175 per aluminium ton in electricity costs by generating from stranded gas.'

Another recourse is gas-by-wire. 'The conversion of gas to electricity is where a group of companies come together and make the economic value chain work; the producer, the transporter and the consumer,' says George. 'Let's say you have a large gas field near a city that is building a new industrial complex. They're going to need electricity, so you have a gas-by-wire option.'

A $200mn CCGT turbine, which efficiently converts gas to electricity, can create enough power to service 500,000 homes. 'There are several places in South America where it is being done right now,' says George.

The future

In the short term, the recent slowdown in the Asian economies has stalled several proposed LNG plants and/or expansions in Yemen, Natuna (Indonesia), Algeria and Australia. 'The LNG market is currently saturated,' says Lucas-Clements. 'The Japanese, who are the major subscribers to LNG production, effectively have enough LNG contracted to last to 2008.'

In the ensuing decade, however, economic growth and the impact of environmental regulations will increase demand for natural gas. 'We estimate a 2% annual compound growth in Canada and a 1.7% annual compound growth in the US,' says George. 'That's a base-case. If the Kyoto protocol is taken into account, we can envision a serious increase in natural gas demand. If all coal-fired electricity generation in the US was replaced by natural gas, it would double natural gas consumption.'

And, as the demand for gas rises, so does the potential to increase the 7tn cf of stranded gas reserves currently being produced. 'Not only do I see the 4tn cf of flared gas disappearing by 2010, but another 8tn cf of stranded or reinjected gas will be converted, for a total of 19tn cf annually,' says Nimocks. ●

LNG exports begin as gas reserves soar

Trinidad and Tobago recently joined the ranks of LNG exporters when it began largescale exploitation of its massive offshore gas reserves. *David Renwick*, based in Trinidad, reports on the latest developments in the story of the country's offshore gas reserves 'accidentally' discovered in the 1960s and 1970s during the search for oil.

Amoco (prior to the BP Amoco merger), Deminex/Agip/Tenneco, Occidental, Texaco and even the state-owned Trintoc (now Petrotrin) all found gas in fields off the east, southeast and north coasts of Trinidad while hoping to make oil strikes instead. Only Amoco was fortunate enough to find oil too: the others never bothered to exploit their discoveries on the grounds that there was no market for gas in Trinidad and Tobago at that time.

How times have changed. The demand for gas in the country has gone from 150mn cf/d in 1975 to an estimated 1,165mn cf/d in 1999 – a growth rate of over 8% a year – and is expected to reach 1,736mn cf/d by 2004. A level far above the gas-utilisation rate of any Latin American or Caribbean country, including Venezuela, Mexico and Argentina.

And that is a low case scenario. If two more liquefied natural gas (LNG) plants are added to the Atlantic LNG's facility at Point Fortin, as expected, then demand in 2004 is more likely to be 2,636mn cf/d.

Since 1975 the government has deliberately set out to encourage the establishment of industries that would utilise the natural gas and give the companies the incentive to develop their gas fields. The wholly state-owned National Gas Company (NGC) was set up in 1975 to buy gas from the offshore producers and transport it across the country to the Point Lisas estate on the west coast of Trinidad, which had been earmarked as the main site for gas-based plants.

Having come into money following the oil price booms of the 1970s, the government itself funded the early gas-using industries, including steel. As NGC's President, Frank Look Kin, points out: 'All major gas-based plants constructed during the period 1975–1988 were funded by the government, either entirely or in joint venture arrangements with foreign investors.'

These included the Trinidad and Tobago Methanol Company plant (100% state owned), the Iron and Steel Company (ISCOTT) (100% state owned), Fertilisers of Trinidad and Tobago (FERTRIN) (51% government, 49% Amoco) and the two Trinidad Nitrogen Company plants (51% government, 49% W R Grace).

Amoco was the first international company to sign a gas supply agreement with NGC in 1976, utilising high-pressure gas wells on its Teak D offshore platform. Its initial commitment was to provide up to 200mn cf/d, a figure that seems remarkably modest by today's standards.

Amoco had the market pretty much to itself for the next 14 years, until Trintomar, a company collectively owned by NGC and two government oil companies then in existence (Trintoc and Trintopec), was brought into the picture to redress Amoco's perceived dominance. This was considered to give the company too much of an edge in negotiations with NGC.

Trintomar installed a platform in the Pelican field in the South East Coast Consortium (SECC) block, with which Texaco had previously been associated, but it soon became apparent that the field did not have sufficient reserves and NGC was obliged in 1994 to turn to Enron for help. Enron took over the rest of the SECC block and began supplying gas from the Kiskadee field.

By then, the government had begun selling-off its gas-based plants, in keeping with the worldwide trend towards privatisation, while foreign investors, for their part, were increasingly selecting Trinidad and Tobago as the preferred location for their own new petrochemical facilities.

Rising demand for gas encouraged British Gas (BG) to take the decision to start exploiting its own local gas reserves in block 6 off the east coast, which it had acquired as part of a deal with Tenneco in 1988. Tenneco held the block 50:50 with Texaco. BG had also inherited blocks in the North Coast marine area, where Tenneco had been in partnership with Deminex and Agip.

The government was happy to have another international heavyweight on the scene and NGC duly signed a contract with BG/Texaco to provide gas from the Dolphin field in block 6 from 1996 onwards.

The petrochemical plants and the electricity generating company have traditionally been the main customers for local gas, so much so that Trinidad and Tobago has now become the world's leading producer of ammonia (eight plants, with a capacity of 3.5mn t/y). By the end of this year it will become the world's largest exporter of methanol (five plants, with a capacity of 3mnt/y).

Stephen Brandon, Executive Director, Corporate Development for BG, was recently moved to refer to Trinidad and Tobago's 'incredible success in developing downstream gas-based industry, relative to almost any other country in the world'.

However, several petrochemical plants are needed to generate demand for really substantial volumes of gas, since an ammonia or methanol facility uses only about 50mn to 60mn cf/d. Even PSC Nitrogen, the Canadian company that operates four of the ammonia plants at Point Lisas, utilises under 200mn cf/d.

For a really big user one has to look at a liquefied natural gas (LNG) plant and it was the advent of LNG in Trinidad that triggered the first exploration programme aimed specifically at identifying new natural gas reserves.

Gordon Shearer, President of Cabot

Figure 1: Trinidad's offshore gas fields and onshore gas facilities

LNG in Boston, first approached NGC in 1992 to discuss the question of buying gas from Trinidad to feed his customers in New England. In 1994 JGC/Kellogg confirmed that a 400mn cf/d LNG plant was a feasible proposition. This interest sent Amoco, for one, on a hurried search for new gas fields in its offshore east-coast acreage. The company drilled 21 exploratory wells in the five-year period 1994–98 and identified an additional 13tn cf of gas in 15 of them.

BG soon followed, drilling two exploratory wells back-to-back in 1997 in the North Coast Marine Area (NCMA) One block, of which it is the operator. The Energy Ministry, at the same time, put out new blocks, believed to be gas prone, for tender in an effort to keep the exploration momentum going.

Year	Oil (b/d)	Gas (bn cm)
1987	155,000	4.5
1988	150,000	5.1
1989	150,000	5.1
1990	150,000	5.3
1991	150,000	5.7
1992	145,000	6.0
1993	135,000	5.9
1994	140,000	6.2
1995	140,000	6.2
1996	140,000	7.1
1997	135,000	7.1

Source: BP Statistical Review, 1998

Oil and gas production in Trinidad and Tobago, 1987–97

During 1996, 1997 and 1998, 13 blocks were allocated to companies or consortia under production sharing contracts (PSCs). This included the NCMA One block, which BG and partners succeeded in persuading the Ministry to convert to a PSC in preference to the old exploration and production (E&P) licence under which it had been awarded to the original partners.

Early results have been heartening. Besides BG's confirmation of 2tn cf in NCMA One, Enron found an estimated 1tn cf with its Omega Two exploration well in the 38,881 acre Modified U(a) block off the east coast last year. BG/Texaco, not to be outdone, drilled four wells in block E, which they acquired as part of the block 6 PSC and in the adjoining block 5(a) awarded to them under a separate PSC. The wells – Dolphin Deep One, Starfish One, Starfish One sidetrack and Starfish Two – encountered at least 1tn cf of natural gas.

BHP, on behalf of its partners Elf and Talisman, has become the latest company to find new reserves. In mid-May, Energy Minister Finbar Gangar announced that the Angostura One wildcat well in the 51,766-acre block 2(c), 40 km off the northeast coast, had penetrated a hydrocarbon bearing zone which flowed on test at 30mn cf/d.

No potential reserve figure had been given up to the time of writing but the Ministry considers this discovery particularly significant as it was made in a relatively unexplored region 40 km to the north of the closest existing oil and gas field – BP Amoco's Samaan. This suggests that gas fields could extend further north in Trinidad's Atlantic waters than had previously been assumed.

The bottom line of all these discoveries is that Trinidad and Tobago's proven natural gas reserves have jumped from 8tn cf in 1995 to 21.3tn cf today, almost a tripling of reserves in the space of four-and-a-half years.

BP Amoco can lay claim to about 15tn cf of the total, which no doubt inspired its Chief Executive Officer Sir John Browne's description of his Trinidad purchase as 'one of the jewels in the Amoco crown'.

People like David Wight, Chairman of BP Amoco's local subsidiary, Amoco Energy, believe there is still much more gas to be discovered in Trinidad and Tobago waters, both in his own company's acreage and in new blocks not yet explored. He has put the country's 'exploration potential' at another 35tn to 40tn cf which, if confirmed, could boost proven reserves to close to 56tn to 61tn cf early in the next millennium.

In the short term, LNG is clearly going to be the major consumer of gas and on the assumption that negotiations with the Ministry for the addition of two trains at Atlantic go well, about another 900mn cf/d will be needed for liquefaction by late 2002.

BP Amoco and BG, on behalf of its partners Agip, Veba and Petrotrin (north coast) and Texaco (east coast) have already cornered that opportunity. Atlantic has agreed that gas for train two will be split 50:50 between BP Amoco and BG/Agip/Veba/Petrotrin, and gas for train three 75:25 between BP Amoco and BG/Texaco. BP Amoco had earlier obtained the contract to provide 100% of train one gas.

This still leaves significant amounts of existing proven gas reserves unsold, not to mention all the gas that David Wight is confident will be forthcoming in the future.

The companies themselves will have to take some responsibility for seeking out buyers of the reserves they discover. All PSC holders have agreed they will make every effort to do so. The NGC, for its part, has also been mandated to actively promote the development of natural gas based industries in the country and a number of new plants are under discussion that will require fairly large amounts of gas. These include Norsk Hydro's 237,000-t/y aluminium smelter, Methanex of Canada's three-plant global methanol hub and a steel complex by Brazil's Companhia Vale de Rio Doce (CVRD), the world's largest iron ore producer.

The 86th IP Annual General Meeting took place on 8 June 1999 with the President Chris Moorhouse (above) in the chair.

Institute of Petroleum's Annual General Meeting

Presenting the President's Report, Chris Moorhouse reflected that 1998 had been 'without doubt a testing time' for the oil and gas industry. He reminded those assembled that crude oil prices falling down to $10/b had had critical implications for North Sea exploration and development while the downstream sector had been forced to struggle against negative margins, poor returns and overcapacity. However, he commented that, despite of the difficulties the industry had faced during the year, it pleased him to report that 1998 was 'a year of significant and far-reaching achievements that underline the IP's independence, professionalism and commitment to its growing membership'.

Stating that he did not wish to document all of the IP successes over the year – which are fully documented in the IP Annual Report – Chris Moorhouse felt it important to draw attention to 'a few highlights'.

'We published 19 new codes of safe operating practice and guidelines – a significant achievement when you realise that the core volunteer group, who are so vital in helping us to undertake our technical work, continues to diminish. Since its foundation 85 years ago, the Institute has helped to ensure UK industry self regulation through the development of its test methods, guidelines, codes, etc. The IP has also played a central role in ensuring the industry has been adequately represented on international bodies. However, especially given the industry context, it is imperative that the technical work we undertake remains tightly aligned with industry needs and expectations. To achieve this, towards the latter part of the year, we established the Scientific and Technical Advisory Committee which now provides overall supervision of all our technical work.'

The President also reported that 1998 was the ninth consecutive year of growth for the IP's membership. 'An amazing statistic when you compare this with the decline in the number of people working in the industry since the beginning of the decade,' he said.

He also noted the launch of the IP Lifetime Learning initiative in 1998, which aims to provide opportunities for members to develop and maintain a portfolio of skills, knowledge and experience to retain their long-term employability.

'Another growing IP strength, highlighted in the results, is our capacity to self generate revenue,' he commented. In 1998, 55% of income was raised in

IP appoints new Director General

The President and Council of the Institute of Petroleum have appointed Jeffrey G Pym (right) as its new Director General and successor to Ian Ward who will retire, after eight years in the post, at the end of August.

Jeff Pym comes to the IP after an international career at BP. He has broad experience of many aspects of both the oil and gas industries, upstream and downstream. After graduating as an industrial chemist, he began at BP's worldwide Research Centre as a chemist working on polymer manufacture. After a period of research in geochemistry for the upstream business, he moved on to fieldwork for BP Exploration looking at advanced crude oil recovery technologies and oil reservoir modelling, based in California and Calgary in Canada.

On return to England, Jeff requalified in economics at Cambridge University and moved to BP's HQ in London to assume responsibilities in external and government affairs for two years. In 1980 he joined BP Gas International and was posted to Melbourne, Australia, where he was responsible for the successful negotiation of a major contract to supply North-West Shelf liquefied natural gas (LNG) to the gas and power utilities in Japan.

Returning to London, he then managed BP's global marketing of liquefied petroleum gas (LPG) until the establishment of BP Oil Europe when, in 1989, he became accountable for part of BP's European Commercial Fuels and Lubricants business, first from Antwerp and then from Paris. With the establishment of BPOE's offices in Brussels, in 1990 he began a new post as European Business Director for LPG. He remained in Brussels until 1996 when he moved to Portugal to assume his last position

at BP as President and Managing Director of BP Portugal.

Announcing the appointment, Institute of Petroleum President Chris Moorhouse said: 'Jeff Pym brings a wealth of experience to the IP, spanning over 30 years. His knowledge and expertise will be most beneficial in taking the Institute into the next millennium and addressing the interesting challenges which are ahead of us.'

this manner enabling the Institute to fund the wide range of activities undertaken during the year – 'a very encouraging achievement in these cost-conscious times'.

'I mentioned earlier the diminishing number of volunteer supporters so I should like to take this opportunity to stress the continuing need for the industry to provide the support that is vital to the IP's ongoing technical work and which in turn sustains the industry's position regarding self regulation. It is in the interests of everyone in the industry to facilitate this work, now and in the future.'

Council members, the Chairmen and members of IP committees, and the IP staff were warmly thanked for their support and excellent achievements in 1998. Particular thanks were given to Ian Ward, whose position as IP Director General is to be filled by Jeffrey Pym at the end of August following Ian's retirement (see p18). 'Ian has led the IP, developed its capability to meet the needs of its members and the industry, and supported the Presidents most ably throughout the eight years that he has been our Director General and we will miss him'.

Orders of the day

First order of the day was the re-election of Chris Moorhouse as IP President for the 1999–2000 session. He went on to explain that the IP was not at present in a position to nominate a President-Elect and it was agreed that the responsibility for filling this position would be given over to the IP Council to decide in due course. Terry Moore and Peter Newman were re-elected Honorary Secretary and Honorary Treasurer, respectively, for the 1999–2000 period.

There were 17 nominations for nine vacancies for Ordinary Members of Council, an unprecedented situation in the IP's history, which were filled by David Blakemore, Roger Cairns, 'Ronnie' Cloke, Chris Hill, Peter Johnson, Sue Karlsen, Anthony Levy, John Mills and John Mumford. Five vacancies needed to be filled for Additional Members of Council. John Banfield, who has served on Council for three years, was re-elected for a further three-year term. It was agreed that the remaining four positions would be filled by the IP Council in due course.

It was also announced that George Bailey would be standing down as Branches Member of Council, having served his three-year term, and that Noel Tierney from the Irish Branch was to fill the vacancy.

The Report of Council was then presented and subsequently adopted. The accounts were outlined to the meeting by Honorary Treasurer Peter Newman, and adopted. Auditors Ernst & Young were re-appointed as auditors for the coming year.

Chris Moorhouse went on to present an Honorary Fellowship to Peter Ellis Jones and the Eastlake Medal to Ian Fotheringham. Awards of Council were presented to Philip Algar, Hayden Barrett, Roddy Hutchinson and Mike Wood.

The President then thanked the retiring Members of Council: Peter Ellis Jones, after more than 20 years of service to the IP in various roles; Colin Harvey after serving three years on Council and Management Committee as a Vice President; Philip Algar, after serving six years on Council and a long-standing member of the Publication and Information Committee; Roger Colomb, after six years on Council; and George Bailey, after three years as Branches Member of Council.

Chris Moorhouse concluded his duties by introducing the new IP Director General, Jeffrey Pym, who commented that Ian Ward would 'be a hard act to follow' and that he was 'looking forward' to taking up the position which he believed would present a 'number of challenges' (see p18).

Honorary Fellowship – Peter Ellis Jones (FInstPet)

During the past 20 years there have been eight recipients of an Honorary Fellowship – awarded to 'persons of eminence who may or may not be actively engaged in the petroleum industry' – including HRH The Prince of Wales, Dr Garrett FitzGerald and two Past Presidents: Sir Austin Pearce and Sir Geoffrey Chandler.

It was the unanimous wish of Council that Peter Ellis Jones join the ranks of previous winners, in recognition of everything he has done for the IP over the past 20 years. During this time he has almost continuously served on Council and Management Committee in various roles – as an elected member, Honorary Editor and Vice President. In addition he has held a number of other offices, namely Chairman of Energy and Economics Discussion Group, and Chairman of Publications and Information Committee, and has been a long-standing member of the Finance Committee.

Throughout this period, Peter's commitment to the IP and the help and support he has given to the Director General and his team have been quite outstanding and way beyond the call of duty expected by any of our volunteers. His knowledge of the industry has few, if any, rivals and his expertise has been vital in enabling the Institute to disseminate information to its members through conferences, publications and our Library and Information Services.

After serving the maximum allotted time as an additional Member of Council and Vice President of the Institute, Peter is now obliged to stand down at this year's AGM. His departure from a position of great influence will leave a hole which will be impossible to plug and we hope that from time to time we will still be able to call on Peter to help us out.

On receiving the award, Peter gave his sincere thanks to Council Members, Director Generals and Presidents past and present. He went on to say that the numerous achievements of the IP over the years – including the publication of Modern Petroleum Technology *(the latest edition due to published to coincide with the millennium), recent developments in the Conference Department's offerings, the IP Library refurbishment programme and development of the IP website – placed the IP in a strong position to face the 'interesting and exciting times ahead'. He also commented that although the industry has 'changed more in the past 15 months' than at any other point in its history, the IP should regard the challenges that the industry is facing as 'opportunities and not a threat'.*

Eastlake Medal – Ian Fotheringham (FInstPet)

Council awards the Eastlake Medal to those members who have given long and meritorious service to the Institute, usually for at least ten years. The last recipients of this award were Tom Farmer in 1994 and Peter Ellis Jones the following year.

Ian Fotheringham joined the Institute in April 1988 shortly before he became the Honorary Secretary at the AGM in June. He held this position for the maximum period of six years and was required to stand down in 1994. Throughout this period, and through to the present day, Ian has also been, and continues to be, an active member of the Finance Committee. During the period 1992–93 he also regularly acted as temporary Honorary Treasurer during the prolonged absence of the incumbent.

On relinquishing the role of Honorary Secretary, Ian became an elected Member of Council and also Chairman of the Membership Committee. It is no coincidence that the most successful years in terms of recruitment and retention of members ever achieved were during the four years when Ian presided over this Committee.

Throughout the past 11 years Ian has given enormous support to the Director General and staff of the Institute, Management Committee and Council.

On receiving the Eastlake Medal, Ian said he felt 'humble and modest' following in the steps of previous recipients. He commented that while others might see the award as recognition of what he had contributed to the industry over the years, it would always serve to remind him of what the industry did for him – providing 'companionship, challenges and laughs' along the way.

Philip Algar (FInstPet)

Philip Algar worked as an employee of the IP for some years in the late 1970s, having responsibility for Library and Information Services and also for the development and editing of *Petroleum Review*. His contribution to both those activities was considerable and forms part of the firm foundation on which their current success was ultimately based. Philip was perhaps a little ahead of his time and his outward-looking approach was not as highly regarded and recognised by the rather introvert IP of that time as one would hope such a contribution would be today!

On leaving the IP's service Philip returned to a career in public affairs in the industry before embarking on a successful career as a freelance journalist, writer and commentator on the oil industry. In his journalistic career Philip has been an impartial and objective, but always an informed and sympathetic, reporter of our industry.

Throughout this whole period Philip remained actively involved in the IP. He has, until his move to Devon two years ago, been an active and informed participant at our Discussion Meetings and taken a lively interest in other IP affairs. He has been a great support to the present Head of Library and Information Services and to her predecessor, and also to successive Editors of *Petroleum Review*, to whom he has been able to contribute the benefit of his journalistic experience as well as occasional articles and features.

Philip has been a most valued member of the Publications and Information Services Committee for about eight years and is now at the end of his second three-year term on Council. He has also, for several years, been a highly regarded member of the team running the two IP Summer Courses where his contributions invariably attract most favourable marking from participants.

On receiving his Award of Council, Philip stressed that the IP had a key role to play in training those employed by the industry and helping them find new careers, particularly in the current troubled times. He also commented that his life had been 'enriched' by his active involvement in the IP, and asked those attending to encourage younger members of the industry to become involved in IP activities.

Roddy Hutchison (MInstPet)

Roddy Hutchison graduated from Heriot Watt University in 1974 with a BSc Honours in Chemistry. After completing a PhD in 1977, he joined BP Chemicals in Grangemouth as a chemist, moving in 1979 to the polyethylene plant. Roddy's career continued at Grangemouth in the area of Polyethylene Research & Development and he transferred to Sunbury in January 1998 to take up the post of Manager, Rigidex Customer Care.

During his last eight years at Grangemouth, Roddy was the Secretary of the Edinburgh and SE Scotland Branch of the IP. His infectious enthusiasm ensured not only a smooth-running operation but also a varied and

Hayden Barrett (FInstPet)

Throughout a career that has spanned 33 years in the service sectors of the oil industry, Hayden Barrett has devoted considerable time over the past 19 years to furthering the interests of the Institute of Petroleum.

While his career has embraced a number of oil-related activities, including the helicopter support sector, training sphere and senior management positions, his association with the Institute has involved two separate branches, initially in Shetland and then latterly with the Aberdeen Branch.

In Shetland, Hayden became involved with the Institute in 1980 and quickly became a member of the Branch Committee. As a regular Committee Member, he put a lot of time into the organisation of the Shetland Branch meetings, being a member of the Technical Meeting Sub-Committee for a number of years. This, in itself, was quite a difficult task in an area such as Shetland, with both a small pool of speakers to call upon, as well as a fairly restricted target audience.

In furthering the educational aims of the Institute in Shetland, Hayden was involved in various Branch projects concerning Education and the Arts. These included an extremely successful schools Art Competition for schools throughout Shetland – a taxing logistical exercise for any small Branch but in Shetland a great deal more difficult, to say the very least.

Transferring to Aberdeen in January 1984, Hayden joined the Aberdeen Branch and became an active member of the Branch Committee shortly afterwards.

Having a keen interest in all matters concerned with training, Hayden actively promoted Branch involvement with educational projects including schools competitions, development projects and a wider understanding of work of both the industry and the Institute, with educational organisations at all levels.

These efforts were rewarded in 1994 when Hayden was unanimously elected Chairman of the Aberdeen Branch, a post he held for some three years until he was forced to retire through ill health. Throughout his period of chairmanship, Hayden continued enthusiastically to promote and participate in many different educational projects, as well as representing the Branch on many civic and social occasions within the City of Aberdeen.

Hayden said he was 'honoured and proud' to receive an Award of Council. He commented that he had originally joined the IP in order to 'learn more about the industry I served'. He reflected that he had 'certainly achieved what I set out to do,' and said that the experience had 'helped me serve the industry better'. He stressed in particular, the importance of the recent Lifetime Learning initiative to the industry, and the continued publication of safety codes of practice and the literature put together for the education sector.

interesting series of speakers in what is arguably one of the most widely encompassing groups within the Institute, and his contribution was greatly appreciated by the Chairman, Committee and Branch members.

With representatives from upstream, downstream, contractors and suppliers, the membership list often reads like a 'Who's Who' of the industry, reflecting a combination of the major oil-related activities in the area and Roddy's unstinting efforts to ensure a truly-representative cross-section of a region that handles some 40% of the UK's North Sea oil.

Roddy's commitment to the IP was unquestioned, readily giving of his time and experience to promote its activities. As an example, he played a major role in organising the IP Branches meeting in 1993. His departure from the role was only as a result of transfer to BP's Research Centre at Sunbury-on-Thames where no doubt his skills may feature at some stage with the IP in that area.

On receiving his award, Roddy said that, when he compared himself with the other recipients, he felt 'guilty' that his tenure had been somewhat 'on the short side'. However, he commented that 'in my defence, I have endeavoured to be active!' He stated that work with the IP provided a 'step up out of what you would normally do' and encouraged others in the industry to embark on the same 'rewarding' path.

Mike Wood (FInstPet)

Mike Wood joined the Institute as a Technical Manager in October 1989 after a career at BP spanning 26 years primarily in the fields of refining technology and downstream planning and investment.

Mike's unstinting efforts, hard work and total support of 'measurement' during his years in the Technical Secretariat were greatly appreciated, not only by the main Petroleum Measurement Committee but also by members of the various sub-committees.

Mike's guidance and technical editing is evident in many sections of the *Petroleum Measurement Manual* and Measurement Papers. Although at times his insistence on correctness was a little baffling to committee chairmen, it was the right approach and the resulting codes reflected this.

Mike's overall knowledge of measurement is vast and he was of great assistance not only to members but also to the many people who contacted the Institute for advice. In measurement circles he was 'the IP'.

Mike's contribution to the Institute was not just confined to the technical area – he was an active member of the London Branch and its Committee and for a number of years he played a key role in organising many varied and interesting meetings.

Mike, having thanked Council for the award, stated his admiration for the professionalism and contribution that IP Technical Committees have made to the industry over the years. He stressed the importance for continued support to the Committees and Branches and paid particular tribute to members of the London Branch.

Forecourts for the future

The fuels retailing sector is highly competitive. Not only are margins under constant pressure from low oil prices and price 'wars' in the West, but many eastern European and Far Eastern countries are deregulating their markets and national oil companies are suddenly finding their monopolistic market position challenged by experienced and well-funded multinational operations. In such a highly competitive marketplace, design is a powerful tool to influence market share and revenues and the realisation that 'image sells' has led many oil companies to reimage their networks. *Kim Jackson* reports on how one design company is working to meet these reimaging needs.

MTA Design is a London-based multi-discipline design company which specialises in corporate and retail identity design and brand development. It covers all aspects of forecourt and convenience store (C-store) – from the whole forecourt and C-store concept down to the lubricants packaging, promotional gifts and employee uniforms.

'We approach projects strategically and create innovative design solutions with the emphasis on practical, effective and commercially successful implementation,' explains Chairman Maurice Acton. 'Our multi-disciplined expertise in architecture, environment, product design, graphic communications, together with our experience in technical design and implementation, combine to create customer relevant, practical, cost effective solutions with strong visual impact and market differentiation.'

According to Ibrahim Ibrahim, Managing Director, 'successful reimaging is about creating "classic qualities" which have a long life-cycle, it is not about creating a "style statement" which, although it may have a strong initial customer impact, becomes outdated quite quickly. We aim to elevate the whole positioning of a brand, working on the whole offer to improve visual impact as well as traffic flow and to keep manufacturing costs to a minimum through "value engineering" and the use of mass manufactured components wherever possible.

'We are not just reactive – we try to look forward and develop new areas on the forecourt in terms of marketing, technology, lighting and materials. We also need to keep pace with international design language – contemporary architecture, furniture, car design, fashion and product designs all act as inspirations for our work. Much of what we see today focuses on lightweight, elegant, minimalistic elements, with a lot of cantilever designs entering the market.'

Current trends

Because of the broad international basis of the company's work, MTA has to deal with a wide range of legislation and standards. To work globally, its designers need to understand international and local lifestyle trends, customer expectations, cultural requirements and local environmental conditions. It is also necessary to know about availability and cost of materials, labour and availability and skill levels of local and regional, as well as international, manufacturers and suppliers.

A number of regional trends have been evident in the global marketplace in recent years, says Ibrahim. 'There was massive interest in the Asia-Pacific, particularly before the economic crisis hit, mainly due to deregulation of the fuels retail sector. National oil companies were now in competition from large multinationals entering the market. Suddenly, their forecourts looked very dated, which prompted many of them to embark on reimaging programmes.

'There has also been a lot of activity in Europe following the development of C-stores on the back of forecourts. New C-stores can often make the existing forecourt look tired and, as companies tend to look at the forecourt and C-store as a total roadside brand, this has helped prompt many redesign programmes. In addition, in Western Europe, many of the oil companies have embarked on a redesign process in a bid to compete with the increasing number of supermarkets entering the sector.

'While there has been a lot of merger activity in Europe in recent months, we have yet to see this really filter down to the design element in the retail sector,

Figure 1: Petronas' forecourt design incorporates the curved and angular shape elements of the company's existing logo

apart from changes to signage. Current opportunities focus around formulating a corporate identity of the merged operation on the upstream side of things. However, this may well filter downstream later this year. The coming of the millennium may act as a catalyst for some companies to think about reimaging as well.

'The situation in the Middle East is slightly different. Here, national pride and reinvigorating the brand is important. Fuel pricing is fixed – this means companies are even more reliant on differentiating their product through branding and design.

'There are also climatic, environmental and cultural considerations. For example, we look at how particular colours react in particular environments. In markets where 24-hour operation is normal, site and brand illumination is important. If you have a brand that is a certain colour by day, it must also be recognisable at night.

'Other service stations act as a full servicing environment. For example, the Middle East is very much a service-oriented culture. Service is carried through to the forecourt where there are "jockeys" to fetch stuff from the C-store, check the oil, wash the windscreen, fuel up and take payment at the pump. All these factors have to be considered and incorporated into the service station design concept.

Defining the brand

When approached to reimage an existing operator's retail network, MTA first defines the company brand's 'main equities'. 'We need to define, in a nutshell, what the brand stands for,' says Ibrahim. 'We then look at what elements in the existing branding represent these values physically – the logo, colours, typeface, name, architecture – so that we can focus on these main equities and build them into the new corporate image.'

Petronas of Malaysia approached MTA in 1996 to upgrade its identity in order to maintain its position in an increasingly competitive market. The curved and angular shape elements of the company's existing, well-established brand logo were retained and, together with 'more confident use of the corporate colours of green and white with a splash of rubine red to strengthen the brand', were incorporated into a new 3D language used throughout the forecourt design (see **Figure 1**). 'This allowed all elements on site to support and complement one another in presenting a consistent image to the public that conveys the Petronas core brand values', says Ibrahim. 'It could be argued that even if the Petronas logo were removed, the site would still be identified as Petronas because of the strong architectural language.'

Figure 2: Thai Oil's new logo abstracts the horns from the original rhino mascot

The graphic element of the C-store identity and its application were a crucial aspect of the overall design concept for Petronas, and MTA developed the *Mesra* identity alongside all other key elements to ensure an overall design synergy. 'Mesra' means warm and friendly in the Malaysian language. The store offers a range of services including mini post offices, ATM machines, photocopying and laundry facilities. 'Co-branding with various reputable fast food operators will help place *Mesra* at the forefront as a destination store,' comments the design company.

New players

The design development process is slightly different when designing the retail image for a newcomer to the market. 'Here the key is to focus on differentiating the client from the competition,' says Ibrahim. 'That said, the company may have an upstream identity already, although it does not necessarily have any consumer awareness. We build on the existing company equity and translate it to the downstream image.'

MTA's work with Thai Oil provides a good example of this strategy at work. The national refiner approached MTA in late 1994 when it was looking to update its corporate image and to develop a completely new retail identity and new retail network service station and C-store design for the Thai market.

Thai Oil already had a well established and well respected branding, using a rhinoceros as a promotional mascot which represented the 'strength and solidity' of the company, branding equity that it wished to retain in its new look. These elements manifested themselves in the abstraction of the horns in the new logo to form 'a powerful and dynamic modern symbol which also evoked the energy flame of the refinery', says Ibrahim (see **Figure 2**).

'The sweeping lines retained in the typeface on the "i" and "l" are also representative of Thai architecture and hand movements in Thai dancing – fitting in with the company's requirement for a modern international design with a flavour of Thailand.' The aerofoil canopy design developed for Thai Oil is also an example of how MTA innovates in a bid to minimise costs while maximising visual impact. It features a white underside, tucking under a red top. Strip lighting inset into the join backlights the red and washes down the white underside to illuminate the company name. 'The canopy design provides cheap illumination but is very visually effective', says Ibrahim.

MTA's work with Thai Oil covered a wide range of design applications from the corporate and retail marques through the design of the service stations and ancillary offers to promotional items and advertising hoardings.

Figure 3: Petrobras's secondary offerings are as important as the primary fuel offering

It also developed liveries for the company's road tankers and ships, and designed a wide range of corporate and retail signage.

Secondary branding

In some markets, the secondary offers are as important as the primary fuel offering, and MTA is required to ensure that its service station design reflects this. Petrobras, the national oil company of Brazil, approached MTA in 1997 to develop a new retail image for both new build and its existing 7,200-strong network.

The retail network appearance was improved with a more subtle use of the Petrobras corporate colours of green, yellow and white on two faces of the canopy, further enhanced by a combination of back and wash lighting on the canopy edge (see **Figure 3**). The remaining two canopy faces were designed to 'frame' the canopy in silver while incorporating the Petrobras name back-illuminated in the corporate green.

The development of a suite of sub-brands for the company's lubricants, car wash, C-store, etc, was a crucial aspect of the overall repositioning of the network. Not only did the sub-branding have to ensure a synergy with the corporate brand, each had to be capable of being recognisable in its own right so that it could be marketed as a stand-alone package.

MTA developed the suite of sub-brands on a two-tier system. The green branding represented the brands which related to the core fuel/automotive offers such as lubricants and car wash services, while the blue/magenta branding related to the non-fuel offers such as C-store and restaurant. Each branding also incorporated graphic elements which easily identified what product/service was on offer – for example, the use of cogs for lubricants, and bubbles for the car wash (see **Figure 4**).

Figure 4: Lubrax Centre Plus sub-branding

Transportable fuel stations

MTA's work in the transportable service station area started in 1994. Agip Petroli was entering the Russian market at this time and needed a fuelling facility that was easily and quickly placed on-site. It wanted a transportable unit that required no underground installation and that was cheap and easily manufactured from readily available and durable materials.

Figure 5: Agip Petroli's transportable service station for the Russian market

The basic unit was made of two shipping containers – the larger 9-metre unit containing the fuel storage tanks, the smaller 6-metre unit containing an operator and vending kiosk, and fuel dispenser (see **Figure 5**). All signage elements are fully integrated to avoid any other site installation.

The fuelling positions are serviced by ramps either side of the container, which allow for secondary containment and anti ground pollution measures, and provide a sound base for cars to reduce the need for ground works. 'One of the big advantages of this design is that it can be placed on-site very quickly and in many situations only requires temporary planning consent', says Maurice Acton. 'It is also excellent for testing out a market at limited cost since the unit can be moved and relocated cheaply and quickly.'

MTA developed a series of variants providing for a number of combinations for larger fuel storage capacity, bigger kiosks and more shop units. It also developed unmanned units that could either only dispense fuel using card and note reader dispensers or dispense fuel and have a range of coin operated vending machines.

Going it alone

The transportable service station designs produced for Agip were specifically developed for the Russian market, where above-ground tanks could be installed without expensive monitoring and fire control systems. However, MTA recognised that the design could fill an important niche in the fuel retailing market, and went on to develop a design which satisfied the much stricter regulations of the EEC countries.

continued on p40...

Getting from here to there

In a presentation to the Institute of Petroleum's retail market seminar at Birmingham in March, *Russell Caplan*, Executive Vice President Marketing for Shell International describes potential scenarios for the service station of the future, highlighting the challenges now facing the industry as fuel and service requirements evolve.

Almost every aspect of forecourt retailing is being changed, being continuously refashioned, sometimes dramatically, by a variety of forces. New technologies, new business practices, changing purchase patterns, new fuels, new relationships right through the supply chain – all are having a major impact. A lot of change is underway and it's not easy to predict where the business is headed.

I'm going to try and describe some customers of the future and consider how their needs, their priorities and their desires might be met. Then I'll touch on the implications of some emerging technical developments – and I'll try to link these things back to some industry structure questions that I think need answering.

How are we going to win these customers of the future to our forecourts? How are we going to adapt our offers to suit their lifestyles? Even further, how can we help enable those lifestyles? We already contribute significantly to their mobility and, through our shops, our food offerings, our car washes and other services, we provide some elements of the convenience that they seek. The question is how can we become even more positive contributors? And if we can see a way through this maze, what will it take to position ourselves and our forecourts to be indispensable contributors to the lifestyles of the future?

Customers of the future are going to be different. Today's forecourt customers are little changed from their 1975 or 1985 counterparts. Of course, they're more attuned to self service on the forecourt and to picking up a variety of convenience items in our shops. They're more conscious of environmental issues, they're likely to use plastic for payment and they're usually more time pressured.

But, fundamentally, they still behave in much the same way. All parts of the transaction – the purchase order, the delivery and the payment – are still typically made at the same physical place: on the forecourt or in the shop. They're also made within a very tight time-frame.

It's quite likely that this is going to change and if it does, the change will have profound implications for our service station business – and for a variety of other retail outlets as well.

Because of advances in technology, customers of the very near future are going to have a lot more choice regarding all aspects of retail shopping. Crucially, they'll be able to use the new technologies to make purchase decisions easily, and to place their orders at different places and at different times.

Of course, this is already possible – although perhaps it's not convenient or easy enough yet. But things are evolving rapidly, and soon it could be quite normal that many purchases and payments are separated, both geographically and in time, from physical product delivery.

To start with, this will probably have little impact on the forecourt. After all, what would anyone expect to gain by ordering a tank of fuel ahead of physical delivery? However, for other elements of the service station business, it may well be a very different story when you consider the possible impact on routine weekly shopping – and crucially on overall customer behaviour.

Understanding changed customer behaviour – and how we can service it – will probably be essential to the long-term profitability and survival of anyone engaged in this industry.

The customer of the future

It seems to me that the key element for almost all categories of customer will be time – and its value. With this in mind, let's try to think about three customers in the year 2020.

Anna is a young working mother, with two children in school. By definition, she's a busy woman. She has work pressures, she has to take care of the children and she runs the household, including the family's social calendar. Probably she's married to an overworked Shell executive, who hardly has time to scratch, let alone help her out in the house. She's a highly organised person – an expert in planning, operations, procurement, crisis management and counselling (in other words, she's a normal young working mother).

Anna orders her food, her groceries and various household supplies on the Internet, using one of the many electronic retail shopping sites. She can do that from home, or from work, or on her mobile phone, or even through the dashboard communicator in her car.

How does Anna actually get hold of her stuff? Well, it could be delivered – that's quite normal – but there's no-one at home and she's ordered quite a few perishables, so she prefers to pick up the order herself. Anna uses her car to collect the children from school, so it makes sense to pick up the groceries on the way. She stops off at a Shell forecourt, where robotic equipment fuels the car with hydrogen, another robot gives it a clean and then an attendant, a live one this time, puts her food and groceries in the boot.

In the example I've just outlined, the forecourt is competing as a fuel provider (we'll talk later about what fuel) and also as a retail distribution point. Because it's close, it offers Anna convenience and it saves her time.

Let's look at another customer in the year 2020. Elisabeth is even more time pressured. She's a London executive, and she lives in Surrey. Each morning she drives to the inter-modal transfer station, where there's an integrated parking, service station forecourt and shopping delivery system. Elizabeth drops off the car, and slips on to the train. She uses the dead travelling time to do some work and some electronic shopping – which will be waiting in her serviced, fuelled and washed car when she gets back that evening. Again, convenient and time saving.

Some customers will have more time – and will have different preferences. Our third customer of the future, Jorge, is a single dad who, on the weekend, likes to relax over a cup of coffee while his son plays on arcade machines. So he drives to a multi-storey forecourt which we'll call the 'Village Hub'. Shell takes care of the car parking and fuelling, while Jorge relaxes over breakfast and the monster

attacks the arcade. In the Hub, Jorge can wander around the shops or just order electronically. Or maybe he'll go to the gym upstairs. Whatever he does, his order will be in the boot of his car by the time he wants to leave.

'The question is how can we become even more positive contributors?'

Each of these customers of the future has different needs and requirements. But there are some strong common threads.

The most critical is the time element. In a busy world, where there is so much to be done and so many enjoyments to be had, people won't want to waste time on routine tasks. They'll want to reduce to a minimum the time they spend on activities like car care and household shopping. I have no doubt that we can add value for them if we can provide convenient, reliable service and consistently high quality products. Customers are already showing that they're quite willing to pay for this.

The fuels of the future

Of course, the products and services will have to be carefully tailored to suit different market segments and will have to be delivered with a degree of consistency and control that is not generally available in service stations today. I think this observation has some profound implications for how our industry will be structured in the future. But, before I move on to that question, I'd like to touch on the fuels of the future and say a few words about technology in the vehicles and on the forecourt.

When I think about the fuels of the future, I find my level of uncertainty increasing. Which fuel is going to dominate in 20 years? We really don't know. Is there going to be one dominant fuel, or will there be a large range of fuel choices? We don't know that either. In the past, you could identify periods where there were several competing technologies. Then a winner emerged. That process took its course and there was a high degree of uncertainty in the meantime.

It looks like we are right at the beginning of another period of major uncertainty on this score. Massive amounts are being invested by the vehicle manufacturers in the development of new drive trains. For instance, at the DaimlerChrysler research centre 400 staff are engaged in a $200mn effort to put a fuel cell vehicle on the retail market in five years.

Toyota is said to be spending $600mn on a competing programme. Estimates of the overall investment in fuel cell technologies are in the $1bn to 2bn/y range.

Techniques have been developed, allowing the efficient, onboard conversion to hydrogen of a variety of fuels, including gasoline, propane, natural gas and methanol. These could be the breakthrough technologies that everyone's been looking for.

Meanwhile, hybrid electric/internal combustion engine cars are already on the market in Japan and will soon be in Europe. Direct injection engines are also being developed.

Because of the relatively slow turnover of the vehicle population, these developments won't have a significant impact on the forecourt in the coming five years. However, after that, we may have to move very quickly indeed.

Methanol, direct hydrogen, simple gasolines with zero sulfur, natural gas, electricity, bio-diesel – some of these fuels are already on sale and others could be required on the forecourt in the uncomfortably near future. How are we going to handle these fuels? Their characteristics vary so much – for instance hydrogen is a gas and methanol is toxic and it mixes with water – that transportation and dispensing systems will need to become much more complicated, and there will also have to be a variety of storage systems under the forecourt.

Better service, lower costs

If we tried to provide such a range of fuels with current technology, the cost would be crippling. However I expect we can assume that the development of smarter equipment will proceed rapidly over the next few years. Sensors and communication devices in vehicles will relay information to fuelling equipment, which will determine the correct fuel. More sensors and yet more communications devices in the fuelling equipment will feed information to the vehicles and also back down the supply chain, generating operating cost efficiencies that will make the provision of such a range of fuels more feasible economically. In case you think this is all rather far fetched, I have to say that all of this technology is in fact in operation today.

I think that the fundamental technology driver for all of this will be the development of electronic commerce. The British government recently released the Kable Report on e-commerce. It predicted that savings of £4.1bn could be made through e-commerce, just in basic government operations, and that 90% of routine government procurement will be electronic by 2001. The potential for cost reduction through e-commerce is now clearly being recognised by everyone.

Today, we live in a world in which PCs dominate the office and access to the Internet. That is already changing radically. A whole range of small net-surfing gadgets is appearing – from personal digital assistants to Web tablets. And then there's interactive television.

Forecourt theme parks

Through these devices, electronic purchasing will make shopping so easy and reliable that customers will only go into physical shops if the experience of being there adds value. So, bookshops will no longer just be selling books. They'll offer a pleasant place to be, to meet people and to spend some time. They'll offer a good experience as well as the physical product.

Likewise, I think our retail outlets will have to offer some type of good experience or pleasure – or focus on rapid and reliable physical delivery of goods and services. Otherwise they'll simply be left behind as customers turn to those who will meet their needs better.

If I had to place a bet, I'd say that our opportunity in service stations lies with speed and convenience rather than with pleasure. But whether I'm right or wrong on this, it's clear to me that today's forecourt is not well suited to emerging customer demands and expectations. And nor, especially, is our industry structure.

I would suggest that complex consistent offerings – based on a high level of customer convenience – require standardisation and real-time supervision in order to succeed.

To demonstrate the difficulties of getting to that ideal, let me refer to the Shell network – at both the global and the UK levels.

Globally, there are around 45,000 Shell branded forecourts, spread across more than 130 countries. Most of them are dealer operated. The degree of Shell ownership, involvement and control varies widely. These forecourts range from tiny areas in teeming developing world cities, to some of the most spacious and sophisticated freeway sites in the world.

The Shell pecten is the one common

element and we've invested to standardise the appearance of our network. Thanks to our long history and high brand recognition, we have an excellent core to work around. But that's not nearly enough.

Problems to be encountered

Providing a consistent petroleum retail/convenience offering globally – or indeed within most national markets – is extremely difficult.

Firstly, cultural, economic and regulatory differences work against global forecourt standardisation. If we were only selling fast foods – say hamburgers – maybe it would be different. But we're not. Fuel is a highly political and regulated substance in many markets and we have to be sensitive to this, as well as to the different market expectations of our customers.

Secondly, the structure of our industry, which has evolved over the decades, works against providing a high quality standard offering. Dealers traditionally have had a very wide area of latitude when it comes to presenting a branded offering. Indeed, in some instances, the fuel supplier, whose brand sits over the whole site, is little more than a wholesaler, with minimum impact on the offering to the customer.

In earlier decades, that was one of the main strengths of the industry structure. The dealers knew their markets and they knew what brought in their customers. But, as I've explained, I am convinced that the customer is changing. Expectations are increasing and it's becoming increasingly necessary to make the offer broad, consistent, reliable and uniform.

When a customer walks into a Shell Select shop in London, he or she wants to see – essentially – the same range of goods and services as is available in Liverpool. And there is a very understandable expectation that Shell will guarantee or stand behind the quality of everything on offer.

When visiting relatives in Australia or South Africa, that customer will also have the same expectation. Of course there is room for regional and national and even local differences and tastes – in fact that's essential. But clearly there is a need for far more standardisation.

What does that mean for national markets, for example Shell in the UK?

Shell has a network of roughly 1,400 forecourts here. About 400 of these are dealer owned and operated. Shell owns about 1,000 sites, operates nearly 300 of them and the rest are dealer operated.

These forecourts vary from very large, high volume sites, to the quite small. The average fuel throughput is not nearly high enough to be competitive across the board and the quality of the shop and service offer, although improving significantly, simply is not good enough or consistent enough for the future.

Given the competition and the market expectations I have outlined, we see no alternative but to move toward a much more consistent offering, through fewer, larger, Shell owned and Shell operated or Shell franchised stations. These stations will have to move sufficient quantities of fuel and also provide a full product and service range if they are to survive and if they are to form the base for the investment and service standard that will be necessary to serve the needs of our customers of the future – Anna, Elisabeth and Jorge.

'The other challenge is to maintain sales volume while reducing the overall number of sites.'

To achieve this, we will have to rationalise the network and rely on a structure with much tighter control and accountability.

The need to drop the lower volume sites, while concentrating on building volume through larger sites, is obvious. But there are real limitations. First is planning permission – for new sites and for rebuilds. This is becoming increasingly difficult to obtain – a problem that is certainly not confined to the UK and not, of course, confined to petroleum convenience retailing.

Future controls

The other challenge, perhaps the greater in the long run, is to maintain sales volume while reducing the overall number of sites. If customers have been used to just popping around the corner, they're not going to take kindly to longer journeys. We'll have to give them a good reason to make the extra effort.

That in itself makes the tailoring and control of the total offer even more important and I don't believe that a loose wholesaler-dealer mentality will be enough. So I think we're headed for a direct control or a very tightly controlled franchise system.

I know that many parts of the industry do not welcome such a transition. However I do believe that this is an absolutely necessary precondition for a company such as Shell, to broaden our offer, leverage our excellent supply chain and deliver a superior range of value added goods and services to our customers.

Change like this does bring dislocation and social costs. Some current industry participants will not be able to adapt to the new demands of the market place. Not because they're doing anything wrong but simply because the environment will require new structures. We'll need to deal sensitively but firmly with these issues because, if you look at the pace of change in the overall retailing environment, it's pretty clear that we're moving very slowly in the petroleum sector.

As retail channels converge, competition gets tougher. Supermarkets are selling fuel and moving into financial services and banking. Banks are moving into insurance. Electricity companies are selling gas. Oil companies are selling fresh food. So, many channels are merging and I think this trend will continue.

Future alliances

Speaking for Shell, if we are to compete, we'll have to expand our forecourt offering quickly and effectively, in order to appeal to our customers and achieve suitable distribution and logistic economies. In this process, we'll probably have to form alliances, with partners who have skills in areas where we could use some help, or where we see a business complementarity – examples of this could be sourcing, logistics, mobility services, financial services, energy services and I could go on. For Shell to be an interesting alliance partner, we'll have to guarantee access to and performance from our network – another reason why network control is essential for us.

Conclusion

To summarise, customers of the future will have different requirements from today, and while I can't be sure what they are, I do have some indications to guide me. They will probably use different fuels from today and, from a business point of view this scares me quite a lot. Technology will allow them to behave very differently as buyers and I will have to prepare for this. And, to give my customers what they want in terms of facility, service, product range, and guaranteed quality, I'll have to take control of my network and I'll have to team up with acknowledged experts in various complementary fields.

Brussels wants even tougher emissions controls by 2010

The European oil and petrochemical industries are facing another round of expensive demands for environmental investments, following the publication of a new proposed directive on emissions from the European Commission which is expected to cost the UK alone some euro 1.3bn, writes *Keith Nuthall.*

Brussels has asked Ministers to approve total national emission ceilings for Member States by 2010 – covering any type of industry – for sulfur dioxide, nitrogen oxides, volatile organic compounds (VOCs) and ammonia. It is the first time that it has made such a demand on Member States.

Petroleum Review has secured figures showing that the move would lead to swingeing cuts in emissions, over and above those which are already planned through such laws as the Auto-Oil Directive, should the idea be approved by EU Ministers.

On VOCs – many of which are hydrocarbons used in the transport, solvents and paints industries – the Commission wants to see the UK reduce its emissions from the existing planned 2010 figure of 1,350 kt (kilotonnes) per year to 964 kt. According to Commission figures, this work would cost as much as euro 1bn/y over 10 years–euro 10bn in total.

Also, Brussels is looking for Britain to reduce its emissions of sulfur dioxide to 497 kt, down from the existing target figure of 980 kt. This would cost around euro 300mn/y. The aim of the measure is to cut acidification, eutrophication and ozone formation in the lower atmosphere.

A much smaller reduction for ammonia is planned for the UK – costing around euro 23mn/y and negligible cuts in nitrogen oxides.

Elsewhere in the EU, Germany would have the biggest bill to foot – euro 2,146mn/y, with Belgium (euro 1,053mn), the Netherlands (euro 971mn) and France (euro 916mn), being the other big payers.

Member States would have to decide how the pollution cuts would affect the oil and chemical industries, but it is inevitable that it would bear responsibility for a significant portion of the changes.

The Confederation of British Industry (CBI) has attacked the idea. An environmental officer said: 'We think it's expensive. We think it's unjustified, given that we're already committed to a massive abatement programme.' She said she was disappointed that the proposal had been 'rushed forward' by the current caretaker Commission, which had promised not to issue controversial initiative while it waited for the new commissioners to take over in September. 'We have concern with the scientific models,' she added. 'While they are better than those of 10 years before, there are still difficulties.'

Instead, the CBI wants the EU to continue with negotiations on a proposed new United Nations Economic Commission for Europe sulfur protocol, while continuing to improve scientific modelling and the monitoring of pollution.

Country	Sulfur dioxide	Nitrogen dioxide	VOCs	Ammonia	Cost (mn euro)
Austria	40	91	129	67	119
Belgium	76	127	102	57	1,053
Denmark	77	127	85	71	5
Finland	116	152	110	31	0
France	218	679	932	718	916
Germany	463	1,051	924	413	2,146
Greece	546	264	173	74	338
Ireland	28	59	55	123	44
Italy	566	869	962	430	403
Luxembourg	3	8	6	7	5
Netherlands	50	238	156	104	971
Portugal	141	144	102	67	57
Spain	746	781	662	353	22
Sweden	67	152	219	48	87
UK	497	1,181	964	264	1,348
EU	3,634	5,923	5,581	2,827	7,514

Proposed 2010 national emission ceilings, in kilotonnes (kt)

Consumer changes drive development

A recently completed report on Global Convenience Store Retailing aims to educate interested parties about the key growth and convergence drivers within global C-store retailing. It also outlines how to benchmark the strategies employed by world-class C-store retailers with a view to improving retail operations, according to *Eric Clark*,* MInstPet, Managing Director of Clark Marketing Partnerships (CMP), which researched and wrote the report, supported by The Ebeltoft Group.

The key changes that are driving the development of forecourt convenience stores and offering market opportunities can be summarised as follows:

- Consumer-led changes are driving the growth opportunities present in the global convenience sector, for example the increase in single-person households.
- 'Think global, act local' consumer segmentation and retail profiling strategies for existing and new retail propositions can aid convenience forecourt store retailers to establish identifiable market differentiation in consumers' mind-sets.
- World-class supply chain and distribution efficiencies will allow convenience forecourt store retailers to optimise their asset return, as well as support such retailers to gain and maintain market differentiation.
- Convenience is not restricted to a physical store. It is a dynamic combination of tangible and intangible factors that will increasingly open up competition for share of convenience expenditures from the whole retail sector, which includes physical and virtual stores.
- New categories are entering the convenience forecourt store sector. As this trend continues, competition will intensify on a cross-category basis. Test marketing to validate and refine the offer in order to reduce risk exposure to new products and services will become essential to optimise asset return.
- With consumer perceptions and expectations increasing, the trend towards higher margin and/or added value products and services will continue as retailers seek to constantly deliver world-class convenience solutions to consumers.
- A consumer pull focus is essential. Product and/or process push will result in competitive underperformace or failure.

Quality and price

Historically, the value-for-money equation revolved around quality and price. Convenience retailing is currently undergoing an evolutionary change process on a global scale. Rates of retail change, maturation, competitive forces etc, are variable and highly dependent upon market specifics on a sub-national, national and regional scale. However, there are some key drivers to the evolutionary change process evident within the global convenience retail sector.

Probably the single most important determinant to the underlying growth of convenience retailing globally has been societal changes. These include issues such as significantly altered lifestyle and shopping habits and an increase in the number of single-person households, which are focusing consumers' need requirements on easily accessible and time efficient retail solutions.

Another very important convenience growth driver has been the reduction in consumers' discretionary time, for example the increase in the average working week with longer working hours reducing the window of time for added value leisure activities. This change driver is creating 'new' consumer segments, with the time poor/cash rich segment driving forward the growth of convenience. In parallel with this, consumers are moving towards multi-tasking/hyperactivity and becoming 'productivity focused' in their personal leisure pursuits, thus increasing consumer demand for convenient solutions.

The final key growth driver for convenience retailing has been the redefinition of the value-for-money equation by consumers such that it now revolves around quality, price and time; that is consumers are willing to buy more leisure time through acceptable differentials in time/price/quality products and services. Increasingly, the 'solution benefits' of existing and new-entrant products/services will either be specifically enhanced/developed to meet the convenience needs of consumers within the convenience sector, or price differentials in particular will reduce to more closely match the pricing strategies of competitive large unit food retailers (supermarkets). The former could allow for higher pricing, higher returns, marketplace differentiation and sustainable competitive advantage. The latter would likely restrict convenience retailers to lower margin products and services. There is, and will be, a level of crossover between the two simplistic 'solution benefits' discussed here, but a consumer retail proposition that 'sits on the fence' will likely lead to competitive underperformance/failure.

Consumer needs

There has been a convergence of consumer needs. Retailers and manufacturers/service providers alike now regularly segment consumers into identifiable target groups. This has been most evident at the national level. However, such consumer segmentation is becoming more evident at a regional and/or global level as the key players focus on 'think global, act local' consumer marketing strategies and tactics.

This global segmentation approach will become ever-more common as retailers build upon national market dominance and saturation and seek to develop regional and, ultimately, global presence. This will be driven in part by restrictive national legislation regimens, such as in the UK where planning controls on new builds restrict continued growth.

In their desire to optimise asset returns, major international oil companies are one of the chief driving forces behind the globalisation of convenience retail brands. Semi-global downstream retail fuels network assets, combined with a realisation of the marketing and financial value to be generated by making these assets 'sweat', has positioned, and will continue to position, the convenience forecourt store (CFS) at the centre of the global growth opportunities the consumer-driven convenience retail sector presents.

A major battleground for convenience dominance will form around supply chain and distribution efficiencies. Consumer switching barriers between competing brands are low among convenience retailers, and marginal at best for CFS retailers. Retail fuels, the primary category footfall driver, are, after all, a highly commoditised functional product. Convenience retailing is artfully simplistic. Get the basics right 100% of the time and consumer satisfaction will be positively enhanced and reinforced.

World-class supply chain and distribution infrastructures will aid CFS retailers to underwrite their national market dominance, for example achieving targets in excess of 98% for on-shelf product availability rates for each and every store from both central and local distributors will more readily provide an immediate competitive advantage than a rebranding or advertising campaign.

Moving from the supply side of the convenience growth equation to the demand side, consumer perceptions are developing apace. Once consumers have been exposed to world-class retail and leisure propositions, they will increasingly demand, and ultimately come to expect, world-class convenience retail propositions from CFSs.

This comes at a time when competitive pressures on integrated oil companies are extreme. Pressures caused by low crude oil prices, slack South East Asian demand, supply over capacity of refined product in Western Europe, and national market shares under pressure from both consumers' commodity perceptions of retail fuels and the entrance of large unit food retailers into fuels retailing.

National characteristics

The most important point to note is that there is no global definition for convenience. It is dependent upon national characteristics that, by their very nature, are only relevant within national market boundaries. One unifying and repetitive issue highlighted during research for the report was that convenience is not just quick and it is not just about a physical store.

Convenience is a range of tangible and intangible factors that interact to combine dynamically. These will increasingly impact store format designs, not just within the CFS sector, or within the general convenience market, but within the whole retail 'sector', that includes physical and virtual stores.

However, there are some common global denominators, which are:

- extended opening hours;
- broad but shallow product range;
- being conveniently located to home, office or when mobile;
- serving shoppers on foot or in car; and
- physical stores under 450 sq metres, or 4,800 sq feet (subject to national legislation).

Two global C-store retail case studies are examined – Shell Select, or Select at Shell as it is now branded in the UK, and 7-Eleven.

Shell has approximately 47,000 retail fuels outlets globally, of which over 5,000 have a CFS onsite with over 3,000 of these being branded Shell Select. The power of the fuel category as a repeat footfall driver is emphasised by the fact that Shell has over 20mn customer visits a day globally. Along with the other major international oil companies, Shell is taking back site control/ownership to implement leading edge retail practices, increase average performance levels, enhance consumer perceptions of the Shell Select retail proposition and increase returns on average capital employed (RoACE). This will be an ongoing strategy.

Shell prioritises national market C-store opportunities for Shell Select by assigning most resource to those national markets that have sufficiently advanced large unit food retail markets. This acts as both an offensive and defensive strategy at one and the same time. Offensively, Shell can claim a proportion of consumer's grocery purse spend that could be spent in C-stores. By offensively taking a viable market value share of the national grocery purse spend, in combination with a defensible network of retail fuels outlets, Shell reduces the attractiveness of both convenience and fuels retailing to national market food retailers. The French market provides the worst case scenario of what can happen if integrated oil companies do not adopt such offensive and defensive strategies.

Globally, the single most important development category for Shell Select is seen as being food service, which includes home meal replacement, food on the move and bake-off. Best practice transference of operational issues relating to the development of the food service category improves efficiency and allows for the adaptation and refining of relevant offers to meet sub-national and national consumer needs.

Largest C-store operator

There are over 18,000 7-Eleven C-stores globally, making this the largest C-store operator in the world. The US and Canada account for over 5,500 stores and Japan over 7,500 stores, giving these countries approximately 75% of global 7-Eleven network numbers. The US and Japanese 7-Eleven network has approximately 13mn customer visits a day. 7-Eleven is extremely successful in Japan, with the Japanese franchisee, Seven-Eleven Japan Company Limited, having the third highest retailer market capitalisation in the world behind only Wal-Mart and Home Depot.

The strategies employed by 7-Eleven to achieve the levels of success witnessed in its Japanese market, and which are being tested, refined and rolled out across its global network, revolve around item-by-item management. Through store-level ordering, 7-Eleven aims to eliminate slow-moving items, retail only those products that consumers demand, and ensure that store management takes a positive attitude to the introduction of new products to safeguard the attractiveness (and asset return) of every metre of sales space.

This item-by-item approach is supported by very advanced information and distribution systems. Examples include:

- store-level orders placed by 10.00am are transmitted to every manufacturer and supplier by 10.30am;
- delivery is up to three times per day for fresh food; and
- the just-in-time distribution process is so advanced that Coca Cola (chilled) is on a six-hour delivery lead time from manufacturing plant to store.

Globally, the key retail product opportunity is seen as being fresh food, based around item-by-item management, store-level ordering and efficient distribution. Retail service opportunities include products such as prepaid phone cards, ATMs and technology-supported offers with global consumer appeal.

National case studies

The report also looks at 'best in sector' convenience retailers on a national

basis to provide relevant benchmarking information. The case studies are:

Country	Case study
Japan	Seven-Eleven Japan
US	QuickTrip
	RaceTrac
	Wawa
UK	Alldays
	Sainsbury's Local
	Select at Shell
	Tesco Express
Germany	Aral
France	Promodès, includes 8 à Huit and Shopi

Store development trends

Worldwide trends and best practice transference supported by bigger and better manufacturers and service providers means that new categories are entering national CFS markets. This will increase category competition. As these trends develop, not only will product and service lines compete against each other intra-category, but there will be category-level competition as well.

With the introduction of net new categories into retail outlets where instore space is severely restricted, and where surrounding development space may also be severely restricted, CFS retailers will have to stake out a niche consumer proposition for themselves, and aggressively defend their 'turf'.

There is a noticeable desire by CFS retailers to enhance their margins. The sector is witnessing higher levels of added value products and services, for example the movement from basic sandwiches and instant coffee to the projected growth of home meal replacement offers, fresh-ground real coffee and the introduction of consumer durables.

The development of higher value goods and services, especially fresh, will require considerable improvements throughout the distribution and supply chain. Although this is being addressed, supply efficiency levels in the CFS sector do not meet world-class retail targets. The ability to deliver against such targets is weakened by the disparate ownership models prevalent within national CFS markets.

There will be a polarisation of competitive retail offers within the CFS sector as competitive pressures intensify, the market matures, and consumers demand ever more advanced solutions to their convenience need requirements. Fascias will seek to build a core competence in meeting specific need requirements of specific consumer segment groups, for example the price-sensitive consumer segment will require, and expect, a different retail proposition to the time-sensitive consumer segment.

We will see true differentiation, with retail propositions clearly understood by the consumer, the retailer and manufacturers/service providers alike. Thus each key stakeholder group will be in closer harmony with other value chain participants, creating more transparent, profitable and long-term defensible win-win partnership relationships.

Ultimately, consumers will become more discerning and demanding in their expectations and needs as CFS retailers develop their retail offer. The improved 'total retail offer' will accelerate until the change process reaches a stepped revolutionary phase, which we expect to occur early in the next decade.

Global Convenience Store Retailing *is a worldwide report on convenience store retailing, published by Financial Times Retail & Consumer, winter 1998, and costs £495. Tel: +44 (0)171 896 2325.*

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Strategic PNG gas player

In February 1999 Santos, Australia's largest onshore oil and gas company, announced the acquisition of an interest in the world-class Hides gas field in Papua New Guinea (PNG). The investment is regarded as being 'strategic to the company', writes *Priscilla Ross*.

Santos holds a 31% interest in the Petroleum Development Licence 1 (PDL1) in Papua New Guinea which contains the majority of the Hides gas field. The recent acquisition is intended to provide Santos with a 25% interest in the entire Hides gas field which, according to Managing Director of Santos, Ross Adler, 'is a world-class resource, estimated to contain proven and probable reserves in excess of 5tn cf of gas'.

He added that the gas field is of 'strategic importance' to the company. Not only is it poised to play a key role in the proposed Papua New Guinea–Queensland Gas Project, there is also scope for it to supply other value-adding gas projects in PNG.

Legislation forming the basis for the Australia Gas Pipeline Project from PNG to Queensland over the next 30 years was introduced to the PNG parliament in late 1998. Its remit covered financial aspects such as tax rates and royalties. A decision on the viability of the $1.8bn project financing may be taken by the end of 1999.

According to a banking source at NM Rothschild & Sons the project financing of the $1.8bn Kutubu pipeline – which includes expenditures on field development – needs a market to be established for the gas. Australian Gas Lines and Petronas are currently discussing terms with customers and the financing of the pipeline hinges on signing off-take agreements. *Petroleum Review* asked for a best estimate for the timing of the financing? He replied: 'There have been a graveyard of estimates.'

Pipeline proposal

The oil major, Chevron, and its joint venture partners have proposed the $1.8bn PNG pipeline to transport natural gas 2,600 km from the southern highlands of PNG to markets in Townsville and Gladstone in Queensland, Australia. If it is developed, it will be the longest pipeline in the Southern Hemisphere, extending 1,000 km more than the Dampier–Bunbury line in Western Australia.

The section of the pipeline stretching from the Torres Strait to Gladstone would be built in a joint venture between the Australian Gas Lines Company and the Malaysian energy company Petronas.

Customers for the project could be Comalco, if it decides to proceed with its A$1bn alumina refinery in Gladstone; QNI, the nickel company in Townsville; the Stanwell-Dynergy joint venture in Townsville; and NRG Energy for a proposed power station in Gladstone.

It is proposed that the Hides gas resource, together with the Kutubu field's output – which has been in production since 1992 – be combined. Kutubu was PNG's first oil production and the $1bn project required advanced technology to recover oil.

Chevron Niugini is operator for the Kutubu, Moran and Gobe projects in PNG. It holds a 19.38% interest in the Kutubu and Moran developments as well as the surrounding Petroleum Development Licence 2 (PDL2) and a 15% interest in the Gobe development.

Production from Kutubu averaged 52,000 b/d from 35 wells in 1998 and output from Moran averaged 10,000 b/d on an extended well test (EWT) programme to gain reservoir information for full field development. Oil is processed and exported through the Kutubu system and all the produced gas is reinjected into Kutubu.

There are two Gobe fields southeast of Kutubu. Chevron was granted a petroleum development licence by the PNG government to proceed in early 1997 with the construction of surface facilities for the Gobe field. Gobe is located some 30 miles southeast of the Kutubu fields close to the Kutubu export pipeline. The development encompasses the SE Gobe field and the Gobe Main Field. Combined recoverable reserves are estimated at 92mn barrels. It is expected that peak production of 45,000 b/d will be achieved in the 2Q1999.

In 1998 Santos completed four major development projects including the SE Gobe oil field in PNG and the infrastructure required to provide gas to Mt Isa in Queensland. Production from the SE Gobe oil field commenced in April 1998, three months ahead of schedule and below budget, and reached a maximum of 20,565 b/d. SE Gobe is the company's first production from PNG. Scheduled peak production is 25,000 b/d but technical issues relating to gas reinjection have resulted in delays in this being reached. Kutubu and Gobe oil production is constrained because of gas reinjection capacity. All the gas is returned to the producing formation for pressure maintenance and energy conservation.

Increased gas consumption

Santos' drilling programme in PNG commenced in early 1999 with the drilling of Stanley-1 in PPL 157. In April 1998 the company began gas sales to Mt Isa under a contract to supply gas to MIM Holdings for the generation of power at the Mica Creek Power Station. The gas is being supplied under a 15-year contract, which provides for a base supply of 15 PJ/y. There is provision for the volume to increase to 25 PJ/y as new projects are committed.

This contract will increase the share of natural gas usage in Queensland to 8.5% from the previous 5.5%. Nationally, the average gas consumption component in the Australian energy mix is 18%. Santos' activities in Queensland have expanded in recent years. The company and its joint venture partners are the major gas producers in all states and territories except for Victoria and Western Australia.

Gas reserve potential

Santos has significant undeveloped gas reserves in southwest Queensland which have the commercial advantage of being rich in natural gas liquids. There is potential to add to these reserves and they are well located not only for sales in Queensland, but also in New South Wales, Victoria and South Australia.

Development of these reserves is already underway. The Challum field was successfully developed in 1998 and Barrolka field production is expected to commence this year.

The Australian economy has been growing steadily over this decade at a rate of 3.2% per year and last year it almost touched 5%. Santos achieved record production for the third year in a row in 1998 with output of 45mn boe. The company's growing production base and domestic gas business mitigated the impact of the sharp fall in oil prices in 1998 and prospects for the future are said to be looking good.

New ISO/TC 67 standards for E&P industry

For several years the IP has been working on contract to BSI to co-ordinate input from the UK oil industry to ISO Technical Committee TC 67 'Materials, Equipment and Offshore Structures for the Petroleum and Natural Gas Industries'. The mission has been to 'create value-added standards for the oil and gas industry' and after years of hard work these are now starting to be delivered. So far this year five new standards have been published by TC 67, four of which were simultaneously adopted as EN's, and all of which have become British Standards. With many other drafts in the final stages of ISO processing, the industry will soon have a suite of standards covering a wide range of materials and equipment to help increase safety and reduce costs. The following brief descriptions of two of the four latest standards have been compiled by the UK experts most involved with developing the documents.

BS ISO 3183-3:1999 Petroleum and natural gas industries – Steel pipe for pipelines – Technical delivery conditions – Part 3: Pipes of requirement class C

A set of three British Standards for line-pipe has now been completed, by the adoption of International and European standards in which the UK fully participated. The recently published Part 3 is now available as BS ISO 3183-3:1999. It applies to pipes (class C) that may be used in pipelines for the transmission of combustible fluids under particularly arduous service, such as offshore service, low temperature service and/or sour service. Pipes in classes A and B, for use in less stringent service, covered in Parts 1 and 2 of ISO 3183, have already been published. In Europe the identical technical requirements are published as BS EN 10208 Parts 1 and 2 respectively.

Part 3 of the standard specifies a range of weldable grades of seamless and several seam welded steel pipe product forms along with material heat treatment conditions. From the specified range the user can select the most appropriate grade, product form and heat treatment condition for the intended application. The standard features a comprehensive list of options from which individual items may be specified in purchase specifications to tailor the line-pipe for particular applications or requirements.

Line-pipe grades are designated according to their specified minimum strength and range from grade L245 up to L555 (corresponding to ANSI/API strengths B to X80). The precisely specified compositional ranges should obviate the need for extensive supplementary purchase specifications. Steel names are reflected in the designation system. Mandatory toughness requirements are specified for these materials. Charpy testing temperatures and minimum energy values are based on requirements for the avoidance of brittle fracture and alternative impact and drop weight tear requirements are included for the avoidance of long running shear fracture in base materials.

The standard deals comprehensively with all mechanical, technical and test requirements commensurate with the expected industrial applications for the specified pipes.

John Hammond, BP Amoco, ISO WG Convenor & Project Leader

BS EN ISO 13628-1:1999 Petroleum and natural gas industries – Design and operation of subsea production systems – Part 1: General requirements and recommendations

Part 1 of ISO 13628 is the first part of a suite of nine standards covering all aspects of subsea production systems. Areas covered range from wellhead, trees, sealines and controls through to ROV and ROT intervention systems. Part 1 is largely a re-write of API RP 17A, which has been expanded and updated by Working Group 6 of ISO/TC67/SC4.

This part of the standard forms a top-level document to govern other standards, which form a part of a subsea production system. The requirements and recommendations address the complete subsea production system, which ranges in complexity from a single satellite well with a flowline connected to a fixed platform, to several wells on a template producing to a floating production facility.

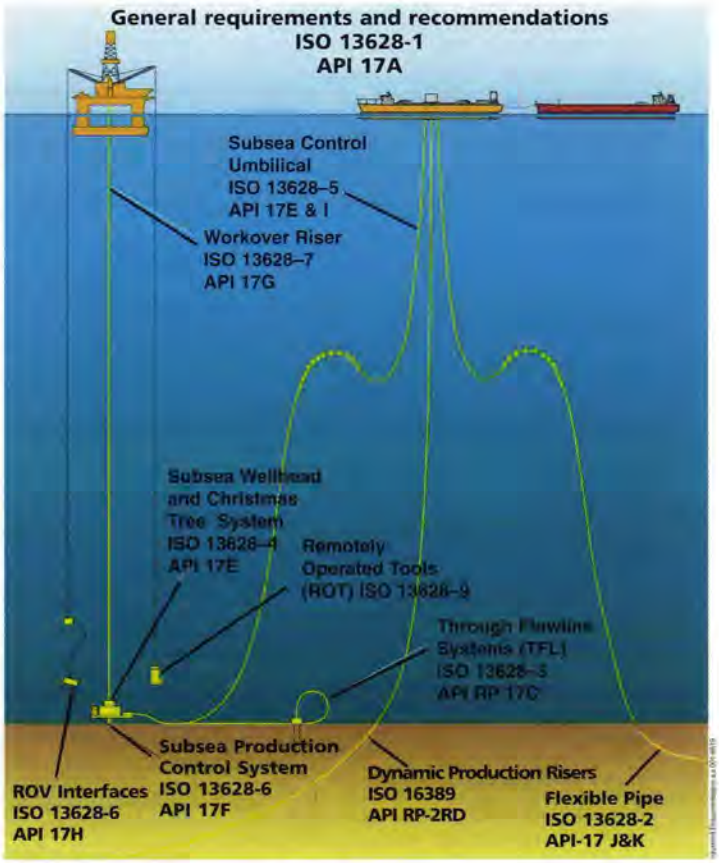
The standard is written in a format which will act as a tutorial for anyone new to the industry and will be of benefit to the more experienced user as it details all areas that have to be considered, from design through to systems testing. Use of this standard will ensure that the subsea production system is designed, fabricated, installed and operated in a safe manner and its functional approach will facilitate the provision of cost-effective facilities.

Detailed requirements are generally contained in Parts 2 through 9, which are still to be formally released, however in certain areas, such as manifolds, which are not covered in the other parts, the detailed requirements are included in Part 1.

Dave Garnham, Cooper Cameron UK, Lead UK Expert

Petroleum and Natural Gas Industries

Design and Operation of Subsea Production Systems



Growth prospects for China's refining sector

China's refining industry – the second largest in the Asia-Pacific region – was, until recently, heavily regulated by central government and monopolised by state-owned Sinopec. However, significant changes have taken place since last year's restructuring of the country's oil and gas industry, providing opportunities for foreign companies and better growth prospects for the industry, writes *Hao Wang*, Business Analyst at Datamonitor.

The most significant consequence of the restructuring is that, while government development planning remains a major market driver, competition is becoming increasingly important. Four important factors will have a direct impact on the Chinese refining sector in the foreseeable future:

- Economic growth.
- The ongoing restructuring process.
- Domestic crude oil supply.
- The government's policy towards foreign competition.

Economic outlook

Between 1978 and 1997, China's economy grew at an average rate of 10%/y. This growth was slowed down by the Asian financial crisis which had an indirect impact on the Chinese economy by reducing foreign direct investment and exports.

However, although this will continue to dampen overall growth over the next two years, China will still maintain average annual GDP growth of 8% to 2010 – a remarkable rate compared to other industrialising countries.

From monopoly to duopoly

Restructuring of China's oil and gas industry, including both upstream and downstream sectors, followed the latest session of China's National People's Congress (CNP, 'parliament') held in early 1998. The organisational change involves the restructuring of CNPC and Sinopec, marking a break up of the long-standing sector monopoly of China's oil and gas industry and its transformation to a state-controlled duopoly model.

The restructuring was a government initiative to integrate the country's upstream and downstream sectors and improve economic efficiency. It has involved the shift of the management system of China's petrochemical sector and a largescale assets swap between Sinopec and CNPC, as well as the establishment of a new regulatory government body (see **Figure 1**). As a result of these changes:

- CNPC (the former national onshore exploration and production company which produced 90% of China's crude oil before reorganisation) has become responsible for all upstream and downstream activity in northern and western China.
- Sinopec (the former national refining and petrochemical monopolist that held around 95% of China's crude oil refining capacity before the reform) now controls the oil industry in eastern and southern China.
- Both companies are to be transferred to the State Petroleum and Chemical Bureau – part of the State Economic and Trade Commission established to take over the regulatory and administrative responsibilities of the former Sinopec and CNPC.

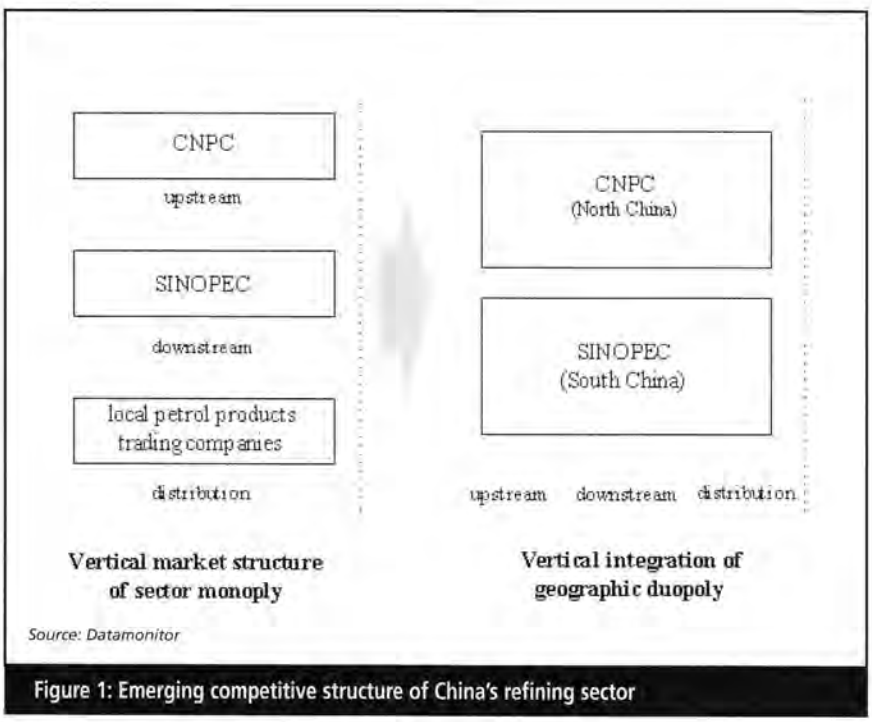


Figure 1: Emerging competitive structure of China's refining sector

As a result of this restructuring programme, Sinopec now produces 42% of the country's onshore crude oil and 26% of natural gas, compared with 58% and 74% for CNPC. Sinopec now has a 65% share of refining capacity compared with 35% for CNPC. It is expected that Sinopec will continue to regard refining operations and petrochemicals as its core business as Sinopec's refineries are located in the most developed areas of the country. These areas include Guangdong, Shanghai, Jiangsu and Zhejiang provinces, where demand for petrol products is much higher than the north and northwest.

The restructuring of China's oil and gas sector immediately created competition between two companies in the oil product markets. Although the reform scheme restricts the two companies to operating production facilities under geographic division, it does not limit them from distributing products across each region. Soon after the reorganisation, CNPC launched a marketing battle in south and east China, now the territory of Sinopec. This was finally settled by an agreement between Sinopec and CNPC, after central government intervention. Under the agreement, CNPC can now only sell its surplus oil products in south and east China through Sinopec, rather than marketing them directly.

A bizarre consequence of the restructuring has been a split of responsibility for foreign cooperation negotiations. Although both companies are authorised to cooperate with foreign companies in upstream and downstream areas, CNPC will represent Sinopec to negotiate with foreign companies for upstream projects, while Sinopec will do the same for CNPC in downstream business. The arrangement not only complicates the competitive structure of China's oil and gas sector, but also obviously makes it difficult for foreign companies to build up relationships with the right Chinese partners.

Oil supply

With demand for oil products growing rapidly, China's import requirement has increased significantly over the past decade. While production of crude oil grew at an average annual rate of 2% between 1987 and 1998, consumption grew significantly faster. This has resulted in a production/consumption gap of almost 1mn b/d that has to be filled by imports which now account for 30% of total domestic crude oil consumption. The rapid growth in imports has significantly altered China's position in the world oil market – China now accounts for 5.5% of total global oil consumption, compared with 3.6% in 1987, while its share of world oil production remains unchanged. In Asia, China accounts for nearly 20% of total oil consumption, and 44% of total production.

The shortage in the domestic supply of crude oil has forced China to turn to the Middle East to meet growing demand. Before 1992, China's oil imports primarily came from the Asia-Pacific region. Given the fact that availability of low sulfur crude oil in the Asia-Pacific region is declining, this situation is changing. In 1995, imports from the Middle East accounted for 15% of total imports – in 1998, they accounted for almost 30%, and will continue to rise in the near future.

	1998	2000e	2005e	2010e	Cagr*
Crude oil cons (,000 b/d)	4,343	4,800	6,500	8,700	6%
Crude oil cons per capita (b/d)	0.0039	0.0035	0.0051	0.0065	5%
Refining capacity (,000 b/d)	3,500	4,200	5,800	6,500	4%

Source: Datamonitor * *compound annual growth rate*

Table 1: Forecast crude oil consumption and refining capacity, 1998–2010

,000 b/d	1993	1994	1995	1996	1997	Cagr*
Diesel oil	165.5	102.6	98.5	62.8	104.7	–10.8%
Fuel oil	75.6	80.4	119.3	171.7	252.5	35.2%
Gasoline	6.6	–21.6	–34.8	–24.9	–17.1	n/a
Kerosene	9.5	3.3	8.1	–11.9	13.5	9.3%
LPG	13.6	20.5	18.6	34.9	47.1	36.4%
Total	**270.8**	**185.1**	**209.7**	**232.6**	**400.7**	**10.3%**

Source: Datamonitor, country sources * *compound annual growth rate*

Table 2: China's net imports of oil products, 1993–97

Refining capacity expansion

The construction of refining capacity in China is seen as a necessary condition for economic modernisation. However, in recent years, the gap between capacity and throughputs has increased, as a result of lower prices of oil products in the world market and, consequently, substantial growth in both legal and illegal imports.

In terms of processing capacity, most Chinese crude is paraffin, ie with low or medium sulfur content making it ideal for cracking. Therefore, while China's catalytic cracking capacity of 1.2mn b/d ranks as the second largest in the world, its other secondary processing capacities are comparatively small with reforming capacity only accounting for 3% of total refining capacity.

However, the recent liberalisation of oil product prices and the government's crackdown on smuggling activities are now helping to boost demand for domestic oil products.

Datamonitor projects annual consumption of crude oil will increase from its current level of 4mn b/d to 9mn b/d by 2010, representing average annual growth of 6% over the period. This will continue to force China to upgrade and build new refining capacity. By 2010, it is expected that a total of between 2.5mn and 3mn b/d of new refining capacity will be added to the current level of 3.5mn b/d. This will be partly the result of consolidation of inefficient small refineries and in part due to the building of new plants (see **Table 1**).

Market dynamics

The Chinese oil product market grew at an average annual rate of 7% between 1994 and 1998, primarily driven by rapid economic growth, rising living standards and structural change. However, growth has varied dramatically between individual product markets. Demand for LPG grew at by far the fastest rate, expanding at an average yearly rate of 26% over the period, compared to just 0.8% for the fuel oil market. As a result, the share of fuel oil in the total market has fallen from 32% to 25% in 1998, while the share of LPG increased significantly from just 5% to 10% over the same period.

Total domestic output of oil products rose from 2.1mn b/d in 1994 to 2.6mn b/d in 1998. Domestic LPG production grew fastest at an average rate of 16%

between 1994 and 1998, while domestic fuel oil production declined at an average rate of 6% each year over the same period. While changes in domestic production of oil products have directly reflected the changes in demand for oil products, lower oil prices in the world markets and the government's loose control over smuggling in the past few years have also affected domestic production.

The Chinese refining sector was largely isolated from the world market until the late 1980s. However, as domestic crude oil production started to plateau, the government allowed the import of oil products in 1986. This led to sustained growth in oil product imports due to lower world market prices. In the 1990s, net imports of oil products continued to grow, particularly for fuel oil and LPG, while net imports of gasoline and diesel oil have decreased (see **Table 2**).

Looking ahead, total demand for diesel, fuel oil, gasoline and LPG in China will grow from 3mn b/d at present to 7mn b/d by 2010. This represents average annual growth of 7% through to 2010. The major driver for this growth will be the LPG market, which will be the fastest growing, increasing by an average of 18%/y over the period. Greater consumption of products, in particular LPG, will be driven by increasing domestic use for cooking and heating, and the rapid expansion of road transport.

Consumption of LPG is forecast to increase from 0.3mn b/d now to 2.2mn b/d in 2010, while demand for diesel oil is expected to grow from 1.1mn b/d to 2.9mn b/d. Fuel oil will see the slowest growth over the period, largely due to the increasing use of LPG as an alternative fuel, and the decreasing use of fuel oil as a thermal power source (see **Figure 2** and **Table 3**).

,000 b/d	1998	1999	2000	2005	2010	Cagr*
Diesel oil	1,104	1,181	1,263	1,772	2,485	7%
Fuel oil	764	768	773	796	820	1%
Gasoline	701	729	758	922	1,122	4%
Kerosene	133	142	152	213	299	7%
LPG	308	363	428	980	2,242	18%
Total	**3,008**	**3,183**	**3,374**	**4,683**	**6,969**	**7%**

Source: Datamonitor * *compound annual growth rate*

Table 3: China's oil product markets to 2010

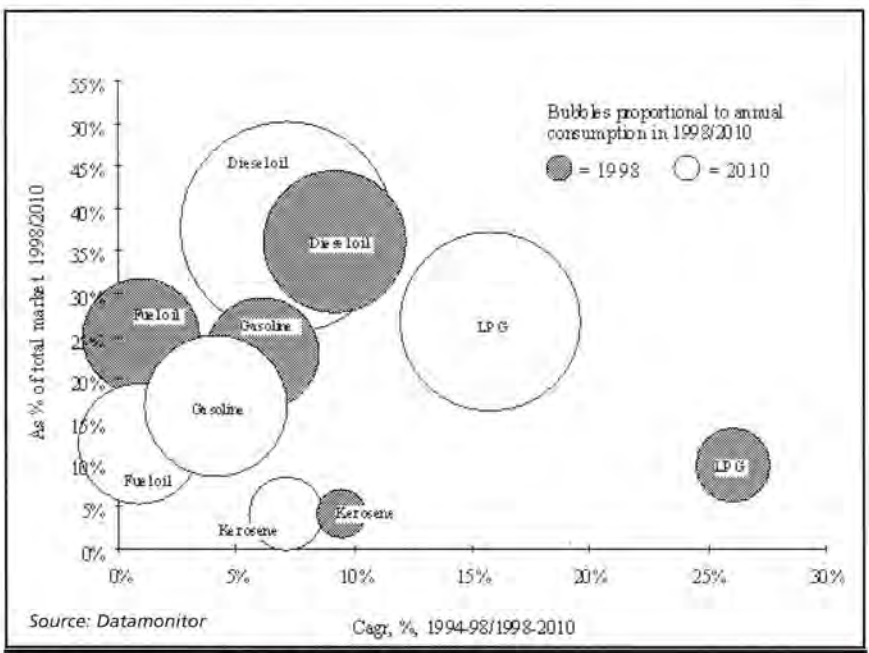
These different growth rates will reshape the structure of China's oil product markets. While diesel is expected to remain the largest segment of the total products market by 2010, with a share of 36%, LPG will become the second largest product market over the next decade with its share increasing from 10% to 32%. Kerosene will maintain its current level of 4% while the shares of fuel oil and gasoline are forecast to fall from 23% to 12%, and 23% to 16%, respectively over the same period.

Foreign opportunities

Compared to the upstream sector, the Chinese government has so far been cautious towards foreign involvement in the refining and marketing sector. In theory, direct foreign investment in the sector is allowed, but in practice there are only four foreign players that have, to some extent, gained access to the Chinese refining industry. These include TOTAL's equity joint venture in Wepec in Dalian with a 20% stake, Arco's acquisition of a 9.9% stake in the Zhenhai Petrochemical plant through the Hong Kong Stock Exchange in the early 1990s, and Aramco and Exxon's involvement in the Fujian refinery. None has been officially granted permission to operate in the retail market, even though a number of foreign companies are doing some business of this kind with the approval of local authorities.

However, opportunities for foreign companies to be involved in adding new refining capacity and operating in the market are set to increase over the next decade. The major reasons for this are:

- China needs to upgrade most of its existing capacity to cope with increasing high sulfur crude oil imported from the Middle East.
- Intensified domestic competition will force Chinese companies to look for foreign alliances, as it has already happened in other industrial sectors in other Asian countries.
- The government's anti-smuggling campaign and lower crude oil price in the world market have made the domestic refining operation increasingly profitable.
- Local governments are becoming increasingly interested in participating in the refining market and more willing to cooperate with foreign majors to compete with their domestic rivals.
- The Chinese government and refineries are facing increasing difficulties in financing new refining facilities through borrowing and issues in domestic and foreign capital markets and are being forced to look to foreign sources through equity joint ventures.
- China will have to liberalise its heavily regulated retail sector,



Source: Datamonitor

Figure 2: Outlook of China's oil product markets, 1998–2010

including petrol products, in order to gain full membership of the World Trade Organisation.

Thus, there are increasing opportunities for foreign companies to invest in China's refining and marketing sectors, and the market is becoming more attractive for them. However, rather than a 'big bang', changes and foreign investment are expected to arrive gradually, in line with the cautious market opening.

The biggest challenge for foreign companies that want to turn the opportunities into long-term profits in the Chinese petrol product markets is to find a way to break into China's heavily protected oil product retail market. In the past, it has been part of the central government's policy to bar foreign companies from retail operations. Although a number of foreign companies have been able to access the domestic retail market only with the approval of local authorities, it remains uncertain whether the central government will change its stance on this issue in the foreseeable future.

It is no secret that China badly needs foreign investment to build new refineries because of soaring demand for fuel oil, diesel and other refined petrol products. However, the government still bars refiners from directly operating petrol stations or other wholesale businesses, which remain a virtual monopoly of Sinopec and now also CNPC.

Few foreign companies have tried to break into the oil product retail market. At present, competition for vehicle fuel suppliers is negligible, with the majority state-owned, although BP, for example, negotiated in 1995 in Guangzhou trying to invest in a number of petrol stations. In the short term, however, it is unlikely that foreign companies will be allowed to establish a presence in the retail market.

Datamonitor is an independent market analysis firm which publishes a wide variety of market information reports on downstream oil and gas, power, and power equipment markets. It also offers a tailored research and analysis programme to meet clients' strategic information needs. For further information, Tel: +44 (0)171 316 0001; Fax: +44 (0)171 372 0130; e:* **ukinfo@datamonitor *Or view the company's website at* **www.datamonitor.com/en**

Malaysia to expand natural gas utilisation

Petronas Gas, a subsidiary of Malaysia's national oil and gas corporation Petronas, has recently completed work constructing the first stage in the expansion of pipeline gas supplies in the country, reports *David Hayes*, recently in Malaysia.

The just completed first stage involves a 500-km gas transmission pipeline looping project from Kerteh on the Peninsular Malaysia east coast to Meru in Selangor State in the west coast industrial Klang Valley region. The project is part of the company's long-term programme to double natural gas consumption in Peninsular Malaysia by expanding its gas processing facilities and increasing the volume of gas transmitted to major industrial centres and cities along the west coast, stretching from the Thai border in the north to Johor Bahru in the south (see map).

Stage 1 of the pipeline loop project has involved constructing a 270-km, 36-inch diameter, high-pressure pipeline between Kerteh and Segamat, parallel to the existing gas pipeline. This pipeline section carries gas from Petronas's gas separation facilities in Kerteh to the gas transmission grid junction at Segamat, from where the gas is either sent south to Johor Bahru and Singapore or west to the Peninsular west coast.

Construction work on stage 2 of the pipeline loop is due to complete by 1Q2001. Contracts worth M$401mn were awarded in December 1998 for the construction of this second 36-inch diameter, high pressure pipeline loop which will run parallel to the existing Segamat to Meru pipeline section and will include upgrading 40 km of the existing pipeline.

'Petronas is the owner of the gas while Petronas Gas is responsible for gas processing and transmission. We supplied about 1,000mn cf/d in 1998 compared with about 970mn cf/d in 1997,' commented a Petronas Gas executive. 'Our facilities at Kerteh can process 1,000mn cf/d so gas utilisation in Peninsular Malaysia is limited to our gas processing capacity. We will be expanding our gas processing capacity to 2,000mn cf/d with the completion of our gas processing plant five in July followed by number six early in year 2000.'

Construction of the PGU gas transmission pipeline, Malaysia

Domestic gas programme

Malaysia launched its large domestic gas utilisation programme in the early 1980s following the discovery of large gas reserves offshore the Peninsular east coast by Esso. Phase 1 of the Peninsular Gas Utilisation programme (PGU 1) was completed in 1984 and consisted of a gas processing plant (GPP 1), an export terminal for gas products and a 32-km pipeline from GPP 1 to the export terminal and nearby gas customers in Kerteh.

Gas consumption did not pick up, however, until Phase 2 (PGU 2) was completed in 1992 with the construction of three additional gas processing plants (GPP 2, GPP 3 and GPP 4) which raised Petronas's gas supply capacity to 1,000mn cf/d. Importantly the project also included construction of a 680-km, high pressure, 36-inch diameter transmission pipeline grid from Kerteh to Segamat where the pipeline divides – one section running south to Johor Bahru and Singapore, the other section running west to the Klang Valley region.

Phase 3 (PGU 3), launched in the mid-1990s, involves expanding gas supplies as well as extending the transmission pipeline network to serve all current and potential gas demand centres in Peninsular Malaysia. With PGU 3 completed, the Peninsular Malaysia gas transmission grid extends over 1,420 km in length and consists of 1,250 km of main gas pipelines and 170 km of lateral pipelines. The network was further upgraded in March 1998 with the commissioning of a compressor station at Segamat to enhance the network reliability.

Power plant driver

Currently Petronas is supplying about 980mn cf/d to various customers through its transmission grid. Most gas is used locally with piped gas consumption in Peninsular Malaysia running at about 850mn cf/d during 1Q1999. Power stations provide the largest single market for gas in Malaysia taking about 670mn cf/d and accounting for 79% of gas consumption in Peninsular Malaysia.

'We do not have any gas storage facilities. Whatever we produce we sell,' the executive commented. 'Power plant sales are what are driving this whole thing. Our power plant gas sales contracts are for 20 to 25 years, the same period as LNG contracts and operate under the same principle.

'For banks to lend money to power station developers they need assur-

ance that gas supplies will be available to the power plants. Our principle in building gas processing plants is to create a gas pool. We do not build facilities for a particular customer. The majority of gas goes to the power sector as these use a large volume.'

Currently 11 power plants ranging in size up to 1,400 MW installed generating capacity use natural gas as their fuel source. All the plants are supplied through the Petronas Gas transmission grid. The largest power generator is Tenega Nasional Berhad (TNB), the privatised former state-owned power company. Various independent power producer (IPP) operators own the other gas-fired stations.

TNB's current installed generating capacity of 8,129 MW accounts for 66.2% of total installed generating capacity in Peninsular Malaysia while IPP schemes totalling 4,144 MW account for the remaining 33.8% of installed capacity.

'Government policy regulates power plants to ensure fuel supplies to power plants so we cannot exceed the fuel source proportion that is allocated to us,' the Petronas executive said. 'Now 70% of power generation is gas-fired according to the Seventh Malaysia Plan (1996–2000). Power plants can choose coal or fuel oil if gas prices are high.'

Other consumers

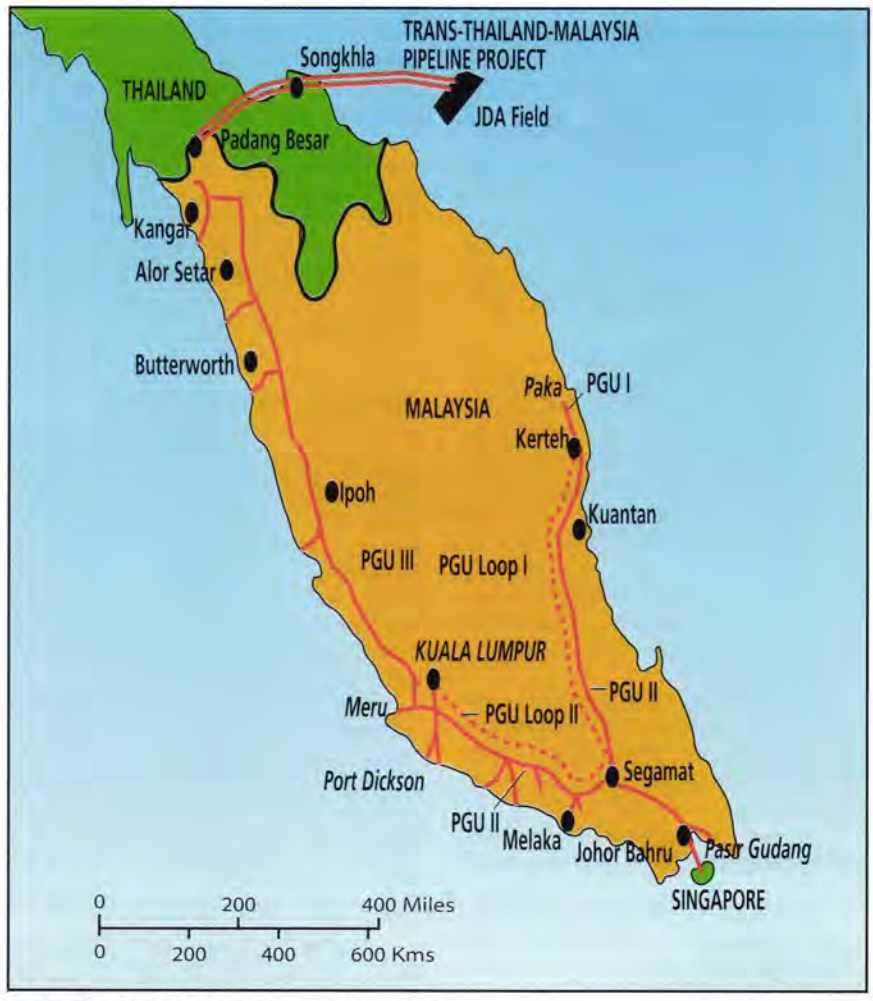
Apart from power stations Petronas supplies about 10 large industrial customers including steel and petrochemical plants. These take a further 150mn cf/d, accounting for about 14% of power supplies.

The remaining gas is supplied to Gas Malaysia, a city gas company in which Petronas has a shareholding. Gas Malaysia distributes about 30mn cf/d to mostly industrial and commercial customers. The company is allowed to supply customers with up to 2mn cf/d while Petronas supplies larger gas users. Gas Malaysia is looking to supply larger customers in future to help expand its city gas business though this will depend on agreement from Petronas.

Gas also is exported to Singapore where Petronas's sole customer and one of its largest clients is Singapore Power which buys gas under a long-term contract to burn at Senoko power station. Petronas's long-term gas sales contract with Singapore Power is for 150mn cf/d ± 20mn cf/d.

Meanwhile, Petronas has started a marketing programme to sell the additional 1,000mn cf/d of gas that is due to become available with the commissioning of gas processing units GPP 5 and GPP 6 this year.

The double looping transmission project together with the installation of additional compressor facilities will ensure Petronas is able to transmit an extra 1,000mn cf/d to the Peninsular west coast once construction is completed on the second pipeline loop from Kerteh to Meru in 2001.



Peninsular Malaysia's gas utilisation project

Pushing coal-fired power

While Petronas is hoping to secure a number of large gas supply contracts with IPP power plant developers as part of sales plans for its increased gas supply capability, the government is concerned the power sector is becoming overdependent on gas and wants to increase the share of coal-fired power generation. With Malaysia planning to reorganise its electricity industry and create a British-type electricity pool system, observers believe few private developers will want to build coal-fired plants which will find it difficult to compete with more efficient gas-fired combined-cycle stations.

At present about seven new IPP power plant schemes totalling about 6,060 MW installed capacity are due to start up from 2000 to 2005. However, all the projects are facing delays due to Malaysia's economic crisis and difficulties in obtaining finance. At least two of the IPP schemes accounting for almost 60% of the total installed capacity are due to be coal-fired plants burning imported coal. A third plant could be coal- or gas-fired; if coal-fired, it will increase the coal-fired share of generating capacity of the next IPP round to 75% of installed capacity.

'Malaysia has a four-fuels electricity policy based on gas, hydropower, oil and coal. That is the principle under which TNB and the government have worked,' commented the sales manager of one company selling power plants to Malaysia. 'Now they feel they are too reliant on gas and want to get a balance which is why they are promoting coal-fired IPP schemes. But coal-fired stations cost more to build and operate, and cannot compete with gas-fired stations in a power pool

market. You cannot have cheap coal-fired power without having domestic coal resources.

'After 2000 the independent grid operator merchant power plants will look for low-cost operations. Coal will not give them this. So we expect more gas-fired plants will be built with higher purchase price agreements or else subsidised coal will be used for the coal-fired plants. Economic reasons are pushing for gas-fired combined cycle plants.'

Meanwhile, with Malaysia still affected by the economic slowdown, many industrial and commercial gas consumers considering increasing their energy consumption, and potential customers thinking of converting to gas in future are still unwilling to commit themselves to long-term plans and investment. Most customers are expected to compare the relative merits of piped natural gas, LPG and oil before making any final decision.

'We have plans to develop gas utilisation,' the Petronas Gas executive said. 'This traditionally has been led by the power sector so we want more innovative gas utilisation such as natural gas vehicles and gas-fuelled district cooling systems as these are more energy efficient uses.'

To encourage development of new uses for gas Petronas has taken a 60% stake in Gas District Cooling, a company set up to install and operate gas-fuelled district cooling systems. Currently two gas district cooling systems are in operation in Peninsular Malaysia while a third is under planning. Apart from supplying cool air for air-conditioning purposes, the cooling plants also can supply electricity to their customers.

Offshore development

Meanwhile, with the PGU 3 pipeline project completed and the Peninsular gas grid now in place, Malaysia's next major gas pipeline scheme involves plans to jointly develop offshore gas resources with the Petroleum Authority of Thailand (PTT) in Malaysia's and Thailand's overlapping Joint Development Area (JDA) in the south of the Gulf of Thailand.

Under an agreement signed by the Malaysian and Thai prime ministers in 1998, the two countries will share gas production on a 50:50 basis. Initially gas production from block A-18 is expected to amount to 390mn cf/d while gas production from blocks B-17 and C-19 is expected to total 250mn cf/d. Commercial delivery of the first gas supplies is due to begin by mid-2001.

Natural gas from the offshore fields will be landed onshore by submarine pipeline at Songkhla in southern Thailand for processing by a gas separation plant, after which gas will be supplied to industrial, commercial and residential customers as well as for power generation. An onshore pipeline will be built from Songkhla through southern Thailand, crossing the border into Malaysia to connect with the Peninsular PGU gas transmission grid at Changlun in Kedah, allowing Petronas to receive its share of gas production from the JDA offshore production fields.

Both the gas separation plant facilities at Songkhla and the offshore/onshore gas transmission pipeline, to be known as the Trans-Thailand-Malaysia (TTM) gas pipeline system, will be jointly developed by Petronas and PTT. Apart from increasing gas supplies to both Thailand and Malaysia, the TTM pipeline will mark an important step towards realisation of the proposed Trans-ASEAN Gas Grid project.

Figure 6: MTA's IMPS project is designed to meet stringent EEC health and safety regulations

...continued from p24

The company chose not to approach oil companies to fund its ideas, but instead decided to finance the IMPS (Integrated Modular Petrol Station) project itself (see **Figure 6**). The low cost, semi-transportable, factory prefabricated modular system consists of a precast concrete sectional foundation box which is dropped into a prepared excavation. The tanks, interceptors, etc, are installed in the box and the prefabricated pump island/kiosk or shop building and canopy is bolted to the top. The car standing areas beside the pumps are steel prefabricated ramped units with steel drainage grills to collect spillage which discharges directly to the interceptors, thus reducing the amount of groundworks.

Because it is a modular system, the units can be configured in a number of different ways to accommodate more fuel storage, more fuel dispensers, larger shops, etc. They can also be configured to provide unmanned sites.

Futuristic concept

While MTA has undertaken many reimaging projects for 'conventional' service station networks, in 1996 Italiana Petroli commissioned it to design a 'futuristic' service station concept which would dovetail into the company's other marketing initiatives including its 'space station' television advertising campaign.

The concept, fully implementable as a high-tech station of the future (see **Front Cover**), was developed as a component based modular system which provided the option to use the main identity elements to retrofit existing stations. The design incorporated many innovative ideas including cantilevered dispensers and moving image promotional displays.

The design is way ahead of its time and, as with many innovative concepts, remains unbuilt except as a scale model. However, who is to say that in x-years' time this won't become the familiar face of the forecourt of the future?

Time for a gas producers' cartel?

Faced with growing surplus availability, Europe's natural gas suppliers have been falling over themselves to secure outlets in the world's second biggest market. But before long the prospect of persisting low oil and gas prices may threaten the commercial viability both of some established sources of supply and of at least some of the would-be new suppliers. Dare one ask, writes *Fred Thackeray,* is it not time for the world's principal gas suppliers to get together, organise quotas and push up prices?

Sighs of relief greet success by the Opec cartel in limiting oil production to obtain an upward blip in crude oil prices. The typical consumer of gasoline does not notice. Taxation by consumer country governments is so high that a few pence per litre at the pump due to higher crude oil prices makes little difference. The justification for pushing price up is said to be that otherwise not enough oil will be found and developed to meet future demand. The same argument, surely, must apply to natural gas, at least for the higher cost sources of supply.

Yet, politically, the pressure is mounting to push gas prices still lower in European markets. The EU has adopted and is about to enforce the Community-wide Gas Directive. Its dedicated purpose is to reduce prices by stimulating competition. This follows the remarkable success of the UK in an intensive regulatory drive over several years to reduce natural gas prices to the lowest in Europe. But neither in the UK, nor in the Community as a whole, has much attention been paid by producers to the need for adequate prices to ensure future supplies.

Now, however, the crunch may be looming ahead. Three newly published reports on the costs of European gas suppliers point up the issue. The reports are the UK DTI's annual 'Brown Book', and two reports on the NW European and UK upstream by consultants Wood Mackenzie.

The DTI's survey reports that for natural gas fields currently in production in the UK North Sea, average life-of-field unit costs fell again last year to 13 p/therm in 1998 money. These costs include an assumed pre-tax 10% real rate of return. They exclude abortive exploration costs not attributable to individual fields.

What the survey does not point out, however, is that while long-term contract prices are well above these costs, spot prices have for some time been considerably lower. The cost of 13 p/therm compares with today's one-year spot prices for UK North Sea gas from October of 11.45 p/therm (*Gas Markets Week Europe*, 3 May). OTC (over-the-counter) spot prices are lower still, in the range of between 9.2 and 9.3 p/therm.

The Wood Mackenzie reports include estimates of the commercial viability of natural gas reserves in fields likely to receive UK government approval for development within the next two to five years. The estimates relate to nine prospective gas fields.

At a Brent oil price of $16/b, Wood Mackenzie says the majority of these fields would be commercially viable, assuming that a real return of 15% is required. At $15/b, however, some 46%, or around 350mn to 400mn boe (say 60bn to 65bn cm) of the reserves would become uneconomic to produce.

Year	EU (CIF)	US (wellh'd)	Japan LNG (CIF)
1985	3.8	2.4	5.2
1986	3.7	1.9	4.1
1987	2.6	1.6	3.4
1988	2.4	1.6	3.3
1989	2.1	1.6	3.3
1990	2.8	1.7	3.6
1991	3.2	1.6	4.0
1992	2.8	1.7	3.6
1993	2.5	2.0	3.5
1994	2.2	1.8	3.2
1995	2.4	1.5	3.5
1996	2.4	2.1	3.7
1997	2.3.	2.2	3.9

Source: BP Statistical Review, 1998

Gas prices 1985–97

For Norway, Wood Mackenzie's estimates indicate that as much as 60% of the gas reserves in the probable field developments of the next two to five years will be uneconomic if the Brent price is about $15/b. It points out that its estimates do not take into account the synergy for some companies due to their equity in pipelines. This means that transport tariffs are intra-company payments. Nevertheless, the message is startling.

The UK and Norway produced between them last year almost 40% of the EU's total natural gas supplies. The Netherlands, which supplied about 20%, provides a happier picture. It is estimated that 80% of its scheduled gas developments will be economically viable at oil prices as low as $3/b. But government-approved forecast of production sees it virtually static for the next 25 years.

Russia and Algeria are the other principal sources of EU gas supplies. It may be doubted whether either of them is in a position to stomach continuing low prices. As for the newer suppliers of gas imports – Trinidad, Nigeria, Qatar, perhaps Libya in a few years time – low prices in Europe's markets will not provide them with the returns they will need. An international cartel of producers is highly undesirable and is unlikely to be practical. But it may be that we should begin to pay more attention to the supply side of the demand/supply equation.

BP Amoco's place in the sun

The European Union (EU) has called for the installation of one million solar photovoltaic (PV) systems in Europe by the end of the next decade; across the Atlantic, President Clinton has launched a similar 'Million Solar Roofs' initiative. Announcing a goal of developing a $1bn solar business by 2010, BP Amoco hopes to play a large role in supplying these PV systems. BP Group Chief Executive Sir John Browne contends that renewables could meet 50% of global energy needs by mid-century, with solar playing a key role, reports *Judith Gurney*.

There are sound business reasons for investing in the solar industry. The technology has been tested and has been shown to work. Solar energy is environmentally friendly and, unlike wind or biomass, its use does not rouse vocal public objections. And finally, there has been considerable progress in enhancing the efficiency of harnessing electric energy from the sun and reducing the costs of doing so.

The most feasible use for all renewables is in the production of electricity, but power generation using hydropower, wind and geothermal resources is limited to sites where these resources exist in sufficient quantities and can be harnessed. Biomass composed of organic material stemming from plants, trees and crops can be transported for use, but the large volumes needed to produce significant quantities of electricity make shipment very costly. Sunlight, however, can be used to generate power on-site in almost all urban and rural areas – that is, solar energy can produce power at the point of demand.

Photovoltaics

There are two solar industry products – photovoltaics and solar thermal collectors. The latter are heat-absorbing panels filled with water which have a very limited application and require a sun-filled environment to function. Photovoltaics is widely seen as the product with greatest potential and is the one in which BP Amoco is involved.

PV cells are composed of a semiconductor material, often silicon, which absorbs photons of sunlight – infinitesimally small packets of radiant energy – and generate electricity. Cells are linked together to form flat-panel modules, the transparent covering of which transmits sunlight but protects cells from water and dirt.

PV modules, which can generate electricity even in moderate sunlight, are used as both a standalone electricity supply or in connection with an existing electricity grid system. As standalones, they supply power to industries and residents in areas that lack existing utility grid systems and often serve as the only means for lighting, water pumping, and telephone systems in remote locations in developing countries.

They also provide electricity for communications satellites, ground-to-satellite links, offshore oil rigs, fibre-optic transmission boosters and remote telecommunications are also used to power tractors, boats, cars and recreation vehicles.

Most analysts consider the major growth point for solar energy to be the use of PV modules in grid-connected areas, with conventional electric utilities providing back-up power when needed, supplying electricity to commercial establishments, hospitals, schools and residences.

Already a number of countries require utilities to purchase some of their energy needs from renewable sources and have initiatives designed to encourage the growth of a solar power residential market.

The Japanese and German governments generously subsidise residential rooftop, grid-connected PV installations. They offer loans for the purchase and installation of PV systems, and arrange for householders to receive a premium rate for any electricity that these PV systems produce in excess of their needs which is therefore fed back into the grid. In some parts of Germany, householders can rent out their roofs to entrepreneurs who pay for PV installation and receive the premium rate for electricity sent to the grid. The US government has tax credits and loans to encourage the installation of PV systems for homes or businesses, and California subsidises a portion of the installed PV systems costs.

BP Amoco solar ventures

The recent BP Amoco merger brought together two existing, separate solar energy businesses. BP set up a BP Solar division in 1981, and by 1998 this had a staff of 900, six plants in the US, Australia, India and Spain, sales in more than 160 countries, and a turnover of $95mn. Major recent projects include the installation of solar PV module panels at the athletes' village for the 2000 Olympics in Sydney, Australia, and a $30mn solar power programme for 400 remote villages in Philippines.

Amoco's investment in solar energy involved the Solarex company, purchased in 1983. It then formed a 50/50 partnership with Enron in 1995 that covered not only the Solarex plant in Frederick, Maryland, which manufactured polycrystalline cells and modules, but also the construction of a $30mn TF-1 factory, in Toano, Virginia, to produce thin-film modules. In 1998, Solarex had a staff of 600 and its turnover was $58mn. It was exporting approximately 70% of its production through a network of distributors in more than 55 countries and was also shipping semi-finished polycrystalline solar cells to plants in Australia and South Africa for assembly into PV modules. MSK Corporation, its distributor for Japan, had an agreement with Misawa Homes, a prefabricated housing manufacturer, to use Solarex modules in its Hybrid-Z homes.

In April of this year, BP Amoco bought out Enron's share of Solarex for $45mn. It then merged the operations of Solarex and BP Solar into a new unit, BP Solarex, Inc, with headquarters initially in Frederick, Maryland. Harry Shimp, a former executive of GE, was named Chief Executive Officer. The two formerly separate businesses were expected to continue to market and sell their respective products.

Competition

Aside from BP Amoco, whose products are expected to capture an estimated 18% of the PV market, there are three other companies with a major role in this industry. Preliminary 1998 figures show Siemens Solar with an estimated 14% market share and two other manufacturers, Kyocera of Japan and

Photowatt of France, taking an estimated 23% share between them. There are about 50 smaller manufacturers and a number of plants that assemble cells into modules. US establishments account for about half of all global production of PV cells, with close to a third of these made in California. The majority of US production is exported.

At present there are two main types of PV cells and modules, single-crystal or polycrystalline cells based on silicon, and thin-film cells which incorporate elements other than silicon, or silicon in a different form. Single-crystal silicon cells, the most expensive type to produce, are the most efficient electricity generators. Polycrystalline cells, which are made up of many small crystals, are less expensive than single-crystal cells to produce, but are less efficient, despite technological advances that have improved their efficiency.

Silicon-based single-crystal and polycrystalline PV cells and modules come with a 20-year warranty and represent a double-digit share of the industry. There are high costs, however, for the materials used in their production, partly because silicon is in demand for the production of all types of semi-conductors and also because the manufacturing process does not lend itself to automation. High-volume, low-cost, automated production is considered essential for the development of large PV solar energy markets.

Thin-film for the future

In order to cut costs, the major players in the PV solar industry have turned their sights on the development and production of thin-film PV cells and modules. These have lower materials costs and are generally lighter than standard polycrystalline products. Each player has come up with its own, patented thin-film technology which involves cheaper semi-conducting materials that have different light-trapping capacities and stability, and an automated or semi-automated manufacturing process. Current thin-film cells are not as efficient in converting sunlight into electricity as polycrystalline cells, but manufacturers seem confident that efficiency can be improved. They see thin-film PV modules as providing the break-through needed to capture a sizeable portion of the grid-connected electricity generating market.

BP Solar began producing Apollo thin-film PV cells and modules in 1998 in its Fairfield, California, plant. These are based on cadmium telluride and include a very thin glass material developed in conjunction with Pilkington Glass. Apollo cells are relatively cheap to manufacture, partly because this can be done at much lower temperatures than those required for silicon-based cells. In addition to Apollo products, the Fairfield plant also manufactures laser-cut crystalline PV modules and has an annual capacity of 10 to 15 MW of product – enough to power 3,000 new homes per year.

Solarex began manufacturing Millenia thin-film PV cells in mid-1997 at its TF-1 plant in Virginia. These are based on the use of amorphous silicon deposited as thin layers on glass in a patented technology which allows for the use of less silicon than polycrystalline cells, and the use of a semi-automated production process.

Siemens manufactures thin-film cells and modules in its plant in Camarillo, California, using a technology based on copper iridium diselenide – CIS – which, it believes, is a more efficient sunlight trapper than either cadmium telluride or amorphous silicon. Siemens also manufactures polycrystalline PV cells in Brazil, India and Portugal. Both Kyocera of Japan and Photowatt of France, the other industry leaders, also produce thin-film PV cells and modules.

A realistic view

Recent advances in technology, government incentives, and deregulation of electricity industries have helped to create a larger niche for solar power in the energy industry. PV modules have proved their ability to adapt to demand requirements and to work well in connection with established utility systems. They are particularly valuable in areas, such as Japan, where grid electricity is expensive and in developing countries which lack conventional utility electricity.

But at present there are very real limits to the use of solar power. Although costs have declined seven-fold since 1980 as a result of technological advancements, improved manufacturing processes and increased market demand, they must go a lot lower to compete with fossil fuels. An installed cost of $8/watt is now achievable in grid-connected systems in the short term, but $3/watt is considered to be the requirement for mass-market penetration.

Some cost reduction can be achieved by economics of scale in bigger production runs, and government subsidies may create a sufficiently large market to make this happen. But improved technologies are needed not only to lower costs but also to increase efficiency so that fewer modules will be needed to generate power and make solar energy more user-friendly.

Renewables in the US

The oil price crisis of the 1970s instigated a number of US government initiatives designed to encourage the development and use of renewable sources of energy. When oil prices receded, government interest also waned and costs brought large parts of US renewable industry almost to a standstill. Environmental concerns rather than oil prices drive the current interest in renewables, although fears of depleting oil resources also play a role.

US renewable energy resources, used primarily to generate electricity, only met about 8% of total US energy consumption in 1998. Hydropower was responsible for a 55% share of the renewable market and biomass for a 38% share; the contribution of wind, solar and geothermal was smaller.

There are a variety of reasons why the use of renewable energy sources has failed to catch on in the US. Hydropower, while inexpensive to generate, requires suitable water resources and has high initial capital requirements. It also faces environmental restrictions and competing uses for water. Biomass composed of plant organic material, mostly wood, has high costs associated with handling, transporting and storing of the large quantities needed to generate electricity. Most current biomass facilities are tied to industrial applications such as paper and paper products.

Only a few areas in the US are suitable for current wind turbine technology, and these are often constrained by land availability and transmission and access problems. Technological difficulties, public dislike, environmental concerns and the fact that US producers receive lower price level guarantees than those in other countries have limited growth in wind programmes.

Economically feasible, high-temperature geothermal resources are only found in the west of the country and solar thermal collectors require areas with a lot of sun. Solar photovoltaic modules have many advantages but still remain costly and require advances in efficiency in order to decrease the size and number of panels necessary to make significant inroads in the electricity generating market.

The future of renewables in the US depends on the response to Kyoto Protocol resolutions regarding restrictions on emissions from fossil fuels, especially on coal-burning utilities, the effect on the balance of payments of ever-increasing imports of oil, and the shape of the deregulated electricity industry.

The dating of reserve revisions

Dear Sir,

Professor Lynch, the President of the US Association for Energy Economics, describes studies of the world's endowment of oil and its depletion as farce.[1] In a sense he is right because many aspects of the situation are indeed farcical. But technically there is nothing particularly difficult in measuring the reserves of an oil field or recording the date on which it was discovered. In more general terms, few would deny the critical importance of studying the world's supply of oil, which drives agriculture, transport and trade.

So what is the explanation for the extraordinary gulf between those who see oil as a fixed stock in Nature that is being depleted and those who treat it as a flow controlled simply by market forces? It is hard to fathom, but one explanation may be the issue of dating reserve revisions. It boils down to a simple matter of philosophical logic divorced from any scientific, technological, economic or political factor.

When a child is born, no-one knows how tall it will grow, how healthy it will be, how long its life will last or how much money it will make, but we can say for sure that if it were not born, it would have no life of any sort. It is rather the same with oil: it has to be found before it can be produced. Seeds can be sown and crops harvested; but oil fields have to be found and then drained to exhaustion. They cannot be refilled. Different rules apply.

For most of their history, the inhabitants of Texas lived without oil, but in 1893 a well drilled for water at Corsicana unexpectedly encountered a shallow oil deposit. It prompted people to start looking for oil in Texas, and on 10 January 1901 the search was rewarded when a wildcat at Spindletop near Beaumont blew out. At first, no-one knew how much the new field contained; how much could be produced from it; what technology might be needed; or if its production could be sold profitably. But its discovery was the starting point that focused attention on all these matters. While knowledge of the field and expertise in producing its oil grew as the years passed, nothing would have happened had it not been found. Discovery was the critical step.

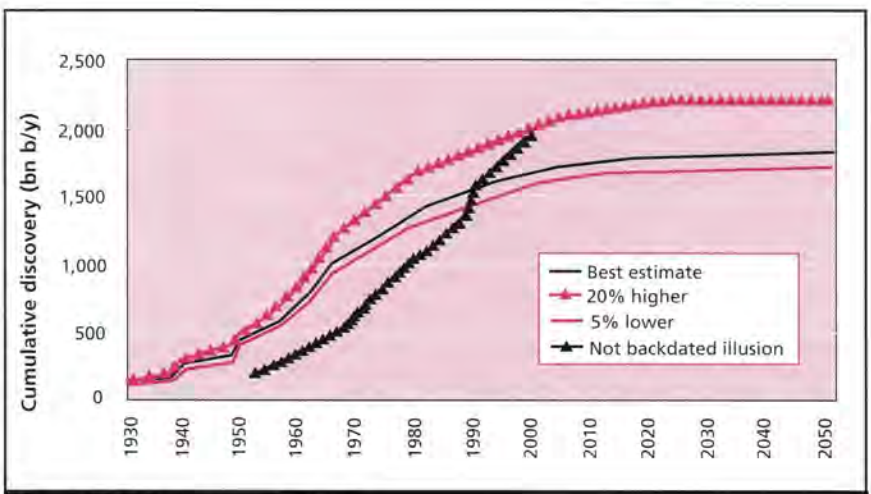


Figure 1: Backdating reserve revisions

The search for oil continued throughout the United States. It was not always successful, and many dry holes were drilled in places that wanted oil but did not have it. These holes really were dry, and stayed that way, no matter how much investment and technical effort was dedicated to them. It demonstrates a critical polarity: oil exploration succeeds or fails absolutely. The reason is that oil is a liquid, which flows to a few preferred spots in response to conditions in Nature. It differs from other natural resources in this respect. A coal deposit extends continuously over a wide area and the degree to which it is mined depends on the concentration of the coal seams, the costs of extraction and the market price. If the price increases, lower concentrations become viable. Oil is different because it is a liquid. It is either there in abundance or not there at all: the degree of concentration is not the issue.

It is a fairly simple matter for explorers to map the size of an oil prospect to determine both the volume of oil and the percentage that is producible. If the estimate is big enough, the prospect is then tested by drilling a borehole, known as a wildcat. This is the moment-of-truth – it either makes a discovery or it does not. Everything hangs on the outcome.

Once a discovery is made, attention turns to the problems of producing it. If it is onshore, the first well will be placed on production at once and start delivering an income. Offshore, production starts with the installation of the first platform. The precise size and recovery factor is now a secondary issue to developing a cash flow.

The company owning the field or discovery is required to report its assets from time to time. It knows the scientific estimates of the size of the prospect, which it can update with new information, but that is not necessarily what it reports for financial purposes. We move from scientific to commercial criteria.

The company is subject to Stock Exchange controls, which in practice are primarily aimed to prevent fraudulent excessive claims. The US Securities and Exchange Commission (SEC) rules allow the company to claim only the estimated reserves being drained by the producing wells, which are described as 'proved'. It means that as more wells are drilled so the claimed reserves go up, although nothing was actually added. Tax too raises its head because the rules very properly recognise that it is not income in a normal sense but a depleting asset. The lower the claimed reserves, the higher the depletion

allowance. For much of its life, no-one is particularly interested in how big the field may eventually prove to be. They just treat it as a daily business like any other, although in the back of their minds they do know that, one day, production will end. That knowledge, in turn, encourages them to start looking for another field in the hope of replacing their existing dwindling asset.

If we now step forward to the date when the field is finally abandoned, silence reigns and nobody is particularly interested in how big it was. That is history of no more than academic interest. But a historian somewhere might look back through the records and find how much oil had been produced as a result of the heroic discovery. He might go even further back and compare the outcome with the scientific estimate of reserves made by the explorers before the first well was drilled to see how good their judgement had been. Were their views valid? And he might track the technological progress over the life of the field as it grew from infancy to middle age when its production reached a peak before heading into decline. He might note the valiant attempts to keep it alive, before sadly closing the book when the last saline drip had been removed and it was finally laid to rest.

The determination and reporting of reserves evolve over the life of the field. The reporting is a subjective process reflecting the purposes of the reports, which may be variously scientific, commercial, fiscal or regulatory. But at the end of the day the size of the field is known absolutely when it is abandoned, being the cumulative production, which equates with the reserves before production began.

The whole world has now been combed for oil. Over 300 giant fields, each holding more than 500mn barrels, have been found and contain some 60% of all known oil in the full list of some 20,000 fields. When were these giants found? The oldest seems to be La Brea-Parinas in Peru, attributed to 1869. Peak discovery was in the 1960s; but very few giants have been found recently. The onshore came first, then the shallow offshore and finally the few deepwater areas having any promise began to deliver. This discovery pattern has much to say about how much remains to be found and produced.

Although in technical terms it would be easy to have a good idea of what these fields contain, no-one wants to tell us exactly what that number is because of all the many vested interests. But one thing they cannot hide is the discovery date, which is the most important element for all the reasons explained.

Figure 1 shows three estimates of world discovery: a best estimate; one 20% higher and one 5% lower. The overall trend is not much affected because if the finds were higher than we think the subsequent discovery trend has been, relatively, even worse. Superimposed on the plot is a curve showing the impact of failing to properly backdate the revisions. It is responsible for the misunderstandings by those who extrapolate it to show discovery surging ever upward which implies that the world will be flooded with oil and that prices will remain depressed. It has not only misled, but it has allowed others with motives to mislead to achieve their ends.

This perhaps explains the gulf between the two positions of the so-called Cornucopians and Neo-Malthusians. It has nothing to do with technology, science, economics or politics but is simply the logic of attributing reserves to the discoveries responsible for them. It is not the farce that Professor Lynch enjoys but rather a tragedy that we know and understand so little about the essential fuel on which our future prosperity depends.

Yours sincerely
C J Campbell

[1] Farce this time. *Geopolitics of Energy*, Vol 20, 12 December 1998, p9–12.

The urge to merge (2) – an outbreak of reality

After the feeding frenzy of the last few weeks, reality – in the shape of government regulators and political realities – is starting to intrude. This is likely to take much of the froth out of the sector and any further announcements – or rumours – of mergers will be greeted with much more scepticism and scrutiny writes *Chris Chew*.

The biggest blast of reality came from the EU Commission, with the announcement that it is planning a detailed investigation of BP Amoco's proposed merger with Atlantic Richfield (Arco). This took the market by surprise, as Arco's limited presence in Europe led most to expect the deal to be nodded through.

The second outbreak of reality was the realisation that national self interest is not yet dead and buried, even in progressive Europe. Elf's bid for Saga Petroleum was not welcomed by the Norwegian government, which had hoped for a 'Norwegian solution' in the shape of a cheap and agreed takeover by Norsk Hydro. Following an increased cost and shares offer from Norsk Hydro and its acceptance by Saga shareholders, the government has got its Norwegian solution! It remains to be seen if the shareholders come to rue their decision. As Louita Gericke of Panmure Gordon observes, the strength of local feeling should not be underestimated.

The third outbreak of reality was Texaco's admission that the merger with Chevron has 'no compelling basis' – despite the fact that it was Texaco that originally approached Chevron with a merger proposal. The merger talks were triggered by the burst of activity by Exxon and BP earlier this year, but the logic never seemed to go much deeper than the defensive benefits of size. There has to be real synergy, and not just one-off cost savings to make a mega-merger work, and this lack of synergy was rapidly exposed in the Chevron–Texaco talks.

But, although the current outbreak of reality is causing companies – and investors – to pause for thought, this does not mean that there is no underlying logic driving the industry's mating attempts. The reasons are varied but Nick Antill of Morgan Stanley, in a recent lecture at the Institute of Petroleum, identified some of the primary factors driving the consolidation of the integrated companies. Of these, probably the most important has been the industry's poor return on capital over the last five years, despite a generally buoyant oil price and an average 7% reduction in the number employed. The poor returns available from both the upstream and integrated sectors have been reflected in a massive underperformance by oil shares in the US and UK, with the US E&P companies in particular losing almost 80% of their value relative to the total market since 1989. In aggregate, the biggest companies have generated an average return on capital of 10.4% over the last five years, compared to a generally accepted target of 12%.

Part of the problem is that industry returns are inevitably heavily geared to the price of oil, but there remains a big disparity in the upstream success rates of the various companies (see **Figure 1**). Clearly, any company that suffers from a high replacement cost of its reserve base, plus a low replacement rate, will find its return on capital under pressure. The problem is compounded by the inherent tendency of upstream returns to be overestimated, as the true depreciation rate, that is the replacement cost, can only be known when the field is finally abandoned. This is a particular problem for companies involved in relatively few, but large, projects as the deteriorating in return on capital may be masked until too late. If this analysis is correct, then it is no coincidence that Arco and Mobil have already succumbed to the idea of a merger. But what about Elf?

Although less clear-cut in terms of the conclusions, the other area that has a major impact on the integrated companies' return on capital is their downstream success (see **Figure 2**). The Morgan Stanley research shows that there is almost a three-fold difference in downstream margins between the most profitable, Repsol, and the least profitable, TOTAL. In contrast to the situation upstream, however, the differential in margins tends to have a bigger structural element as companies are far more likely to be locked into their downstream operating environments. There is also much more heterogeneity in the way in which downstream activities are controlled and regulated by national governments. Nevertheless, there is some evidence that poor margins are related to the scale and concentration of downstream operations. Companies suffering from a combination of dispersed, low volume downstream activities plus a weak upstream position are therefore likely to be the real prime targets for consolidation through merger or acquisition, so place your bets.

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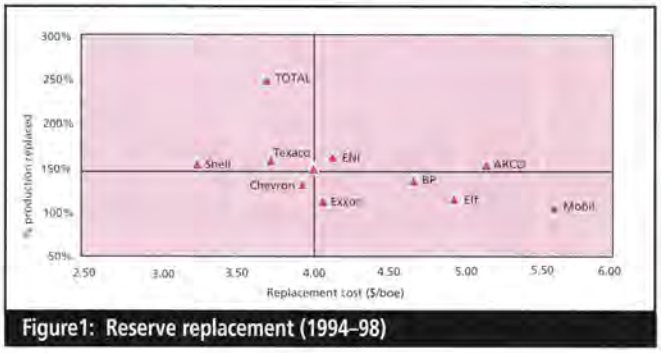

Figure1: Reserve replacement (1994–98)

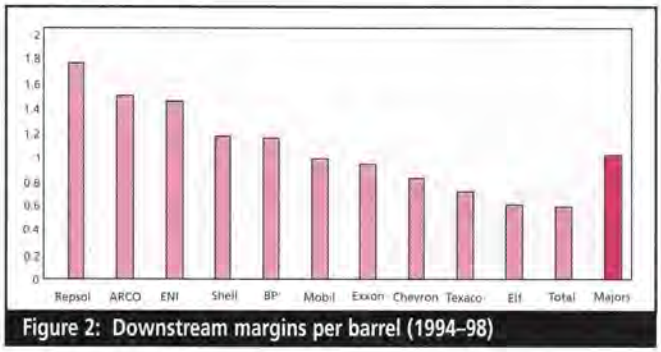

Figure 2: Downstream margins per barrel (1994–98)

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Telling oil from sand in well flows – online

A British company, Jorin, has just launched a continuous online analyser for produced water from oil wells. Sales and Marketing Director, Rick Gaskin, told *Petroleum Review* that it is the first analyser to be able to distinguish between oil and sand particles in the flow and to continuously monitor their size and shape.

Jorin's Chairman, John Roth, explained that the unit's ability to take direct measurements without making assumptions and its recording of individual particles would give operators considerable operational flexibility.

His view was that the unit would find wide application in areas such as the North Sea where depleted fields are producing well flows with high and rising water cuts. He confirmed to *Petroleum Review* that Jorin was at an advanced stage of negotiation with at least one major North Sea operator for the equipment and revealed that the sales price of the unit was 'around the £25,000 mark'.

He went on to explain that the ability to accurately measure, in real time, the amount of oil or solids in a process water flow would allow operators to make optimal use of separators and processing equipment. It would also improve control of produced sand as operators would have real-time data on which to make decisions on speeding or slowing well flows and on when to shut-in wells.

The unit would also allow informed judgements to be made about the suitability of produced water for reinjection into the formation.

The actual monitoring unit is a shoebox-sized stainless steel unit called ViPA through which the process (produced) water flows (see **Figure 1**). Inside this rugged stainless steel box is a flow-through cell (tested to 240 bar) and a video microscope which analyses any particles present, giving full information in terms of size, shape and relative quantity of each and every type of particle it sees. The particles themselves are shown on a screen (see **Figure 2**).

The ViPA differentiates between different types of particle using shape analysis to distinguish one sort from another. For example, oil droplets in water are spherical, while sand is crystalline and irregular. These different types of particle population can be clearly distinguished and viewed on screen.

The ViPA can also show trends, such as the gradual increase in concentration of oil or solid particles. Using data that has been gathered, the ViPA uses statistical techniques to predict the future trends within the process, allowing operators to avoid process problems before they occur, rather than having to repair damage that has already been caused.

Jorin was formed in 1998 by bringing together a team with considerable industrial and instrumentation experience. Technical Director Nick Roth has wide experience in technical development and production within the industrial instrumentation sector and with a major computer manufacturer.

Rick Gaskin, Sales Director, has previously worked in both the chemical and instrumentation industry, recently concluding a multi-million dollar contract with one of the major oil producers.

John Roth, Chairman, has extensive experience in chemical engineering and instrumentation, having introduced a number of new instruments and techniques, and has represented the industry at both national and international levels. One of the directors of the company is Wallace Grubman, known internationally throughout the chemical industry, having headed major companies both in the US and Europe.

Roth commented: 'The ViPA will help oil companies to run their production at optimum efficiency, allowing cost savings in chemical dosage, energy consumption and time. It costs very little when compared with what it can save. It is rugged, compact, easy to install and simple to run. Patents have just been applied for. In other words, this brand is new.'

Figure 1: Shoebox-sized monitoring unit

Customers already showing considerable interest include a major multinational oil producer, a leading supplier of separation equipment and a major consultancy group.

The ViPA, an all-new British product, once installed online, runs continuously and will help the oil producers safely to maintain optimum efficiency and production rates.

Tel: +44 (0)1252 861221
Fax: +44 (0)1252 861551

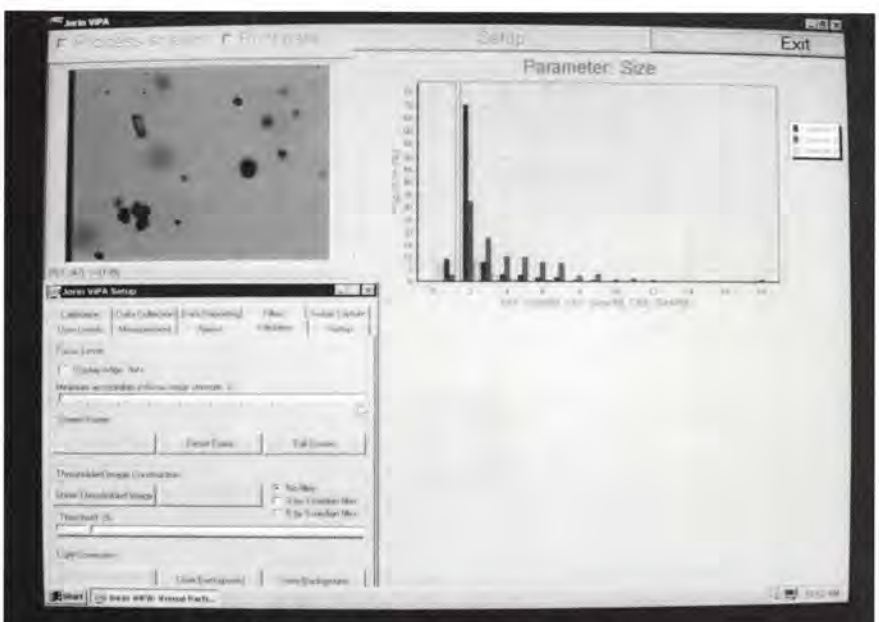


Figure 2: The particles present in the flow are shown on a screen

Land-based pipeline technology award for pipeline

Clock Spring Company has won the Pipeline Industries Guild award for the 'most significant contribution to land-based pipeline technology'. The company's pipeline repair technique uses a composite, resin bonded glass fibre sleeve for the permanent repair and rehabilitation of onshore high pressure oil, gas and petrochemical pipelines up to 1.4 metres in diameter.

Clock Spring is used to repair isolated and general corrosion defects of up to 80% metal loss, as well as mechanical and third-party damage such as dents and gouges. The repair is said to be stronger than the pristine pipe, allowing the pipeline to be returned to service at 100% of its maximum allowable operating pressure.

The system operates by transferring the hoop stress from the defect via a high compressive strength filler to the composite sleeve which is secured in place using an adhesive. The sleeve itself is sized and heat treated to suit the pipe diameter. The sleeve is said to be unique in that all the glass fibres are continuous strand and aligned in the hoop direction providing an installation tensile strength of over 175,000 psi.

The system provides a number of cost saving and safety benefits when compared with existing repairs (welded/epoxy sleeves, hot tap or cut outs), says the Pipeline Industries Guild. These include: no hot work or welding, no need to shut down the pipeline to make the repair, only two unskilled technicians are required to make the repair which can be made within 25 minutes, no heavy lifting or specialised installation equipment is needed, the system is versatile and can be used to repair elbows, girth welds and field bends, there is no shielding of the cathodic protection system, and the repair is supported by an approved software package which confirms the repair in accordance with ASME repair codes. In addition, once installed the Clock Spring coil is said to be totally benign, non-toxic and has no detrimental impact on the environment, the repair is permanent and prevents further corrosion growth.

Suitable for use in all environments, from arctic to desert conditions, the system is currently being developed further to enable its use for leak repair applications and to allow installation in open water environments.

Tel: +44 (0)1487 824449
Fax: +44 (0)1487 824451

Tracking system for vessels at sea

Racal has launched a new tracking system to provide fleet operators with reliable communications and cost-effective monitoring of vessels in even the most remote locations.

The Tracs-SAT/C Marine system has been developed for operators requiring a single system for the exclusive management of their vessels. Housed in a rugged, tamper-proof container, it uses Inmarsat-C satellite communications to relay position and status information between the vessel and a company control centre, and enables communications to be maintained worldwide.

Software is available which can receive input from onboard sensors and permits the automatic transmission of important vessel data such as engine performance, bunker levels and cargo condition – enabling the system to also serve as a management tool.

Tel: +44 (0)181 391 6511
Fax: +44 (0)181 391 1672

Cross-platform integration

Landmark Graphics Corporation has announced the availability of SeisXchange™, a cross-platform integration tool designed to make it easy to move seismic data and interpretations between Landmark's and GeoGraphix's integrated interpretation families. The software will enable E&P companies to deploy these seismic interpretation families on both NT and UNIX platforms.

Tel: +1 281 649 2941
Fax: +1 281 560 1586

Multi-tasking auto roughneck offers safer drilling operations

Maritime Hydraulics UK's new Type MH 1899 roughneck travels on rails welded to the drill floor on each side of the rotary table and is designed to automatically spin-in/torque-up and break-out/spin-out drill pipe (DP) and pipe collars (DC) from 31/2-inch DP to 91/2-inch DC.

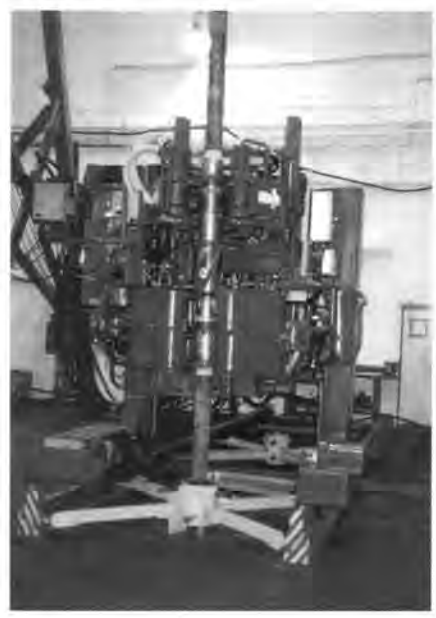
In addition, the hydraulic spinner can be swung out of the side of the roughneck to facilitate the make-up and break-out of stabilisers, cross-over subs and other bottom hole assembly equipment. The unit can also be mounted on a skidding system in order to perform mousehole connections which are out of the range of the roughneck's normal travel direction.

The roughneck's gateless torque wrench automatically sets the clamping force when torque is adjusted. It has a maximum make-up torque of 135,000 Nm (100,000 ft lbs) and maximum break-out torque of 169,000 Nm (125,000 ft lbs). The spinner head has a maximum spinning moment of 2,500 Nm (1,850 ft lbs) and rotates at 0–140 rpm (for 5-inch DP).

The machine has both local and remote controls to minimise risk to personnel during drilling operations. The local controls are located on the side of the unit. The panel includes two pressure gauges, one measuring the main pressure and one the consumer pressure. In addition, there is a make-up torque calibration valve and a large gauge showing the make-up torque.

The roughneck is also delivered with a hydraulic torque control and read-out panel for location in the driller's house. A remote operator's panel offering individual control of each function is also available for installation on the drill floor.

Tel: +44 (0)1224 870091
Fax: +44 (0)1244 874808



Pipeline liner project enters phase two

Following the successful completion of Phase 1 of the COREL (Corrosion Resisting Liners) joint industry project, Phase 2 has been launched with a budget of £225,000. The main objective of the 18-month project is to identify practical, cost effective lining systems for the prevention (or minimisation) of corrosion in hydrocarbon flowlines.

Proof of concept testing will lead to an early field trial of the most promising technology. Qualification of pipe liner technologies will provide large potential cost savings for operators: in the majority of corrosive applications, a carbon steel pipe with a thermoplastic (or similar) liner will be significantly (up to 50%) cheaper than utilising chrome steels and corrosion inhibitors.

An earlier thermoplastics linings joint industry project identified that liner collapse is the major technical hurdle preventing the adoption of this technology. Over time, gas permeates through the lining into the annulus between it and the steel host pipe, reaching a pressure close to that in the bore of the pipe. When pressure within the pipe is reduced, the expansion of the gas within the annulus can cause irreversible collapse of the lining.

Phase 1 of COREL identified five concepts with the potential to provide a means to effectively vent the annulus:

- Longitudinally externally grooved liner
- Perforated liner (internal venting)
- Rubber/elastic liners
- Longitudinal venting via insertion of profiled strip in the annulus
- Co-extruded liner

The first two concepts are being tested as a priority. Testing in Phase 2 will aim to answer the following:

- Can gas that has built up in the annulus between the steel pipe and the liner vent at a sufficient rate to avoid liner collapse on depressurisation?
- Does the liner concept provide adequate corrosion resistance?
- Can the liner be installed using a close-fit technique without compromising its performance?
- Will the liner be affected by rapid decompression?

A total of 10 companies, comprising operators, pipe-lay contractors, and pipe lining contractors and suppliers, are currently supporting Phase 2, and more are being sought.

For more information, contact Jenny Cambers, Senior Consultant, Offshore Technology Management.
Tel: +44 (0)1483 598000
Fax: +44 (0)1483 598010

Millennium Product status for slope indicator

ICL Technical Plastics's I-Tech slope indicator has been awarded Millennium Product status by the UK Design Council after improving the original 'bullseye' concept to meet current and anticipated needs of operational development in subsea exploration and production.

The device allows for accurate levelling of subsea equipment and oil production structures. It has been independently tested and certified to depths of 13,500 ft, thereby surpassing the tested 600 ft of the original steel design, states the company. The construction is now manufactured totally in acrylic in order to reduce weight, operator handling difficulty and corrosion problems while cutting costs.

Following the concept development, a number of new markets have presented themselves in levelling diving habitats, in laying pipe and many other instances where a quick, accurate check on level is required, states the manufacturer.

Tel: +44 (0)141 332 1331
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Flare gas monitoring

The new FCI GF90 mass flowmeter, now available from Allison Engineering, is designed for flare gas applications and can handle temperatures of between –73°C and +454°C. It monitors total gas flow to flare stacks as well as flow-through feed lines to the main flare header. An optional packing gland that permits hot-tap installation and retraction of the flow element without system shut-down is available.

Tel: +44 (0)1268 526161
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Corrosion measurement

After the launch of Cormon's new CEION™ corrosion measurement and management technology at the NACE International Corrosion Conference, production companies worldwide have made commitments to use the technology in trials and on imminent projects and that the technology will be commercially adopted. British Gas has ordered a long-life sub-sea probe for use in the North Sea and a process plant transmitter to be installed in Tunisia.

The simple ratiometric measurement employed by CEION can detect minute amounts of metal lost from a sample almost instantaneously, opening the door to real-time control of corrosion and erosion damage. In laboratory conditions the loss of a nanometer from a 1mm sample has been achieved. This is one-in-a-million resolution for an industry that is used to resolution of about one-in-one-thousand for metal loss measurements.

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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

Deputy Editor, *Petroleum Review*

61 New Cavendish Street, London W1M 8AR, UK

NEW Publications

Performance of Cross-Country Oil Pipelines in Western Europe*

(Available from CONCAWE, Madouplein 1, 1210 Brussels, Belgium). 20 pages.

This report (no. 6/98) reviews the performance of the 31,650-km network of cross-country oil pipelines in Western Europe, analysing reported spillage incidents by cause and recording the effectiveness of clean-up operations. Spillage performance in 1997 (0.19 spills/1,000 km of pipeline) is shown to have continued the long-term downwards trend. A total of 29 cm/1,000 km of oil was spilled during the study period. The publication also reports, for the first time, levels of inspection activity using intelligent pigs.

VLCC Supply/Demand & Profitability to 2010

(Available from Ocean Shipping Consultants, Study Sales Dept, Ocean House, 60 Guildford Street, Chertsey, Surrey KT16 9BE, UK). Price: £530 (UK); $930 (overseas).

The VLCC/ULCC (very large/ultra-large crude carrier) market faces a number of challenges over the next decade, particularly in light of the recent surge in newbuilding activity and disrupted demand growth in Asia due to widespread economic problems. Included in this report are detailed analyses and forecasts covering: oil consumption, production, refinery capacity and crude oil trade; VLCC/ULCC trade patterns and demand to 2010; fleet developments, including scrapping and new building forecasts to 2010; and freight rate developments and implied profitability for new and second-hand vessels.

Agequake

Paul Wallace (Nicholas Brealey Publishing, 36 John Street, London WC1N 2AT, UK). ISBN 1 85788 192 3. 266 pages. Price (hardback): £18.00 (UK) $25.00 (US).

A popular book on demographic change may seem unpromising and possibly even irrelevant to the oil and gas industry. In fact, Paul Wallace has produced a compulsive and highly readable account of how the ageing of the global population and particularly those of the OECD countries will fundamentally change and disrupt all aspects of social, political and business life. We learn that by 1998 fertility rates were below replacement rates in North America, Europe, Russia, China and Australasia and that over the last two years the UN has cut its global population projection for 2050 by 500mn people.

One of the great bonuses of reading the book is that it induces a new way of looking at many recent events and changes. Is the real reason for the prolonged stockmarket booms in the UK and US simply that the post-1945 baby boom generation is now at its investing peak as it anticipates retirement? Is the explanation of falling UK crime rates (and falling beer sales) that the proportion of men under 34 is at a historic low and falling?

The figures produced in the book (predominantly US and UK data) show that the intergenerational swings are large. In the 1995–2005 period in the UK, the 55–64 and 35–44 age groups increase by around 20% while those aged 25–34 fall by 20%. This must impact on corporations particularly if they try to maintain traditional age profiles.

Although the book does not address the specific problems of individual industries it helps to frame possible questions. For example, if there are more older people who drive less and consequently change their cars less often just at the point when there are fewer high mileage younger people – what will be the impact on fuel sales? Similarly is a recovery in Japanese economic growth even possible given that it has the oldest and most rapidly ageing population in the world?

Chris Skrebowski

Oil Markets to 2010: The Impact of Non-Opec Production

Peter Enav (FT Energy, Maple House, 149 Tottenham Court Road, London W1P 9LL, UK). ISBN 1 84083 065 5. 151 pages. Price: £495 ($792).

This report provides an in-depth assessment of oil development programmes in the major non-Opec oil producing countries from 1998 to 2010. Evaluating the extent and direction of future oil trade for Opec and non-Opec countries alike, it also reassesses world oil consumption patterns in the light of the Asian financial crisis. Country-by-country analysis includes historical data on production, consumption, imports and exports; current oil balance – production, imports and exports; oil development policy; potential regulatory, financial, political and environmental obstacles to development; projected oil production and consumption to 2010; and import and export projections to 2010 by destination and source.

Winning the Oil and Gas Game

Michael R Smith (FT Energy, Maple House, 149 Tottenham Court Road, London W1P 9LL, UK). ISBN 1 84083 124 3. 113 pages. Price: £395 ($632).

This report assesses the opportunities and threats facing the international oil and gas industry in the light of the recent oil price slump. It provides the reader with a strategy aimed at maximising the future worth of an oil and gas company while minimising its exposure to large expenditures of high risk capital.

** Available from the IP Library*

Latest from the Library

Library refurbishment – reminder

The IP Library at 61 New Cavendish Street will be CLOSED for refurbishment from 6 July. Although you will be unable to visit our facilities, you will still be able to contact us by post, telephone, fax and e-mail. We hope to reopen on 16 August 1999.

Recent additions to library stock

- *Asia-Pacific Petroleum Directory 1999*; incorporating the South East Asia Directory. 15th Edition. Pennwell Directories, Houston, Texas, US, 1999.
- *International Petroleum Encyclopedia*. Pennwell Directories, Houston, Texas, US, 1999.

Contact details

- Information queries to:
  Chris Baker, Senior Information Officer, +44 (0)171 467 7114
  Sue Tse, Information Officer, +44 (0)171 467 7115
- Library holdings and loans queries to:
  Liliana El-Minyawi, LIS Assistant, +44 (0)171 467 7113
- Careers and educational literature queries to:
  Octavia Leigh, Information Assistant, +44 (0)171 467 7116
- Website queries to:
  Catherine Pope, Webmaster, +44 (0)171 467 7112
- LIS management queries to:
  Catherine Cosgrove, Head of LIS, +44 (0)171 467 7111

Fax any of the above on +44 (0)171 255 1472 or e-mail **lis@petroleum.co.uk** Visit our website at **www.petroleum.co.uk**

Membership News

NEW MEMBERS

Mr A J Alwadani, Kuwait Aviation Fuelling Co
Mr A Anderson, Conoco Inc
Mr J W Anderson, Great Yarmouth
Ms H Ashenden, Norton Rose
Mr A Attar, Algeria
Ms C L R Back, Norton Rose
Mr R Bailey, London
Mr J Bengt-Erik, Scanraff
Mr V Bertuzzi, Vitol
Mr S J Bishop, Koch Supply and Trade Company
Mr J E Burton, Drigg
Mr D J Capper, London
Mr C P Conway, Tyco
Mr L J O Dada-Bashua, AMNI International Petroleum Development Company
Mr G Delsad, Vitol
Mr M G Donovan, Bristol
Mr N Fielder, Mobil Oil Company Limited
Mr G J Hine, Cape Engineers Limited
Mr C Hobbs, Norton Rose
Mr P Hopwood, Aberdeen
Mr I Jouldybine, London
Mr R Kamoto, Petroleum Control Commission
Mr K P Law, Hong Kong
Ms L Leatherbarrow, Montrose
Mr N J Lewis, Poles Apart
Ms H C R Logan, Norton Rose
Mr R G Longhurst, Lympstone
Mr J Lyon, CETCO Europe
Mr M Marshall, Falkirk College of Further & Higher Education
Ms K Masson, AUPEC
Captain P R Maudsley, Aberdeen College
Mr I B McVey, Bolney
Mr B Melzer, Resource Strategies (Asia) Limited
Mr V Morrell, Middlesbrough
Mr J Morris, Wirral
Mr R Morris, Robert Morris Building Contractors
Ms A F Plant, Norton Rose
Mr W A Powell, Southampton
Mr R Quigley, AUPEC
Mr P Rees, Norton Rose
Mr R R Rocca, Argentina
Mr A F Umar, First Bank of Nigeria
Mr V Volkov, Kingston-upon-Thames
Mr S A Wainwright, York
Mr N C Waters, Scomark Engineering
Mr A R Watson, Co Down
Dr L Wilkinson, Secor
Dr Y Yousfi, Algeria

NEW STUDENTS

Ms S Eslah, London
Mr I Handoh, University of East Anglia
Ms A Kurchenko, Dundee
Mr L DE J Rodriguez, London
Mr O Savane, London

DEATHS

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

	Born
Mr W W A C Chalmers	1903
Mr G C Dear	1925
Mr J W Fisher	1910
Mr T R Lester	1934
Mr F T Levi	1919
Mr J A Riddell-Webster	1921
Mr J B Usher	1911
Mr I C Wilkins	1937

NEW CORPORATES

Common Data Access Ltd, 1st Floor, Hans Crescent Mansions, 50 Hans Crescent, London SW1X 0NA, UK
Tel: +44 (0)171 584 8900 Fax: +44 (0)171 584 8744
e: cda-limited@compuserve.com
Representative: Mr M Fleming, CEO
Common Data Access Ltd is a no-profit, industry-owned service company whose objective is to create a common, complete and quality-assured UKCS dataset, shared by industry in accordance with agreed entitlements. Currently the system includes digital wireline log data, hard-copy well information and seismic navigation data.

Fort Vale AD, Southfield Street, Nelson, Lancashire BB9 0LD,UK
Tel: +44 (0)1282 440055 Fax: +44 (0)1282 440056
e: adsales@fortvale.com
Representative: Mr Andrew J Bishop, General Manager
Fort Vale AD is a manufacturer of couplings, connectors and valves for petroleum transfer through bottom loading operations. It manufactures nozzles and fittings for tankers serving the heating and lube oil sectors.

AEA Technology Engineering Software, 404 Harwell, Didcot, Oxfordshire OX11 0RA, UK
Tel: +44 (0)1235 436146 Fax: +44 (0)1235 434294
Representative: Ms J Backhouse, Sales Office Manager
AEA Technology Engineering Software is a leading supplier of engineering process design and plant design software through its wholly owned software companies: Hyprotech, EA-Systems, CFX and ncode.

Wells Offshore, 3E Beacon Industrial Estate, Hull Road, Withernsea, East Yorkshire HU19 2EG, UK
Tel: +44 (0)1964 615 476 Fax: +44 (0)1964 614 706
e: wells-offshore@msn.com
Representative: Dr Brian Wells, Manager
Wells Offshore specialises in the supply of medicines, dressings, medical equipment and pharmaceutical advice to the oil industry, both in the UK and overseas.

Process Plant Computing Ltd, PO Box 43, Gerrards Cross, Buckinghamshire SL9 8UX, UK
Tel: +44 (0)1753 893090 Fax: +44 (0)1753 893950
Representative: Dr R Brooks, Managing Director
Process Plant Computing Ltd provides truly independent management and technical consultancy to process plants worldwide with special expertise in the oil and gas industry.

Wood Mackenzie Consultants Ltd, Kintore House, 74–77 Queen Street, Edinburgh EH2 4NS, UK
Tel: +44 (0)131 243 4302 Fax: +44 (0)131 243 4472
e: name@woodmac.com
Representative: Andrew Bradley, Business Development Manager
Wood Mackenzie Consultants Ltd, a division of Bankers Trust International plc, are global consultants to the energy industry encompassing Upstream, Energy Markets and Downstream sectors. Wood Mackenzie provides tailor-made consultancy services on a wide range of capabilities including: industry and market surveys, corporate and strategic analysis, acquisitions and disposals. Complemented by Energy Research Products covering the European, African, Asia-Pacific, FSU and Latin American regions.

Unicorn Consultancy Ltd, Unicorn House, Burghill Road, Westbury-on-Trym, Bristol BS10 6NH, UK
Tel: +44 (0)117 9764748
Fax: +44 (0)117 9764140
e: UCSBristol@compuserve.com
Representative: Mr P Nichols, M&E Design Manager
Unicorn Consultancy Ltd are a leading property consultancy com-

Membership News

pany providing a comprehensive and specialised range of services to the petroleum industry ranging from detail design and project management to professional inspections and facility surveys. Unicorn's expertise includes fuelling facilities incorporating bulk storage, pipe line distribution, SCADA systems, aircraft re-fuelling and ship to shore transfer. At the consumer end of the market Unicorn is actively involved in retail engineering and forecourt design including site communications, electronic point of sales, wetstock management and IFSF.

Unicorn is also a major provider of architectural and building services to a presitigious client base, providing specialist engineering support, health and safety audits, energy reviews and environmental engineering. Unicorn has BS EN ISO 9001.

To find out how Unicorn can adapt their flexible range of services to meet your requirements, please contact Paul Nichols at the above address.

Manufacturers Merchant Bank, 2 Adeyemo Alakija Street, PO Box 74, Victoria Island, Lagos, Nigeria
Tel: +234 01 2617828 Fax: 234 01 2617760
Representative: The Managing Director
Manufacturers Merchant Bank plc is a financial institution primarily involved in merchant banking (investment) business, oil and gas project financing and oil services (downstream). Merchant Manufacturers Bank is involved in financing key products and services including export finance, long/short-term finance, treasury (management of funds), corporate finance and international operations.

Catalist, Richmond House, 22 Richmond Hill, Clifton, Bristol BS8 1BA, UK
Tel: +44 (0)117 923 7113 Fax: +44 (0)117 923 7166
e: nigel.catalist@netgates.co.uk
Representative: Mr Nigel Lang, Managing Director
Catalist maintains the definitive database of petrol stations. Eight site details include brand, address, volumes, ownership, car wash, shop, market shares and digital photographs. GIS and Intranet services are also available. Catalist has formed a joint venture company with GMAP called Categy. The aim is to provide a benchmarking system for petrol stations, giving each site a rating based on its location and facility for fuel, car wash and QSR.

PHH Vehicle Management Services plc, PHH Centre, Windmill Hill, Swindon SN5 6PE, UK
Tel: +44 (0)1793 884612 Fax: +44 (0)1793 886089
e: matthew.snelling@phh.co.uk **web:** www.phh.co.uk
Representative: Mr Matthew Snelling, Business Development Manager
PHH is the UK's leading vehicle management company, operating over 300,000 company vehicles and over one million fuel cards on behalf of its clients.

National Oilwell Inc/ Dreco Europe Ltd, 14 Waterloo Place, Pall Mall, London SW1Y 4AR, UK
Tel: +44 (0)171 631 3000 Fax: +44 (0)171 631 1667
e: info@dreco.com **web:** www.natoil.com
Representative: Mr Connie Watson, Vice President/Managing Director
Dreco Europe Ltd, a National Oilwell technology company, designs and supplies drilling, workover and coiled tubing rigs and associated equipment worldwide for land and offshore use. Equipment includes drawworks, mud pumps, power swivels, SCR systems, travelling equipment and rotary tables. Downhole drilling motors and specialised drilling tools are for rent and sale. Services include engineering and project management, EPC contracting, surveys, repairs and rig refurbishment.

Channoil Consulting Services (UK) Ltd, 6–8 Old Bond Street, London W1X 3TA, UK
Tel: +44 (0)171 495 6922 Fax: +44 (0)171 495 6955
e: consult@channoil.co.uk
Representative: Mr Stewart James, Director
Channoil provides consultancy services from the point of crude oil production to the point of product sale; whether marketing, manufacturing or transporting. Channoil consultants have a wealth of industry experience whose strength is in the combination of technical knowledge of industry hardware and infrastructure with commercial understanding of current markets.

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Tel: +48 22 628 99 68
Fax: +48 22 628 99 67
e: brog@broq.com.pl
web: www.brog.com.pl
Representative: Mr Michael Bichniewicz, Member of Board
Publisher of industry monthlies "Gas Market", "Petrol Station" as well as weekly information services "Polish LPG Market", "Polish Fuel Market" and "Polish Retail Market". Organiser of the international LPG forum (conference and exhibition) and Petroforum (conference and exhibition).

Smith Read Energy Associates Ltd, Hunstead House, Nickle, Chartham, Canterbury, Kent CT4 7PL, UK
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e: srea@easynet.co.uk **web:** www.srea.co.uk
Representative: Ms Karen Rhodes, General Manager
Business consultants to the oil and gas industry. Techno economics, corporate finance & strategy.

EVENTS Forthcoming

JULY

5–7 **London**
Financial Negotiation Skills MasterClass
Details: Hilary McCann, Euromoney Training
Tel: +44 (0)171 779 8753
Fax: +44 (0)171 779 8693
e: hmccann@euromoneytraining.com
w: www.euromoney training.com

5–8 **Singapore**
Understanding Commercial Refining and the Interface with Oil Trading
Details: Petroleum Economist
Tel: +44 (0)171 831 5588
Fax: +44 (0)171 831 4567/5313
w: www.petroleum-economist.com

8–9 **London**
Iranian Petroleum Summit 99
Details: SMi Customer Services
Tel: +44 (0)171 252 2222
Fax: +44 (0)171 252 2272

9 **London**
The Future of UK Marine Emergency Response
Details: IBC UK Conferences
Tel: +44 (0)171 453 5492
Fax: +44 (0)171 453 2090
e: cust.serv@ibcuk.co.uk

12–13 **London**
2nd West African Oil and Gas Summit
Details: SMi Customer Services
Tel: +44 (0)171 252 2222
Fax: +44 (0)171 252 2272

12–15 **London**
Iranian Oil and Gas Contracts Update
Details: Penny Richards, IBC UK Conferences
Tel: +44 (0)171 453 5491
Fax: +44 (0)171 636 6858
e: cust.serv@ibcuk.co.uk

12–15 **Durham**
Maritime Boundary Delimitation
Details: IBRU, University of Durham
Tel: +44 (0)191 374 7701
Fax: +44 (0)191 374 7702
e: IBRU@durham.ac.uk

13–16 **Malaysia**
Oil, Gas & Petrochemical Engineering
Details: Heather Edkins, The Montgomery Network
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Fax: +44 (0)171 862 2078
e: heathere.montnet.com

13–16 **Kuala Lumpa**
OGM 99
Details: Heather Edkins, The Montgomery Network
Tel: +44 (0)171 862 2073
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AUGUST

23–24 **Singapore**
Petroleum Trading and International Law
Details: Abacus International
Tel: +44 (0)1245 328340
Fax: +44 (0)1245 323429

25–26 **Singapore**
Petroleum Trading and Cargo Shortages
Details: Abacus International
Tel: +44 (0)1245 328340
Fax: +44 (0)1245 323429

25–27 **Vancouver**
Permeable Boundaries and Borders in a Globalising World: New Opportunities or Old Problems?
Details: IBRU, University of Durham
Tel: +44 (0)191 374 7701
Fax: +44 (0)191 374 7702
e: IBRU@durham.ac.uk

SEPTEMBER

6–10 **Dundee**
Contracts in the Oil and Gas Industries: Negotiating and Drafting
Details: CEPMLP, University of Dundee
Tel: +44 (0)1382 344300
Fax: +44 (0)1382 322578
e: cpmlp@dundee.ac.uk

7–10 **Aberdeen**
Offshore Europe 99
Details: Offshore Europe Partnership
Tel: +44 (0)181 949 9222
Fax: +44 (0)181 949 8193

13–14 **New York**
Oil and Gas in Brazil
Details: Jon Neale, CWC Associates
Tel: +44 (0)171 704 6742
Fax: +44 (0)171 704 8440

13–17 **Fife**
UK Oil and Gas Law
Details: CEPMLP, University of Dundee
Tel: +44 (0)1382 344300
Fax: +44 (0)1382 322578

15–17 **The Netherlands**
Reliability Conference: Oil, Petrochem, Power
Details: Global Technology Forum
Tel: +44 (0)1737 365100
Fax: +44 (0)1737 365101
e: events@gtforum.com

16–17 **London**
World Oil Prices
Details: Jon Neale, CWC Associates
Tel: +44 (0)171 704 6742
Fax: +44 (0)171 704 8440

16–17 **Geneva**
Petroleum Loss Control and Measurement Uncertainties
Details: GHB Consultant
Tel: +41 22 348 7378
Fax: +41 22 348 7978
e: ghbconsu@worldcom.ch

20–21 **London**
Oil and Gas in Angola
Details: Jon Neale, CWC Associates
Tel: +44 (0)171 704 6742
Fax: +44 (0)171 704 8440

20–24 September
London: *Planning Economics of Refinery Operations (PERO)*
Details: Pauline Ashby, The Institute of Petroleum

22–23 **London**
Gas-To-Liquids II
Details: SMi Customer Services
Tel: +44 (0)171 252 2222
Fax: +44 (0)171 252 2272

22–24 **Turkey**
Gas and Power in Turkey
Details: IBC Global Conferences
Tel: +44 (0)171 453 5491
Fax: +44 (0)171 636 6858
e: cust.serv@ibcuk.co.uk

23–24 **London**
Re-identifying and Meeting China's Oil and Gas Demand
Details: Jon Neale, CWC Associates
Tel: +44 (0)171 704 6742
Fax: +44 (0)171 704 8440

29–30 **London**
An Introduction to Offshore Engineering
Details: Bentham Technical Training
Tel: +44 (0)171 436 7500
Fax: +44 (0)171 436 2112
e: v_li@bentham.com

29–30 **London**
Gas to Liquids World Forum
Details: IBC UK Conferences
Tel: +44 (0)171 453 5491
Fax: +44 (0)171 636 6858
e: cust.serv@ibcuk.co.uk

29–30 **London**
Power Project Finance
Details: Euromoney Legal Training
Tel: +44 (0)171 779 8126
Fax: +44 (0)171 779 8599
e: brapetti@euromoneyplc.com

IP Conferences and Exhibitions

International Conference on

Gas to Liquids

London: 6 October 1999

There has been much publicity about the development of gas to liquids technology in the last 2–3 years. This International Conference will take a serious and critical look at the subject – assessing its viability from the point of view of technology, economics, environmental desirability and effectiveness as a vehicle for the use of 'stranded' gas.

The programme and registration form will be available this month

International Conference and Exhibition on

Offshore Marine Support (OMS '99)

Southampton: 12–13 October 1999

A joint IP/ABR Company Conference

The Conference will discuss developments in the offshore oil industry and the opportunities and challenges they present to marine support contractors in the coming decade. For the first time in many years, it will present a unique opportunity for naval architects, yards and vessel owners to present their capabilities and new ideas to the oil industry.

Exhibition and Sponsorship
An Exhibition of related equipment and services will be held in association with the Conference. To receive a copy of the Sponsorship and Exhibition brochure, please contact Sue Nixon in the IP Conference Department.

The programme and registration form is now available

3rd International Conference on

Recommissioning? Removing, Re-Using or Recycling Redundant Offshore Facilities

The Netherlands: 13–14 October 1999

The programme and registration form will be available in August

Workshop on

Health Effects of Fatigue on Performance

London: 21 October 1999

The Occupational and Environmental Medical Sub-Committee of the IP is organising this Workshop on the health effects of fatigue on performance. It will be restricted to 30 participants and will be of interest to health professionals in all sectors of the oil and related industries.

For more details or to book your place costing £100, please contact Jo Howard-Buxton at the IP on +44 (0)171 467 7127 or e: jhb@instpet.co.uk

Autumn Lunch

Guest of Honour and Speaker: Dick Cheney
Chief Executive Officer, Halliburton Company and Former US Secretary of Defense 1989–93
Savoy Hotel, London: 15 November 1999

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

It is expected that many companies will purchase tables and maximise the opportunity to entertain guests at one of the key social events in the industry year.

Please note that tickets are limited. Book now to avoid disappointment

International Conference on

Developments in Measurement and Loss Control in Oil Refineries

London: 7–8 December 1999

The programme and registration form will be available this month

Training Courses

The Institute of Petroleum is organising a portfolio of nine energy related training courses. Further information is available from Jane Hill, in the IP Conference Department. Tel: +44 (0)171 467 7105, Fax: +44 (0)171 255 1472 e: *jhill@petroleum.co.uk*

Programmes and registration forms for all events are available from:

Pauline Ashby,
Conference Administrator,
at the Institute of Petroleum

Tel: +44 (0)171 467 7100
Fax: +44 (0)171 255 1472

e: pashby@petroleum.co.uk

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

MOVES People

Kvaerner Oil and Gas has replaced its Chief Executive **Tore Bergersen**. The position will be temporarily filled by **John Sole**, head of the company's engineering and construction subsidiary in Houston, who will relocate to London.

TOTAL has re-elected the following Directors for another three-year term: **Jean Syrota**, Chairman and Chief Executive Officer of Cogema; **Michel François-Poncet**, Chairman of the Paribas Supervisory Board; **Lord Alexander of Weedon QC**, Chairman of NatWest Group; and **Bertrand Jacquillat**, Co-founder and Chairman and Chief Executive Officer of Associés en Finance. The Board also elected for a three-year term as Director **John J Goossens**, Chairman and Chief Executive Officer of Belgacom.

Cedric Brown, former Chief Executive of British Gas, and Dennis Cottrell, former Managing Director, have been appointed to the Board of Atlantic Caspian Resources. Brown is to become Non-Executive Chairman, and Cottrell Non-Executive Director.

The Board of Hungarian oil and gas company Mol has announced that **Gyorgy Mosonyi** will take over as its new Chief Executive, replacing **Zoltan Mandoki** who will remain with the company as a Member of the Board of Directors and Chief Administrative Officer. Mosonyi was previously Chief Executive of Shell Hungary.

Director of the UK Offshore Operators Association (UKOOA), **John Wils**, has been made an Honorary Professor by the University of Aberdeen. He will act as an adviser on oil and gas-related matters in the University's Department of Management Studies.

UKPIA has re-elected its President **Christian Cléret**, Managing Director of Elf Oil UK, for a second year in office.

***Donald MacCuish*, FInstPet, has been appointed as President of the Institute of Transport Administration. He has been an active member of the Institute for over 40 years, a Trustee, and Vice President.**

Atlantic Power has appointed **David Workman** as its new Managing Director. He succeeds **Robin Pinchbeck** who has been promoted to Senior Vice President, PGS Corporate Business Development. Workman's most recent position at Atlantic was as Director of Projects and Technical Services. Pinchbeck joined the company following an international career with BP.

Balmoral Group International has appointed **Gary L Brown** as its new President, and **Andy Bruce** as Vice President Finance. Brown was most recently Director of International Manufacturing with Halliburton Energy Services. Bruce has been with Balmoral for more than 10 years and was previously Management Accountant in Aberdeen.

Jean-Y Bernier is the new President of Ultramar Ltd. Bernier joined the company in 1997 to head its retail sales network and to oversee Ultramar's major investment programme in this sector. Previously he held management positions including Executive Vice President, C Corp, and Vice President, Maxi.

Jane Evans is the Institute of Petroleum's new Administration Assistant for Office Services/Membership.

... continued from p46

Finance oil price

Last month in the markets

After the excitement of the last two months, the rise in dated Brent of only 3% provided little in terms of market incentive and most share prices drifted in line with the oil price. The exception to this general trend was the (largish) band of companies involved in real or imagined take-over activity. The star performer was clearly Saga whose share prices rose by over 55%, reflecting the latest joint bid from Norsk Hydro and Statoil. The cash-and-paper offer is worth NKr 135/share and has now been accepted by Saga shareholders in preference to Elf's NKr 125 /share all-cash offer.

	Price (p) (11 June)	% Change One month	Comment
BP Amoco	1165	2.8%	
Shell T&T	489.75	4.3%	
Royal Dutch	£37.25	0.0%	
TOTAL	£81.69	2.4%	
Elf	FFr 140.5	-1.6%	Bidding for Saga
Enterprise	416	-2.6%	
Lasmo	128	-8.6%	Bidding for Monument
British-Borneo	170	-6.3%	
Monument	54.25	-8.4%	Lasmo bid
Norsk Hydro	£25.25	-8.2%	Bidding for Saga
Saga Petroleum	NKr 85	55.3%	Bid target (Norsk Hydro, Statoil, Elf)
Dated Brent ($/b)	16.17	3.3%	
FTSE100	6484.8	2.0%	
FTSE Actuaries:			
UK Oil & Gas	6311.8	2.9%	
Europe Oil	1126.5	2.3%	

Source: Financial Times, *press reports*

Last month in the markets: European oil stocks