Petroleum review october 2000



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ABBREVIATIONS

The following are used throughout Petroleum Review:

- $mn = million (10^6)$
- bn = billion (10^9)
- tn = trillion (10^{12})
- cf = cubic feet
- cm = cubic metres
- boe = barrels of oil
- equivalent
- t/v = 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.

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Front cover: The majority of UK forecourts ran out of fuel within four days of the start of the UK fuel blockade in mid-September 2000









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The Institute of Petroleum as a body is not responsible either for the statements made or opinions expressed in these pages. Those readers wishing to attend future events advertised are advised to check with the contacts in the organisation listed, closer to the date, in case of late changes or cancellations.

- kW = kilowatts (10³)MW = megawatts (10⁶) GW = gigawatts (109) kWh = kilowatt hour km = kilometre
- sq km = square kilometres
- b/d = barrels/day

ROUNFrom the Editor

Brutal lessons for European governments

For much of the 1990s oil supply concerns did not loom large for western governments and a complacent 'the market will sort it out' view became the conventional wisdom. The very low oil prices of 1997/98 were widely seen as a boon because they facilitated the economic boom and inhibited inflation. No government saw them as a threat because they inhibited investment and threatened future supply.

Now, soaring oil prices and the vulnerability of economies to supply disruptions are back with a vengeance and once again front page news. Those who lived through the 1970's oil crises are already suffering an acute sense of *dêja vu*. Oil stocks are low (exactly how low is an endless, and maybe pointless, debate), the northern hemisphere winter is coming and oil prices are high.

Opec has responded to the pleas of western politicians by raising its production ceiling by 800,000 b/d to 26.2mn b/d for the Opec 10 (excluding Iraq) (see p8). However, according to IEA, the Opec 10 were already producing 25.84mn b/d in August, so the 'additional' oil may be less than 400,000 b/d. Even this estimate may be optimistic as the new Opec quotas for Indonesia, Iran and Venezuela are almost certainly greater than the volumes they can actually produce.

All the other Opec members are now very close to 100% utilisation of operational capacity. In addition, much of the production coming back into the market is in heavy grades such as Saudi Medium & Heavy and Kuwait. These are economically unattractive as they are long-haul, high sulfur, low distillate yield streams. Rapidly tightening environmental regulation means desulfurisation capacity is tending to become the refining bottleneck. Hard to sell Middle East crude at a time of apparent oil shortage is not quite as strange as it seems.

High tax policy

All European governments, but particularly the UK Government, are feeling the heat generated by their high taxation policies for motor fuels. Opec doesn't like them (see p8), nor do European fishermen, farmers and road hauliers. Increasingly, the general public is starting to side with the protestors rather than the governments (although prolonged or repeated inconvenience may change this).

In the UK, motorists find it difficult to

reconcile the government's desire for a level European playing field for car prices with a desire to levy the world's highest motor fuel taxes.

At the time of writing the various European governments affected – France, UK, Belgium, Netherlands, Germany, Italy, Norway, Sweden, Finland, Slovenia, Poland, Ireland and Spain – were all acting independently rather than making common cause through the European Commission. At a time when the sovereignty of individual governments is more circumscribed than ever before, this looks to be a bad mistake. Europeans drive identical cars on identical fuels so multiple tax regimes seem an eccentric relic of past sovereignty.

The cost of just-in-time

There is also the, in many senses alarming, fact that virtually every business and enterprise is involved in minimal or just-in-time stocking. As a result any disruption to the supply of fuels servicing the system has a rapid and dramatic impact.

The fact that UK forecourts ran out of fuel in just four days shows how little stock is held outside the refineries and terminals, and how dependent filling stations are on near daily deliveries. In 1970 there were 23 UK refineries, 37,000 filling stations and 13mn vehicles on the road. By 1998 there were 10 refineries (Shellhaven has since closed), just under 14,000 filling stations and 27mn vehicles on the road. Put another way, the per vehicle stock held in filling stations is a fraction of the 1970 level. The rest of Europe is in a similar position.

Economists rejoice in telling us that oil is now less important in western economies, accounting for a smaller percentage of GDP. They also rejoice that the old economy is now being replaced by the new weightless, electronic economy. What they fail to point out, and what the UK stockout has just demonstrated, is that western economies are wholly dependent on regular transport deliveries, virtually all fuelled by oil products. As a result, and to date unrecognised, European economies have never been so vulnerable to oil supply disruptions.

The cost of outsourcing

Compounding the vulnerability of economies to oil supply disruption has cont'd on p56



Infield Systems is soon to launch its new online information service – InfieldOnline – with over 60,000 pages of up-to-date information on existing and future oil and gas field developments around the world. Infield claims to currently include data on 5,850 fields.

Jiskoot's website at www.jiskoot.com lists the company's capabilities and services and is also claimed to act as a comprehensive reference site for operators with sections giving the criteria for correct design in sampling, blending and multiphase metering.

A job vacancy scheme for the welding industry is soon to be available on TWI's JoinT website as part of an association between TWI and the Welding & Joining Society. To access the service, visit www.joinit-regional.grantapark.com and select 'News' and 'Jobs'.

Noble Denton is soon to launch its new website – www.nobledenton.co.uk – that will 'feature a library of resources for all those with an interest in the oil and gas industry, engineering or the environment.' The initial resources available will include an extensive database of downloadable papers and industry guideline reports, spot location reports, location specific seasonal weather trends and forecasts.

A new website seeking 'to give citizens around the world a voice in seeking a halt to global warming' has been launched by a coalition of 16 environmental organisations, which include the World Wildlife Fund (WWF), Greenpeace, Friends of the Earth, The Clean Air Network and Save our World. The portal – found at www.climatevoice.org – is initially being launched in English, but versions in French, Spanish and German are planned to follow.

PetroChina and China National Petroleum Corporation (CNPC) are planning to join forces along with the Hong Kong-based conglomerate Hutchinson Whampoa to build what is claimed to be the first e-commerce portal focusing specifically on the demands of the Chinese oil and gas industry. The site will initially act as an e-marketplace for all oil and gas products and related services in China, providing a range of trading, logistics, credit and other valueadded services.

Plimsoll Publishing has launched a new acquisitions service on the Internet at **www.whichcompany.net** The service will find and name companies that would be the best acquisition prospect in a chosen market and then provide 'projections' on how much hidden profit the prospects could achieve.

In Brief

NEWsstream

UK

Conoco has announced that production has begun from its Vixen natural gas field in the North Sea block 49/17a.

UK Energy Minister Helen Liddell welcomed first production from the Shelloperated Shearwater field as she officially inaugurated platform and processing facilities offshore in early September.

Wood Group Engineering has secured the \$5mn front end engineering design (FEED) contract for the BP-operated Clair field, located 60km West of Shetland. Work is expected to complete in 2Q 2001.

Following the Canadian company, Talisman Energy's decision to develop a small North Sea field off the Scottish coast, potentially 50 jobs could be created for fabrication workers at Barmac. The contract will involve the construction of a satellite pipeline system that will be used to link the company's Beauly field development to the nearby Balmoral field floating production unit.

Europe

The Norwegian Petroleum Directorate has announced a surprise oil find on Norsk Hydro's Ormen Lange gas field, discovered as the company was proving up field reserves.

The Norwegian Energy Minister's Gas Sales Committee has refused a gas sales contract for Statoil's Mikkel field. However, it has been recommended that Norsk Hydro's Vale field should be allocated a contract from 2001.

FX Energy has announced the commercial viability of the Kleka 11 well onshore western Poland. Production is scheduled to commence in November this year. Operating partner Polish Oil and Gas Company has agreed to allow access to its pipeline.

Two modules weighing 750 tonnes and 850 tonnes and built by Aker McNulty have been lifted into place on Statoil's Gullfaks C platform. Gullfaks C is being modified to start receiving gas from Gullfaks South and Rimfaks in 3Q2001.

The Norwegian Government has announced plans to launch a 17th

UK implements key Ospar decommissioning decisions

The UK Government has published new guidance notes for the decommissioning of offshore oil and gas installations. The document clarifies the procedures operators should follow when preparing decommissioning programmes for government approval. According to the UK Offshore Operators Association (UKOOA), this will 'help to simplify and speed up the process, as well as providing the framework that will ensure that the requirements of the Ospar Convention (Commission for the Protection of the Marine Environment of the North East Atlantic) are met.' fixed steel, five floating and two subsea) have been decommissioned in the UK since 1988, reports UKOOA. These have been mainly small-scale and most were removed to shore or re-used. 'As the North Sea matures, the removal of redundant infrastructure will become a more pressing issue, particularly for large structures of 10,000 tonnes or more. No installation of this size has ever been moved,' comments UKOOA.

The UK is said to be the first country in Europe to implement key decisions of the Ospar Convention that effectively ban almost all sea disposal of offshore oil and gas installations.

A total of 20 offshore installations (10

Satellite Accelerator fields announced

The first five undeveloped UK North Sea discoveries to be offered to the market place under the UK Government's Satellite Accelerator initiative have been announced. The initiative, a Pilotsupported project announced in June 2000, aims to 'unlock the door' to the development of a number of marginal, technically challenging or commercially challenging discoveries on the UKCS. The five fields are:

- 22/18 Wood discovery BP-operated marginal oil and gas find to the east of the Arbroath field.
- 205/26a Solan and Strathmore discoveries Amerada Hess-operated West of Shetland oil discoveries to the south of the Foinaven and Schiehallion fields.
- 211/21a Kestrel discovery Shell

Expro-operated northern North Sea oil find, adjacent to the Shell Exprooperated Tern field.

 30/01c Kessog discovery – BP-operated high pressure, high temperature central North Sea gas condensate discovery.

Amerada Hess, BP and Shell Expro will be opening up their data and ideas to the industry at large, inviting companies throughout the supply chain to offer innovative proposals for the development of these fields in a process to be facilitated by Logic. Cumulative reserves for the five discoveries are in excess of 200mn boe and could lead to as much as £500mn of new development investment.

Further information about the Satellite Accelerator initiative can be found at **www.logic-oil.com**

The world's largest single 'jack-up' built - the PUQ (production/ utilities/quarters) for the Elgin/ Franklin development en route to location in the North Sea. Photo supplied by International Protective **Coatings** who supplied the coatings used to protect the installation.



NEW_{pstream}

Jade contract award for Halliburton Subsea

Halliburton Subsea, a division of the company's Brown & Root Energy Services, has announced that it has been awarded a contract worth around £3.5mn for diving support vessel services by Phillips Petroleum on behalf of the North Sea Jade field owners.

The scope of the work – to be undertaken in a number of phases – commences later this year with the installation of the docking piles to assist with the Jade platform installation.

The main construction phase for the Jade project will take place during 2Q2001. It includes the installation of a large number of pipe-in-pipe spoolpieces, structures and umbilicals, together with the testing and commissioning of field facilities.

Initiative to convert natural gas into clean fuels

Chevron, together with the Nigerian National Petroleum Corporation, has announced the launch of a major initiative to convert natural gas into clean petroleum fuels and to significantly reduce the amount of gas being flared in their Nigerian joint venture operations.

Under the initiative, \$2bn will be invested in two projects – the Escravos Gas Project Phase 3 and the Escravos Gas-to-Liquids development – which are targeted for completion in 2005.

Dana advances offshore Mauritania

Following a successful review of technical work completed to date, Dana Petroleum has elected to extend its exploration work programme in all three of its major production sharing contracts (PSC) offshore Mauritania, West Africa.

Dana is operator of Blocks 1, 7 and 8, holding an 80% working interest in each. The PSCs cover a total area of approximately 34,000 sq km, representing over 40% of Mauritania's offshore petroleum licensed area.

First-half results for Elf Gabon

Elf Gabon has reported net income of \$92.6mn, an increase of 143% compared with \$39.6mn for the same period in 1999. Increases in price of Gabon crude oil to an average of \$25.59 against \$12.59/b compensated for the effect of a decrease in production. Production in 1H999 was 117,000 b/d compared with 95,000 b/d for the latter half of the year. The decrease was due to the decline of the Rabi field, operated by Shell Gabon and a 13% decrease in production from fields operated by Elf Gabon.

Capital expenditure was on the increase, from \$15.6mn for 1H1999, to \$19.5mn for 1H2000. The main concerns were: continuing studies on exploration areas; continuing development of the Atora field and work related to Baudroie Nord Marine (operated by Elf Gabon); and the drilling of two wells relative to the Increment B project on the Rabi field (non-operated).

Year Month	Oil production (av. b/d)	Av. oil price (\$/b)				
Jul	2,602,363	6,852	18.90			
Aug	2,645,493	6,604	19.93			
Sep	2,588,488	7,379	22.83			
Oct	2,666,146	9,380	22.03			
Nov	2,698,681	11,641	24.64			
Dec	2,634,050	13,054	25.64			
Jan 2000	2,645,841	12,900	25.63			
Feb	2,567,535	12,645	27.97			
Mar	2,606,250	12,306	27.27			
Apr	2,480,945	12,024	23.15			
May	2,213,942	8,904	24.15			
Jun	2,407,709	8,491	30.48			
Jul	2,345,970	7,256	28.89			

Source: The Royal Bank of Scotland Oil and Gas Index

North Sea oil and gas production

In Brief

Norwegian Sea licensing round in early 2001. Its North Sea round is to be launched mid-September this year, with bids accepted until mid-December.

Norsk Hydro has sold interests in six exploration and production licences offshore Norway for an undisclosed sum. It sold a 20% stake in PL244 and 9.3% in PL048b (Glitne) to Pelican; 20% in PL210 to BP; 10% in PL218 to Conoco; and 50% in PL035 and 25% in PL219 to Enterprise Oil.



Coflexip Stena has announced that it intends to divest up to 100% of its interest in marine salvage company Cal Dive International, subject to market conditions.

Transocean Sedco Forex is to acquire R&B Falcon in an all-stock transaction. The deal will produce the industry's largest offshore drilling contractor and the third-largest oil services company in the world with an equity market capitalisation of \$17.7bn. Transocean forecasts annual combined cost savings of some \$50mn within a couple of years of the acquisition.

Kerr-McGee has acquired all of Statoil's interests in 93 deepwater Gulf of Mexico blocks. The deal gives Kerr-McGee stakes in 33 new licences and increases its current working interests from 33.33% to 66.67% in 60 blocks.



Qatar General Petroleum Corporation (QGPC) is upping its original projection of 867,000 b/d of oil production for the next 18 months to 1mn b/d, reports Stella Zenkovich. The company is also about to evaluate bids for the \$100mn Khuff pipeline replacement contract.

Two degassing stations have been built at the West Qurna field in southern Iraq despite current UN sanctions, adding a further 250,000 b/d to production. The field has 15bn barrels of proven reserves.

It is reported that Kuwait's oil authority has announced a final shortlist of foreign companies from which to select an operator to aid in developing the country's northern oilfields. The list comprises Conoco, Chevron, Texaco, ExxonMobil, BP, Eni, TotalFinaElf and Royal Dutch/Shell.

In Brief

NEW_{pstream}

A new oil field, Changoleh, is reported to have been discovered in Iran. Reserves are put at 1.7bn barrels. A 800bn cf gas field, called Zireh, has also been found in the southeast of the country.

China National Petroleum Corporation (CNPC) is reported to have secured a \$85mn contract from the National Iranian Oil Company (NIOC) to drill 19 gas wells in southern Iran.

Russia & Central Asia

United Financial Group has reported that the Chaivo-6 well on the Sakhalin 1 concession has found oil and is estimated to contain sufficient quantities to justify development plans. To date Sakhalin 1 has found large quantities of gas.

An agreement has been reached between Itera, Russia's private gas company, and the Turkmen President to supply an extra 10bn cm of gas to Russia this year at a price of \$38/mn cm.

TotalFina Elf and Norsk Hydro will each sell a 10% shareholding in the Kharyaga development to Lukoil. TotalFinaElf currently owns 50% and Norsk Hydro 40%.

TotalFinaElf has announced the discovery of the Perpetua-1 well in Angola's deepwater block 17, approximately 200 km northwest of Luanda. The well produced 8,740 b/d of 20° API oil during initial production tests.

Asia-Pacific

United Financial Group reports that Gazprom and PetroVietnam have signed an agreement to develop what is variously described as a 1tn cf or a 1tn cm gas field offshore Vietnam in the Gulf of Tonkin. Development will not start until 2005. Sales will be targeted at the domestic market.

Austrian company OMV is reported to be planning to bring its Patricia Baleen gas field in the Bass Strait onstream in 2001. The field has just under 100bn cf of reserves.

Latin America

US company Olympic Oil is understood to be planning to start commercial operations at block 13 in the Sechura

ITF provides a boost to technological development

The UK Industry Technology Facilitator (ITF) has launched its first five collaborative technology development projects. Over £900,000 is to be invested by the ITF in new technologies that have the potential to make breakthroughs in North Sea drilling and production. This is the first step towards the target of committing £4mn to 16 new projects by the end of 2000.

The ITF was established as an initiative of the Oil and Gas Industry Task Force, now Pilot, and is funded by subscription by 17 member oil companies.

The companies to receive support are Maris International, Proneta, TWI, Alstom Power and W D Loth & Co. Their projects are outlined in the following paragraphs.

Maris, with the support of BP, Conoco, Shell Expro and BG International, is to develop a device to allow continuous circulation of drilling fluids while adding or removing drill pipe during the drilling process. It is said that this will improve safety, as well as save time and cost on all current top-drive rigs. It will also help to protect reservoir formations from potentially damaging downhole pressure fluctuations.

Amerada Hess, BP, Chevron and Shell Expro are supporting Proneta in the transfer of space technology into the oil industry. An imaging tool is to be

Banff oil field production vessel to be upgraded

The Ramform Banff floating production, offtake and storage (FPSO) vessel in the North Sea Banff oil field is to have its heavy weather performance improved by a modification programme. The vessel will be taken to the Blohm and Voss yard in Hamburg, Germany, by PGS Production who owns and operates the field facilities. Bilge keels will be fitted to the hull as well as modifications to the vessel's anchor handling system and topsides. It is expected that the work will take five weeks to complete with the vessel returning to service in November.

During winter storms of 1998 and 1999, the vessel experienced a degree of roll and pitch that exceeded operational requirements. The modifications are planned to reduce by about 50% the motion in both planes, allowing an improved production and availability record to be established in both storm and more moderate seas. developed that can see optically through crude oil. It is claimed that this will radically alter downhole inspection techniques with potentially large cost savings, and could lead to a wider range of oil industry applications.

TWI, supported by Shell Expro, Enterprise and BP, is to implement and test innovative coating techniques. Wear and corrosion have long been problems in plant and equipment offshore, and it has often proved difficult to reliably apply protective coatings to small components.

Unstable flow, known as slugging, is one of the major difficulties in developing and operating long subsea tiebacks. Alstom Power has proposed a methodology to monitor, predict and ultimately control slugging in real time. Amerada Hess, BG International, Shell Expro, BP and Marathon will support a short initial project investigating the methodology's feasibility and applicability.

Also in the subsea arena, W D Loth &Co will be developing an electric actuator for subsea valves. With the support of Conoco, Enterprise and BG International, it is to build a prototype that derives its motive power from thermal expansion of a working fluid.

More details about ITF can be found at www.oil-itf.com

Fusion awarded further West African E&P license

Australian oil company Fusion has been awarded a stake in an exploration license in a West African offshore area, controlled by the governments of Senegal and Guinea-Bissau.

The Croix du Sud license was awarded by the AGC Joint Commission which was established to administer petroleum and fishing activity over the maritime border zone by the respective governments.

The company's operating interest covers an area approximately 3,500 sq km, in both shallow and deepwater regions, and is situated in one of the largest leastexplored offshore basins in West Africa.

The license has an initial term of three years with two extension periods, each of two years. The company has committed to an exploration programme that involves an extensive seismic campaign followed by exploration drilling in each of the extension periods.

NEWsstream

Renewed interest in Gulf of Mexico leases auction

The US Minerals and Mining Services (MMS) auction held in late August for leases on offshore blocks in the Gulf of Mexico Western Region, which included deep and shallow-water acreage offshore Texas and deepwater acreage offshore Louisiana, attracted a lot more interest than the August 1999 auction, when oil prices were down. Sixty companies, compared with 41 a year earlier, participated. They submitted bids on 226 blocks, compared with 153 in 1999, offering \$153.7mn in high bids compared with \$94.6mn. The enthusiasm shown, however, was nowhere near that of the August 1998 auction, when 63 companies bid on 402 blocks, offering \$563mn in high bids.

The shallow waters of the Western Region are gas-prone and this year's auction clearly reflected the current US gas supply shortfall – natural gas is selling in futures markets at around \$4.50/mn BTU, compared to less than \$2.00/mn BTU in 1998. Some 57% of this auction's high bids were for OCS blocks with water depths of less than 200 metres, compared with 20% for blocks of the same depth in 1998.

Although deepwater bids accounted

North Sea installation completed

Amit Maritime Contractors has completed the towout and installation of Veba Oil Nederland's steel gravity base structure (GBS) in the Dutch sector of the North Sea. Veba will use the 24,000 cm capacity structure for oil storage.

The towout of the structure, constructed by Hyundai Heavy Industries at Ulsan, Korea, took approximately two and a half days, while the installation was completed in two days. Dredging contractor Boskalis will perform the final stage, adding a scour-protection rock layer, using a fall-pipe vessel, around the GBS.

'Guide' update for North Sea investors

Arthur Andersen has published its updated Guide to Oil and Gas Taxation in the UK. The report, specifically targeted at new entrants to the UKCS, suggests that both domestic and foreign investment into the UK North Sea is set to grow.

'Surprisingly, the North Sea has still not reached its peak production after almost 30 years. What is interesting, however, is the changing nature of new for almost two-thirds of the total sums offered, there were notably fewer bids compared with previous auctions for deepwater blocks with water depths of more than 800 metres. This doesn't necessarily indicate that enthusiasm is ebbing for Gulf of Mexico deepwaters, as there are good reasons for restraint on the part of companies. Most of the choice deepwater blocks in the Western Region are already under lease and companies are more concerned with exploring and developing their existing large deepwater inventories before the leases on these expire than they are with taking on more acreage.

Independent companies dominated the MMS auction. Unocal, Kerr-McGee, Amerada Hess and CXV Energy (a subsidiary of Canadian Occidental) each submitted high bids totaling over \$13mn, and they accounted for 41% of all high bids. Ocean Energy, Murphy Exploration & Production, Pioneer Natural Resources, Pan Canadian Gulf, Spinnaker and Devon rounded out the list of top ten bidders' high bids totaling more than \$5mn, and Kerr-McGee in partnership CXY Energy made the highest bid for a single deepwater block of \$10.5mn.

Development crisis

Petrodata Research has announced new findings that suggest that high oil prices may have come too late to avert both a failure in non-Opec oil supply growth and a new rig market shortage in 2001.

'High oil prices mean oil companies are awash with cash again and have been so for over a year now', said Petrodata analyst Maarten van Mourik at the Offshore Northern Seas Conference. However, the money is not being spent on drilling wells, but on buying back shares and competing with high growth technology stocks.

investors,' commented Nicholas Woolf, Head of Arthur Andersen's Energy Utilities tax practice (see figure on p56).

The company sees the new investors as the driving force in the North Sea in the future. However, there is a complex regime which new investors must understand in order to raise finance and manage their business successfully. The updated guide provides an overview of all necessary information for investors.

In Brief

Basin, offshore northern Peru, by November this year. Initial production is expected to be 15,000 cf/d of gas,

New oil and gas fields have been discovered by state-run Petroleum Development Oman in its south and central regions. Potential production is predicted to be 12,200 b/d of oil and 63mn cf/d of gas.

Texaco (30%), Phillips (40%) and PdVSA (30%) are understood to have awarded just over \$1bn worth of engineering, procurement and construction contracts for the Hamaca heavy oil project located in Venezuela's Orinoco Belt. Field reserves are put at more than 30bn barrels of oil. Production is expected to reach 190,000 b/d in 2004.



ExxonMobil reports that the Saxi-1 well located in block 15 offshore Angola, West Africa, has flowed 5,400 bld of oil.

The Sao Tome & Principe and Nigerian governments have agreed to jointly exploit disputed offshore oil reserves.

Lundin Oil of Sweden and Edison Gas of Italy is to jointly bid for blocks under offer in the latest licensing round of Libya's National Oil Corp.

The Moroccan National Oil Research and Exploitation Office (ONAREP) has announced that the recent discovery in the north-western Sidi Belkacem region is estimated to contain up to 10mn barrels of reserves. US company Lone Star Energy has also discovered 11 other oil fields in the Talsint region, northern Morocco. Reserves in both regions are reported to be between 50mn to 100mn barrels.

Reserves of around 600 mn barrels of crude have been confirmed by ExxonMobil's Nigerian division. The reserves are located in its Nigerian OPL 209 deepwater block offshore southeastern Nigeria.

The Yemeni authorities are reported to have signed a production sharing agreement for Sabatain block 20. Adair Yemen Exploration (30%) is to act as exploration operator on behalf of partners Occidental (50%) and Saba Yemen Oil Company (20%). Occidental is to assume operatorship of the block once commercial reserves are discovered.

In Brief

NEWS*ndustry*

UK

Traditional utilities have been missing out on e-business B2B opportunities, according to new research just published by international management, technology and systems consultancy, PA Consulting Group. The survey, which assesses the adoption of e-business technologies in the utilities sector in the UK, Australia and Scandinavia, states that companies are 'not-as-yet maximising the advantages of e-business to its full potential.'

Centrica has announced that 1H2000 earnings increased by 50% to £364mn compared with the same period a year earlier. The company's market share in the residential gas market in the UK was also reported to be just under 72%, with a further 3mn electricity customers on supply.

Europe

TotalFinaElf has reported that Group sales for 1H2000 have increased by 62% to euro 52.4bn. Operating income from business segments rose to euro 6,812mn, a 190% increase on last year.

French engineering group Technip and new associate Coflexip Stena Offshore have received their first joint contract. They have been awarded a \$20mn contract by PTT Exploration and Production to supply a temporary FPSO facility on the Bongkot gas field in Thailand.

Kvaerner has posted a 2Q2000 pre-tax profit of NKr145mn, compared with NKr46mn in the same period a year earlier. First half-year operating profit of NKr541mn showed an improvement of NKr84mn over the same period last year (before exceptional items).

Enterprise Oil has posted a 1H2000 operating profit of £477mn compared with £70mn for the 1999 period.

Hungarian Oil and Gas company Mol has announced that the Hungarian Anti-Monoploy Office has approved the its proposed partnership with Slavnaft. The acquisition is still subject to Slovakian anti-trust clearance, which is expected to be received by this autumn.

United force on climate change for Germany and the UK

A common goal between the UK and Germany is to see the Kyoto Protocol enter into force by 2002, ten years after the Rio Earth Summit, reports the UK Department of the Environment, Transport & Regions.

UK Environment Minister Michael Meacher and Jurgen Trittin, the Federal Minister for the Environment, Nature and Reactor Safety, Germany, joined forces in an article published in newspapers across Europe and Japan.

They both called for ministers around

Better response to oil spills

Following the implementation of the international oil pollution convention, OPRC 90, the UK's ability to deal with onshore and offshore oil spills has increased significantly believes Oil Spill Response. The convention, which came into force on 15 August 1999, requires compliant ports, harbours and oil handling facilities to prepare contingency plans, establish local and regional pollution response measures and to train and exercise their staff. the globe to show 'political will' to make the Protocol ratifiable at the 6th Conference of Parties to the Framework Convention on Climate Change at the The Hague, Netherlands in November.

The article discusses the make-up of the deal needed at The Hague and calls on industrialised countries to show leadership by cutting domestic greenhouse gas emissions and intensify dialogue with developing countries about working together to tackle climate change.

Aspentech and Air Liquide in alliance

Aspen Technology has announced a strategic alliance with Air Liquide, a leading supplier of industrial and medical gases and services. The two companies will provide joint solutions to optimise the manufacturing operations of Air Liquide customers in the process industries. This will include creating value for these customers by enabling them to realise the economic benefits of integrated plant manufacturing, supply chain and e-business solutions.

Findings look good for steam trap

Independent case-study ETSU 120 published its findings this month on the GEM Venturi Steam Trap. The study was funded by the UK Department of Environment, Transport and the Regions, and covers the trap's performance *in situ* for one year between August 1998 and August 1999. The findings report that the installation of the steam trap will provide up to 19% savings on fuel, a 19% reduction in CO_2 and NO_x emissions, low maintenance and no major operational problems. Suitable for use in oil refineries, the steam trap promotes itself as releasing a continuous flow of condensate from steam lines through a carefully-sized orifice combined with a venturi.

The manufacturer, Gardner Energy Management, claims the product is a permanent solution to steam trapping problems as it has no moving parts unlike conventional mechanical steam traps.



NEWShdustry

for offshore vessels

The requirement for more high-quality offshore vessels could increase with predicted upturns in the offshore industry, according to John Westwood of energy industry analysts Douglas-Westwood speaking at the Ship Design Conferece 2000 in Aalesund, Norway.

However, there are concerns about the age of the offshore vessel fleet. The average age of the total fleet is 20 vears old while 30% (over 1,000 vessels) are over 25 years old. This results in a fairly limited economic lifetime for the existing fleet and the unsuitability of current vessels with regards to new industry sectors such as deepwater and subsea operations.

Offshore vessels make up less than 4% of the world's total fleet of commercial vessels and because of their specialised role require a higher investment than any other vessel type.

Over the last five years the annual expenditure on offshore vessels has grown from about \$500mn to \$1.4bn, with most of the expenditure concentrated in Norway and Europe.

Douglas-Westwood forecasts that the next five years will see an increased demand for building new vessels, due to the industry shift to deeper waters and the age of the current fleet, while competition to build them will intensify with expanded concentration on European yards to build special vessels.

Growth in prospect | BP plans for for offshore vessels | UKCS unveiled

UK Energy Minister Helen Liddell has welcomed BP's substantial investment plans for the UK Continental Shelf (UKCS). Sir John Browne, BP Chief Executive, announced a \$900mn UKCS investment programme in 2000 as well a forecasting continuing rising capital investment over the next three years. Liddell said: 'new investments from BP is both welcome and timely, coming in the wake of other significant announcements heralding more activity in the North Sea.'

Investment plans comprise an imminent award of an engineering design contract involving a \$750mn projected investment by BP and partners in the Clair oilfield West of Shetland; confirmation of the Magnus enhanced oil recovery project (a \$500mn investment); the East Foinaven satellite field development (\$120mn); plans to provide electrical power to offshore fields from onshore generation, with benefits in terms of safety, reliability and the environment; a new 'infrastructure portal' developed by BP for the industry which will help facilitate the development of small discoveries such as Talisman's Beauly field; a fibre optics communications link between Scotland, the central North Sea and Norway; and plans to begin acquiring 4D seismic technology over BP-operated UKCS fields to create new development opportunities, enhance production and recovery, and extend field life.

Opec raises production ceiling

At its 10-11 September meeting in Vienna, Opec agreed 'to further increase overall production by 800,000 b/d applicable from 1 October.' The individual countries new quotas are listed in the accompanying table.

Opec expressed its dismay that 'the governments of the European Union nations fails to recognise the role which their excessive domestic taxation of petroleum products plays in the high pump prices being paid by consumers,' and stressed that only '16% of the revenue from a barrel of refined oil in Europe goes to oil exporters, the remaining 84% comprising taxation and the take of refiners and marketers."

The Organisation welcomed the opening of dialogue with the European Union and other consuming nations, considering a continuous exchange of views on the oil market situation to be in the interests of both producers and consumers.' The next ordinary Opec meeting will take place in Vienna on 16 March 2001.

Country	New quota b/d							
Algeria	836,600							
Indonesia	1,358,600							
Iran	3,843,800							
Kuwait	2,101,000							
Libya	1,404,200							
Nigeria	2,156,600							
Qatar	678,800							
Saudi Arabia	8,512,200							
UAE	2,289,400							
Venezuela	3,018,800							
Total Opec 10	26,200,000							

North America

In Brief

Centrica has completed its C\$912mn acquisition of Direct Energy Marketing in the US, marking the first step in its international development strategy.

The US is being urged by Washington research body, the Worldwatch Institute, to implement stiff petroleum product tax increases as a way of reducing the potential for punitive oil price increases.

It is reported that US oil firms Chevron and Phillips Petroleum are close to agreeing a \$55bn merger with a decision reported to be finalised by the vear-end.

The New York Mercantile Exchange (Nymex) has selected Andersen Consulting to act as the program manager and integrator for enymex(sm), the Exchange's new Internet venture.



Oman is understood to have reduced taxes on foreign-owned businesses in a bid to boost foreign investment in the country and diversify the domestic economy away from oil and gas revenues which accounted for some 70% of its income last year.

Russia and Central Asia

Russia is reported to have announced plans to privatise stakes in 11 companies in 2001, including a 19.68% stake in Slavneft, 25% plus one share in Rosneft and 3.3% in Gazprom.



The Chinese Government is reported to be considering setting up a strategic oil reserve to prevent soaring crude oil prices from undermining its economy.

Shell is reported to be seeking New Zealand antitrust clearance to acquire the New Zealand operations of Fletcher Challenge Energy. Shell proposes divesting a range of assets in the merger, including Fletcher Energy's Challenge Petroleum fuel retailing division and its New Zealand Refining operation. It also proposes to sell Fletcher's stake in New Zealand's undeveloped offshore Kupe gas condensate field and its interests in the onshore Taranaki Kapuni gas field.

In Brief

NEWSwnstream

UK

Bibby Line has ordered a 35,000 cm LPG carrier from Hyundai Heavy Industries in Korea and has an option for a further vessel. The first vessel is scheduled for delivery in November 2002.

River Tyne based shipyard Swan Hunter is reported to have won a contract to build the topsides for Kerr-McGee's FPSO destined for the North Sea Leadon field.

Europe

Vopak has announced that HAL Holding has increased its interest in the capital of Vopak to 29.05% and thereby its voting right to 25.76%.

European independent oil refining, marketing and logistics company, Petroplus has announced that 1H2000 net sales are up 199% to euro 1,407.8mn. The company completed the acquisition of the 68,000b/d refinery in Cressier, Switzerland, and associated assets from the Royal Dutch Shell Group on 1 May 2000. Associated assets include oil products storage facilities, Shell's wholesale commercial sales businesses in Switzerland and certain interests in pipelines supplying the refinery with crude oil.

The Board of Directors of TotalFinaElf has approved the making of an exchange offer in Belgium for the 1.24% of PetroFina shares not held by the Group.

North America

ExxonMobil has announced that a new double-hull very large crude oil carrier (VLCC) – the M/T Hawk – was delivered for leasing to a Trust established by Marcare Shipping Company, a joint shipping venture between subsidiaries of ExxonMobil, the Onassis Group and Petros J Goulandris Sons Group. The ship, the first of two sister vessels to be leased to Marcare, will be chartered by International Marine Transportation, which is a subsidiary of ExxonMobil in the UK.

KSS Group has announced that an agreement for a pilot project at 29 company-operated stores has been reached with Chevron Products of the US for the use of KSS' PriceNet™ system for the pricing of fuel products.

From TV station to service station

Forecourt Television (FTV) is seeking admission to float on the Alternative Investment Market (AIM) and is looking to raise up to \$10mn to fund ongoing development. The Group sells advertising spots on large television screens in petrol station forecourts. To date, 165 forecourts within London and southeast England have fully functioning TV screens, with 300 operational sites envisaged by end-2000 and 1,000 sites across the UK planned by end-2002. The Group has possible future expansion into parts of Continental Europe.

The management team of the company includes: Tony Vickers as Executive Chairman, formerly Group Sales & Marketing Director, BSkyB, and Alan Bryson, Chief Executive, formerly the European Sales Director at NBC (Europe) Ltd.

Philippine power project

BG International reports that its First Gas Holding joint venture's 1,000-MW Santa Rita power project in the Philippines has entered full commercial operation. Power generated from the \$890mn project is being supplied to the Manila Electric Company, the country's largest electricity distributor, under a 25-year contract.

Santa Rita is initially operating on condensate fuel until the Malampaya gas field offshore Palawan Island comes onstream in 2001. Under a gas supply agreement, Shell and Texaco will provide Malampaya gas to fuel the power plant for 22 years. The Santa Rita plant, together with the 500-MW San Lorenzo power project that began construction in June and is due to be commissioned in 2002, forms a key component of the Philippines strategic Malampaya Gas-to-Power project.

A nation of 'ghost stations'?

According to specialist property advisers Nigel Lawrence Partnership, the country's petrol stations are closing at a rate of 11 a week. Reasons given by the company for the trend are: long-term downward pressure on petrol profit margins; the increasing dominance of supermarket stations and the state of the property market. The Partnership also predicts the closure of more garages for good if the current fuel blockade continues for any length of time.

Move to use hydrogen as fuel

Speaking at Hyforum 2000 in Munich, Royal Dutch/Shell Group Chairman Mark Moody-Stuart said that 'more cost-efficient transportation and significant cuts in CO_2 emissions are among a range of benefits that using hydrogen as fuel can offer.' 'Onboard fuel cells could be powering cars, trucks and... even heavier vehicles such as trains and ships within decades. Stationary fuel cells could be efficiently and cleanly powering homes and businesses,' he continued. He also called for a public debate on the issues facing the introduction of hydrogen as a fuel for vehicles and power generation. The move to hydrogen would present significant challenges in storage and transportation. Shell believes that for the transition period, hydrogen from natural gas or gasoline is the best solution.

'Some companies have suggested the use of other transition fuels such as onboard methanol to hydrogen conversion. Such fuels would require significant infrastructure investments, which would be difficult to justify with what could be short-lived solutions... Health, safety and environmental impacts of such fuels would also need to be considered,' said Sir Mark.

TankShare scheme looks set for success

Total Butler subsidiary Power has committed itself to use UK haulier Suckling Transport's new TankShare scheme for its 60 forecourts in the East Anglia region starting this month. The pilot TankShare scheme started in April this year and so far 12 companies, including Power, have used it. The others are Bayford & Co, Bayford Anglia, Phillips Petroleum Products, Futura Petroleum, Murco Petroleum, Spot Petroleum, CYMA Petroleum, Browns of Buwell, CPL Petroleum, Linton Fuels and Airport Energy. The fleet is expected to comprise of four new 41-tonne DAF FTG 85.430 CF trucks together with four 33-tonne artics and three 8-wheeled rigids. An order for new tank trailers has been placed with Heil Trailers. The official launch was set for 12 October. It is reported that a further 10 companies have expressed an interest in participating in the scheme from this date.

NEW_{Swnstream}

Joint partnership into UK energy distribution

Touchstar Technologies, supplier of handheld computers to the energy and fuel distribution industry, has secured a partnership with engineering and transport specialist George Meller.

The deal will allow the two businesses to develop and install onboard mobile computing systems to distribution vehicles serving the petroleum, fuel oils, bulk and cylinder gas, and aviation refuelling systems.

The partnership will combine the IT and solutions expertise of Touchstar Technologies with the engineering knowledge of George Meller. It will be led by Michael Eagleton who joined Touchstar from George Meller to oversee the joint venture service.

George Meller, part of the Axflow Group, has been installing the Touchstar Technologies, flagship TouchPC device – a durable, handheld computer designed for easy use in hazardous environments – into petroleum vehicles since 1997.

The partnership will provide energy

A trio of trucks for Phillips

Suckling Transport has received an order for three new urban artics from Phillips Petroleum Products with delivery expected before the end of the year. Two of the vehicles will replace eightwheeled rigid tankers at Grays and the third will be an additional tanker based at Theale in Berkshire.

In the interim, to help meet demand at Theale, a rigid vehicle has been deployed from Grays until the new vehicles are delivered.

The vehicles are DAF 75.290CF tractor units with Heil 28,000 litre tank trailers. The trailers will be capable of metered delivery both on bulk and through the hose reel. The tanks will be built to the new 'sealed delivery system' specification, which will eliminate the need for drivers to dip the tanks.



www.petroleum.co.uk



distribution business customers with an increased range of end-to-end IT solutions, drawing on a worldwide network of experts and over 10 years' experience.

German fuel duty increases

The German Government has asked the EU Council of Ministers for permission to charge an additional 3 pfennigs per litre on duty for petrol and diesel that has a sulfur content of more than 10 ppm from January 2003 to December 2005. It needs Brussels' approval as EU law insists on flat rates of duty for fuel. It already has permission to charge extra duty on fuel with more than 50 ppm sulfur content from November 2001, reports *Keith Nuthall*.

Georgian transit rates

Georgia is to be paid no less than \$52mn/y for 40 years from 2004 for Caspian oil transiting the planned 1,737-km long Baku–Ceyhan pipeline, two-fifths of which runs though Georgian territory, reports *Stella Zenkovich*. A further 468 km of the pipe-line runs through Azerbaijan and the remaining 1,034 km through Turkey.

The transit rate through Georgia is to be fixed at \$0.89/t in Phase 1 of the project, from 2004–2008; at \$1.94 in Phase 2, from 2009–2018; and at \$1.26/t in Phase 3, from 2018–2043, according to Giya Chanturia, President of the Georgian International Oil Corporation.

In Brief

ExxonMobil is rolling out a new 'On the Run®' branded convenience store in both its Exxon and Mobil-branded service stations in the US. The stores, some of which will be as large as 4,000 sq feet, will offer a wide variety of products including an On the Run café. It is planned to extend the new stores across the company's worldwide network in the future.

Syntroleum is to begin offering its licensees access to proprietary hydrocracking technology optimised for converting synthetic crude oil into ultra-clean, sulfur-free synthetic transportation fuels, primarily diesel and jet fuels. The technology is claimed to operate at lower pressure and require less hydrogen than is normally required for hydrocracking conventional crude oil.



Alstom of France has secured a \$31.8mn contract from Bahrain Petroleum Company (Bapco) for the upgrade and rehabilitation of the Sitra refinery in Bahrain.

National Industrial Gases, an affiliate of Saudi Basic Industries Corporation (Sabic), has started up a major expansion project at its Al-Jubail complex, including a new air separation plant and a rare gases extraction unit to produce krypton-xenon for the first time in Saudi Arabia.

Star Energy Resources, based in Jebel Ali, UAE, has awarded a contract to CBI Eastern Anstalt to add three oil tanks with an additional capacity of 90,000 cm to the existing 21-tank, 520,000 cm capacity complex.

JGC Corporation of Japan has been awarded the downstream gas contract for the FEED package at Oman's Sohar refinery, reports Stella Zenkovich. The main construction contract is due to be awarded shortly.

Russia and Central Asia

Having refused to countenace any involvement with the Shell development of the TransCaspian pipeline for some considerable time, Turkmen President Niyazov has changed his mind and now wants the project to go ahead, according to the United Financial Group's Russia Morning Comment. 'His concerns now centre on whether – because it competes with Blue Stream – Russia will refuse to buy Turkmenistan's gas as a penalty on

In Brief

the Central Asian country,' comments UFG. 'The pipeline has essentially become a sideshow since Gazprom's Blue Stream will be completed ahead of it and the Russia gas company will secure the baseload gas demand in Turkey.'

The Islamabad Government has announced the deregulation of high speed diesel imports by the private sector by December, saving state spending of approximately \$1bn/y.

Century Resources – a \$3.67mn compressed natural gas (CNG) joint venture project launched by Pakistan State Oil, Shell Pakistan and the Adamjee Group – is to set up five CNG refuelling and vehicle conversion stations in Karachi and Hyderabad. Plans are to set up additional sites in other cities in the future.

The Russian Government has reimposed export restrictions on fuel oil and gasoil to ensure sufficient supplies during the forthcoming winter season.

Asia-Pacific

Shell is expected to sign a \$4.3bn petrochemical venture with China National Offshore Oil Corporation (CNOOC) in October. The project centres on a new 800,000 t/y ethylene producing plant in Huizhou in Guangdong Province, due onstream in 2005.

Pakistan is reported to be about to embark on a \$700mn drive to promote the use of compressed natural gas (CNG). The phased programme involves converting over 250,000 vehicles to CNG and building 250 new CNG service stations across the country over the next five years.

NEWSwnstream

Cut diesel duty by 15p now says FTA

The Freight Transport Association has called on the UK Government to cut the duty on diesel by 15p/l. The Association says that the industry's long-standing talks with the Government have reached the point that the Chancellor and the Treasury can no longer delay action on the issue but must make positive decisions to cut the tax.

FTA Deputy Director General Richard Turner says: 'Although there is an overwhelming economic case for a cut in industrys essential fuel bill right now, a cut of 15p/l would still leave the UK with the highest price diesel in the EU. It is obvious that such high taxes overlaid on exceptionally high oil prices constitute an unnecessary own goal. The rising world price of crude oil means that it is urgent and vital that a cut is made without delay.'

The FTA says there are six fundamental reasons why diesel duty should be reduced:

1. Diesel duty has suffered from seven years of over inflation duty increases (1993, 23p/l; 2000, 48p/l).

 UK pump prices are by far the highest in Europe (82p/l UK; 45p/l Spain).
 The enormous difference between the duty rate in the UK and elsewhere is leading to smuggling and related crime.

4. The importance of diesel is recognised everywhere else in the world but not in the UK.

5. World oil prices rises have hurt and will hurt more.

6. Other governments have acted to help their industry – the UK has not.

The FTA says that it is essential that industry must now comprehensively provide MPs and Ministers with detail and evidence of the harm that inaction is causing to their business. They believe that blockades and civil disobedience are not the way to find a resolution to the very serious problems faced by the transport industry and industry at large. FTA remains committed to strong and informed dialogue with government.

The International Road Transport Union (IRU) appealed to the EU Finance Ministers ahead of their Ecofin meeting in September to compensate for the recent significant increases in fuel prices through reductions in national fuel taxes. Transport operators, operating in a highly competitive market, find it impossible to pass on increased fuel prices to their customers, it said.

Swedish KPS Petrol Pipes partners Malaysia in venture

Swedish-based international company KPS Petrol Pipe System has entered into a strategic partnership with two Malaysian companies, with a total investment worth RM5mn.

The venture involves the manufacture of the KPS polyethylene petrol pipes in Malaysia and distribution to strategic clients within the country and in neighbouring countries. The first agreement was signed between KPS Petrol Pipe System and Forenede Plast (M) Sdn Bhd to manufacture the petrol pipes in Klang, Selangor. The second agreement was signed between KPS and Guardian Venture (M) Sdn Bhd for the marketing and installation of these pipes for both the local and regional markets.

UK Deliveries into Consumption (tonnes)

Products	†Jul 1999	*Jul 2000	tJan-Jul 1999	*Jan-Jul 2000	% Change
Naphtha/LDF	249,493	125,845	1,853,308	1,285,630	-31
ATF – Kerosene	925,342	971,522	5,385,170	5,729,824	6
Petrol	1,872,638	1,733,863	12,395,582	12,142,663	-2
of which unleaded	1,644,917	1,608,352	10,521,708	11,153,144	6
of which Super unleaded	35,816	30,575	207,719	231,300	11
of which Premium unleaded	1,609,088	1,577,777	10,313,976	10,921,844	6
Lead Replacement Petrol (LRP)	0	125,511	0	989,519	-
Burning Oil	140,611	159,994	2,086,633	2,172,550	4
Automotive Diesel	1,277,677	1,270,417	8,726,533	8,926,317	2.3
GasOil/Marine Diesel Oil	509,326	497,865	3,963,519	4,025,914	2
Fuel Oil	137,785	96,665	1,269,636	913,143	-28
Lubricating Oil	67,797	71,124	461,907	473,608	3
Other Products	697,465	631,508	4,974,477	4,778,427	-4
Total above	5,878,134	5,558,803	41,116,765	40,448,076	-1.6
Refinery Consumption	489,230	396,551	3,642,262	3,035,043	-17
Total all products	6,367,364	5,955,354	44,759,027	43,483,119	-3
+ Revised with adjustments * Figures dated from Feb	2000 onwards are the fir	nal figures as supplied by re	porting companies, they are n	o longer provisional figures	

PETROLEUM REVIEW OCTOBER 2000

election

Pouring oil on political waters

Big Oil moved to centre stage in the US elections with the nomination of *Dick Cheney*, CEO of Halliburton, as the Republican Party's Vice Presidential candidate. *Judith Gurney* reports.

Dick Cheney above, speaking at the IP's Autumn Luncheon at the Savoy Hotel, London, in November 1999

hile serving for five years as CEO, Cheney doubled the size of Halliburton, the Dallasbased oil services company - notably through the \$7.7bn acquisition of Dresser Industries. Halliburton's earlyretirement settlement for Cheney just prior to his nomination - reported to be \$20mn - quickly drew fire from the Democratic Party which was already focusing on George W Bush's links to Big Oil as a principal, from 1968 to 1988, of Texas Rangers in Midland, Texas. The sale of Texas Rangers earned Bush \$16mn and provided the bulk of his current wealth according to tax records. Donald Evans, a Midland oilman, heads Bush's electoral campaign.

Republicans insist that Al Gore also has Big Oil connections, noting that his father, a Vice President of an Occidental Petroleum subsidiary, served on Occidental's Board of Directors and that Gore holds Occidental shares valued at between \$500,000 and \$1mn as executor to his father's estate. A demand by protesters that Gore surrender these shares and condemn Occidental's plans to drill in Colombia on lands claimed by the indigenous O'wa tribes presents problems for the Democrats as Clinton has supported Occidental's operations in Colombia as a means of combating that country's huge drug industry.

Over the summer, the two presidential contenders fired broadsides on three energy issues – high gasoline prices, moratoria on offshore exploration and production, and the future of the Alaskan Arctic National Wildlife Refuge (AANWR).

Blame for high gasoline prices

A dramatic rise in retail gasoline prices in the Midwest in June provided the material for a battle for votes in Midwestern states, with the intensity of the debate which refelcts the way the US electoral system functions. Presidents are chosen on the basis of votes cast in an 'electoral college' composed of state representatives whose numbers are equal to the total of each state's Congressional members. All states, except Maine and Nebraska, subscribe to a winner-take-all system for electoral college representatives. This means that a presidential candidate who wins a plurality of votes in a state gets all of its electoral college representatives' votes.

The effect of this system is that candidates focus on states with substantial electoral delegations as well as on 'swing states' which are not considered to be securely in either the Democratic or Republican camp, Both Gore and Bush visited the Midwestern states which fall in this second category a number of times during the worst of the gasoline price crisis. Gore insisted that oil companies were colluding to maintain artificially high gasoline prices, pointing to large profits declared in second-quarter oil company results. He called these profits 'enormous and completely unreasonable' noting that they 'suggest that Big Oil is gouging American consumers.' He intimated that because of their connections to Big Oil, Republicans would do nothing to change the situation.

Bush insisted that the main reason for expensive gasoline was the cost to refiners of crude oil supplies, arguing that these were the result of the lack of an energy programme on the part of the Democrats. Some Republicans suggested that Gore supported high gasoline prices, noting that he cast the tie-breaking Senate vote in 1993 for the passage through of a federal 4.3 cents/gallon add-on gasoline tax known as the 'Gore Tax.' They agreed with the oil industry contention that another reason for Midwestern gasoline prices was the EPA requirement for the sale of a new reformulated gasoline with stricter emission standards, beginning on 1 June. They also noted the problems resulting from a Unocal patent on methods for making the new reformulated gasoline and from its content, in the Midwest, of ethanol, with ethanol supply reported tight in the Chicago and Milwaukee areas.

Neither Bush nor Gore, however, cared to risk loosing farmers' votes by criticising ethanol, a fuel made primarily from corn grown in the Midwest, despite the fact that its price was 40% higher than it had been the previous summer. Instead, they went out of their way to express their backing for ethanol. Bush announced that: 'I'd have supported ethanol whether 1 was in lowa or not – the reason I do is that it's good for the quality of air. It also reduces our dependence on foreign oil.'

Gore was depicted as having 'consistently led the fight for the development and use of ethanol' and suggested that as President, he would 'build on his long record of public support for ethanol to invest in research and continue supporting programs and tax relief.' (Ethanol requires federal tax relief credits of some 54 cents/gallon in order to compete with the other widely used additive, MTBE, a petrochemical product which has recently been found to be an underground water pollutant.)

The return of Midwest gasoline prices to lower levels removed this issue from the front burner of the election during the August Democratic and Republican parties conventions.

Offshore moratoria

California and Florida command large numbers of votes in the electoral college and both Bush and Gore have taken pains to win over – or at least not to alienate – the strong environmental movements in these states by supporting existing federal moratoria on the leasing for oil and gas exploration of new acreage off their coasts. These moratoria cover 122mn acres off the Pacific coast, mostly offshore California, and 56mn acres in the eastern Gulf of Mexico offshore Florida.

Gore, promising to 'take the most sweeping steps in our history to protect our oceans and coastal waters from offshore drilling' not only supports existing moratoria but insists on the need 'to go further, to bar new drilling in these areas even where leases have been granted under previous administrations.'

Gore's proposal would prevent exploration and development on some 180 blocks leased by oil companies on sites off the coast of California and Florida and would block new drilling on some 40 blocks offshore California where production is currently underway. If this were to happen, offshore California producers such as Exxon would have output from existing fields reduced as a result of the lack of new drilling. And Chevron, who with Conoco and Murphy Oil have invested substantial sums in exploration of leased blocks in the Destin Dome area off the coast of Florida, where they have found substantial natural gas reserves, would lose all their investment.

If companies were prohibited from working the leases that they acquired from the federal government in MMS auctions, they would undoubtedly try to recover the costs of obtaining these leases. Their chances of success have been considerably enhanced by the recent US Supreme Court decision that the federal government must reimburse Marathon and ExxonMobil \$156mn for voiding the leasings that they acquired in the early 1980s off the coast of North Carolina, another offshore area now under a moratorium. The amounts paid for undeveloped leases off California would be far greater, probably in the vicinity of \$1bn.

Prospects for ANWR

One issue which has remained in the spotlight is the future of the current federal ban on exploration and production of hydrocarbons in the 19mnacre Alaskan Arctic National Wildlife Refuge (ANWR), especially in its 1.5mnacre coastal plain just east of Prudhoe Bay. The EIA has recently estimated that there is between 5.7bn and 16bn barrels of recoverable oil in this plain, with a mean estimate of 10.3bn barrels.

Bush agrees with the oil industry and the Alaskan Government on the need to open up this coastal plain to exploration for both oil and gas, and the platform which was adopted by the Republican Part at is recent convention endorsed his view. By law, the Trans-Alaskan Pipeline System (TAPS), which transports oil 800 miles from Prudhoe Bay to the ice-free port of Valdez in southern Alaska must be dismantled and the land returned to its original condition as soon as the oil throughput falls below a minimum level. If Alaskan oil production continues the decline which began in 1988 - output in 1999 was just over 1mn b/d, down 10.7% from 1998 there is a real danger that the pipeline will be demolished before any oil reserves in the ANWR plain can be produced and sent to market.

Gore has pledged that if elected, he would never allow oil exploration in the ANWR plain. There have been rumours that even if Gore looses the elections, Clinton will support this pledge and declare all or part of ANWR a national monument, a step he can take without the consent of Congress. As this would remove the possibility of future production of ANWR's estimated oil and gas reserves, it would undoubtedly be challenged legally, citing the terms of the Alaskan National Interest Lands Act of 1980. The outcome of such a challenge is unclear.

Energy issues were downplayed at the parties' conventions this summer but they will undoubtedly regain the spotlight if crude oil and natural gas prices remain at all-time highs as winter approaches. Neither Bush's plan for a national energy policy nor Gore's 10year, \$85bn energy programme designed to encourage energy efficiency and develop alternative fuels offer feasible short-term solutions for a new administration to the very real US energy supply problems.



jet fuel



Aviation fuel, once a high flyer, has lately had some of the wind taken out of its wings by high prices, environmental concerns and oil company mergers, to name a few factors. *Gordon Cope* examines this volatile commodity.

and-in-hand with oil prices, the cost of jet fuel has taken off dramatically over the last year. According to the US Department of Energy, the price of Jet A-1 fuel in the US has increased from an average of 46.8 cents per American gallon (excluding taxes) in May 1999 to 78.8 cents per gallon by May 2000 – a rise of 65%.

The increase primarily impacts commercial and cargo airlines, which consume around 11bn litres annually. John Armbrust a Florida-based Consultant in the aviation industry and publisher of World Jetfuel Report, reckons that net fuel costs to the airlines were approximately \$3bn in 1999, or 4.25% of expenses. If the price of fuel has risen by 65%, then the cost of fuel may exceed \$5bn this year, or over 7% of costs.

Airlines have responded with modest price hikes. 'Some, like KLM, have raised their ticket prices by 3%,' says Martine Malka, a spokeswoman for the International Air Transport Association (IATA).

They have moved cautiously because air travel is sensitive to pricing. 'All other things being equal, a 3% increase in airfares reduces air transportation by over 5%,' notes Jean-Francois Wen, a Professor of Taxation at the University of Calgary, who recently studied air fuel taxes.

Unfortunately, the industry has little room to absorb fuel price increases. Last year, IATA-member airlines made a profit of \$1.9bn, or 1.3% rate of return on revenues. But from 1990–93 they collectively lost \$16.5bn on international scheduled flights.

Airlines have launched other, shortterm strategies to mitigate price rises, such as increasing the number of buttocks in seats. 'Flights are jam-full,' says Armbrust. 'There were record-load factors in June. Last year, it was around 60%, but now, some airlines have 90%.'

Airlines have also begun to merge. In

January, Air Canada took over the country's other major airline, Canadian, when the latter company's finance became parlous. This spring, British Airways (BA), the world's largest airline, announced renewed efforts to merge with KLM, the fifth largest carrier. The coalesced airline, with 191mn annual passengers, would dwarf the number two airline, Lufthansa, with 102mn passengers.

Mergers don't necessarily lead to significant fuel savings through economies of scale however. 'There is some saving in bulk purchases of fuel, but it is minor,' says Malka. 'Most of the alliances and mergers have been for traffic, marketing, routing, connectivity and the potential for growth in market share.'

The tax differential between various jurisdictions does have a more significant effect on fuel costs. According to a study conducted by Professor Wen, the US federal excise tax is 4.3 cents per US gallon, versus 10.6 cents per US gallon in Canada.

Tankering – a common practice on trans-border flights – is one way that airlines exploit variations in tax regimes. The practice involves loading more fuel at a lower-taxed location than would otherwise be required, and utilising that fuel for a subsequent flight beyond a higher-taxed geographic locale.

Airlines have also lobbied for relief from tax inequities, and some jurisdic-

tions have responded. 'The province of Alberta reduced its fuel tax from five cents per litre to 1.5 cents,' says Wen.

On a wing and a prayer

In the longer term, aircraft and component manufacturers may provide a solution to higher fuel costs by increasing the efficiency of jet engines.

Since the first oil crises in the early 1970s, there have been dramatic improvements in fuel efficiency, with energy consumption per seat-km reducing by a factor of three (comparing modern aircraft with the models of 40 years ago). Since the mid-1970s alone, fuel consumption per passengerkm has reduced by an estimated 50%.

And further reductions are in the offing. Approximately 85% of commercial jet engines are now manufactured by three firms – Pratt & Whitney, General Electric and Rolls Royce.

Pratt & Whitney, based in Hartford, Connecticut, has begun development of a geared turbofan. The engine is the result of more than \$350mn and ten years of research. The engine's fan, which produces most of the thrust, is driven through a reduction gearbox, rather than being directly connected to the rest of the engine. The company

An exhausting subject

Kerosene itself is relatively benign when compared with other fuels. Unlike petrol and diesel, jet fuel is relatively low in sulfur and has not been subjected to lower-content regulations. The last major regulatory initiative was to remove the lead in aviation gasoline, which has been almost completely accomplished through its replacement with octane-boosting additives.

Much of the concern regarding jet fuel has focused on the impact that occurs when a plane is in flight. Shell Aviation recently released a study paper, prepared by Dr Mike Farmery, on the impact of jet emissions.

According to the study, aircraft activity is responsible for only a small proportion of man-made emissions (for example, around 3% of carbon dioxide (CO₂).

However, jet engines operate in portions of the atmosphere in which emissions can have significant effects. For example, NO_X (reactive nitrogen compound) emissions in the troposphere (the section of atmosphere that stretches from sea level to 11 km) produce ozone. Ozone, an oxygen compound of three, rather than two, atoms, filters out most of the harmful ultra-violet rays from the sun. NO_X in the higher stratosphere (11–50 km), however, destroys ozone.



claims that, in addition to the engine reducing operating costs, improving reliability and cutting noise levels, it will also reduce fuel burn by 9%.

But even with the recent price rise, fuel efficiency has been replaced by a more pressing concern. 'Fuel efficiency has been a big thing for the airlines for the last 20 years, but recently, it's been driven by environmental concerns,' says Mark Sullivan, a spokesman for Pratt & Whitney. In the troposphere, CO_2 , NO_X and condensation trails from aircraft all contribute to the Greenhouse effect. This refers to the ability to trap heat that would normally reflect off the surface of the earth and dissipate into space.

The effect of NO_X is more complex. Although NO_X emissions from aircraft are very much lower than CO_2 emissions, some estimates suggest that the Greenhouse effect of NO_X is as big as the CO_2 effect from the same aircraft. Condensation trails from aircraft also contribute to the Greenhouse effect, as well as being very visible and increasing cloud cover in areas of high flight activity. Some models predict their effect to be as comparable to that of CO₂.

As a long-term solution to emissions in the upper atmosphere – cleanburning hydrogen – has been suggested as an alternative fuel. Liquid hydrogen, which is used in the booster rockets of the space shuttle, is extremely volatile, however. 'Can you envision an airport full of super-chilled liquid hydrogen?' asks Pratt & Whitney's Sullivan. 'It is difficult to manage and very expensive.'

Shell Aviation notes that the impact throughout the fuel chain would also need to be considered, as some of the potential methods of producing the hydrogen are themselves big generators of CO₂.

Environmentally taxing

In order to promote the conservation of fuel and mitigate the impact of emissions in the atmosphere, a recent EC document proposed that EU member states be permitted to impose an environmental tax on aviation fuel used in domestic flights and on flights between consenting member states.

In a prepared statement, Shell Aviation outlined many of the industry objections to the tax:

- Activity in the aviation sector is more affected by general economic growth patterns than the cost of fuel, and fuel is only one part of the variable cost of a ticket.
- If an environmental fuel tax were applied in the EU for application within Europe, airlines could avoid the taxes by simply tankering fuel for legs of flights not subject to tax. An aircraft flying from Singapore to Athens to London would almost certainly seek to bring maximum possible fuel in from Singapore. This would involve carrying tens of tonnes of 'extra' fuel in from Singapore, thus increasing the weight and worsening the fuel efficiency.
- Overall aviation activity is unlikely to be impacted by competition from other modes of transport, unless the tax was applied globally.

Oil company mergers

Recent oil company mergers have had a secondary effect on the aviation fuel market – the further concentration of production into fewer and fewer hands.

There are three types of jet fuel. Jet A-1 fuel, essentially pure kerosene,

Aviation

jet fuel

which is the most popular aircraft fuel, accounting for around 90% of use. Jet B is designed for use by the military, helicopters and northern, cold climate aircraft. Aviation gasoline is used in small, personal aircraft and water bombers.

Internationally, the production of aviation fuel has largely been controlled by a relatively small number of refiners: Shell, BP, Exxon as well as TotalFinaElf.

Earlier this year, the Federal Trade Commission in the US required Exxon and Mobil to divest some of the aviation fuel and jet turbine oil production as a prerequisite to their merger. 'Exxon and Mobil dominate the sales of jet turbine oil with approximately equal shares that, combined, account for 75% of the worldwide market and approach 90% of worldwide sales to commercial airlines,' the FTC explained in documents supporting its decision. By eliminating direct competition between the two companies, the merger would 'create a virtual monopoly in sales to commercial airlines."

However, some analysts believe that there is little desire on the part of oil companies to corner the world market. 'Most of the majors want to get out of refining jet fuel,' says Armbrust. 'They

IP 🌍

want to put the money into exploration and production. Independents are taking over the refineries, and they're primarily interested in gasoline. They don't care about jet fuel either. They sell it out the back door to majors or sell it directly to airlines.'

In North America, airlines have adopted this refinery orphan by taking over the forecourt aspect of jet fuel. 'They control almost every fuel farm [at airports],' comments Armbrust. 'They'd love to do that in Europe as well, but, with few exceptions, like BA at Heathrow, the majors still control access into the wing. Air France in Paris has one supplier – TotalFinaElf.'

The opportunity for greater airline control at European airports may increase in the near future, however. 'So many major oil companies have merged and switched that you have two companies in two different (aviation farm) pools,' says Armbrust. 'It could provide airlines with an opportunity to bust them up, but they must make the investment.'

In the end, it would seem, the vagaries of jet fuel have been eclipsed by other global drivers.

According to the International Civil Aviation Organization, ICAO, there were 476mn scheduled international passengers and 1.05bn domestic passengers in 1999. Growth in international traffic is predicted to average 5% for the next three years, with the greatest percentage of increases occurring between Europe and the Middle East, Far East and Africa. During the same time period, domestic international traffic is expected to increase by 3.2%. By 2003, a total of 1.8bn passengers are expected to travel on regularly scheduled flights.

International air freight traffic stood at 15.9mn tonnes in 1998. While growth that year was restricted to 2% due to the Asian economic crisis, growth for international air freight, which stood at 15.9mn tonnes in 1998, is expected increase at an annualised rate of approximately 5.5% for the next three years. By 2003, international air freight traffic is forecast to surpass 20.7mn tonnes.

'The increased travel is not because they raised prices, but in spite of it,' says Professor Wen. 'There are more people wanting to travel, and there is more economic activity.'

'Our engines have 25-year life cycles, and we have to ask: "Where are we going to be in the next few years?"

New publication

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Lend me your megaphones...

It is megaphone diplomacy time in the global warming debate as the time nears for a November conference in The Hague scheduled to decide on how the 1997 Kyoto Protocol will be implemented, reports *Maria Kielmas*. edia stories about summertime ice melting in the Arctic and its potentially catastrophic effects for life on earth, have become ever more apocalyptic since an apparent recant by James Hansen of the NOAA Goddard Institute. Popularly known as the 'father of greenhouse warming,' for the past 12 years Hansen has been one of the strongest advocates of the hypothesis that anthropogenic carbon dioxide has caused 20th century global warming.

While global warming sceptics, who have always included most of the oil and gas sector among their ranks, cheered, claiming that their scepticism had been vindicated, a number of environmentalist groups and non-government organisations (NGOs) stepped up their own battle with the launch of a new website at **www.climatevoice.org** (see p2).

The NGOs have been stepping up their protests as politicians in the industrialised world are coming to terms with what they may be signing up to under the Kyoto Protocols, and how much it will cost their economies. In late August the Australian Government announced it would not begin mandatory greenhouse gas emissions trading ahead of an international market and would avoid measures that would hurt the country's multi-billion dollar LNG sector. According to Industry, Science and Resources Minister Nick Minchin, Australian industries, including the LNG sector, faced stiff competition from developing countries that had no obligations to reduce emissions.

When they adopted the Kyoto protocol in December 1997, 37 industrialised nations - among them the transition countries from central and Eastern Europe and the former Soviet Union - agreed for the first time to accept binding limits on their emissions of greenhouse gases. The relevant gases are carbon dioxide (CO2), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride (SF₆). The parties, known as Annex I parties, pledged to ensure that their aggregate emissions for the first commitment period of 2008-2012 would not exceed an 'assigned amount' that was calculated as a specific percentage, an overall 5.2%, of their 1990 base year emissions. Under the United nations Framework Convention on Climate Change (UNFCCC), negotiated at the 1992 'Earth Summit' in Rio de Janeiro, the parties committed themselves to stabilise greenhouse gas concentrations 'at a level that would prevent dangerous anthropogenic interference with the climate system.'

The issue at the centre of the Protocol has been based on a decade-and-a-half long assertions by environmentalists, NGOs, a significant proportion of climate scientists and the United Nations Intergovernmental Panel on Climate Change (IPCC), that human activity, particularly the burning of fossil fuels, has been a primary cause of an estimated 30% increase in atmospheric carbon dioxide over the past century and a half. In consequence this has given rise to destructive climatic extremes, floods, droughts and windstorms, which have been popularly perceived to have become increasingly frequent since the 1990s.

The counter-argument among an equally significant proportion of climate scientists is that human activity accounts for just 5% of CO_2 emissions in the atmosphere and the greatest contribution comes from the oceans.

The climate models used by the environmentalist camp to extrapolate into the future and the historic past does not take full account of the carbon cycle, the Milankovich cycle, rapid climatic changes evident in the geological record, variables such as the relative extents of land and ocean, a misunderstanding of the interaction between atmosphere and ocean and most importantly, the role of the sun. The environmentalist climate models take little or no account of historical climatic records such as the medieval warm period and the 'Little Ice Age' in the 19th century.

This is in contrast to the earthquake seismologists who have developed into serious historians in their attempts to interpret historical accounts of earthquakes and to quantify in a comprehensive modern manner the nature of the damage they inflicted.

Nevertheless the IPCC has become the real driver in the debate since first publishing a report in 1995 stating that there has been a 'discernible human impact' on the climate. The IPCC has also ruled out the inclusion of the most common greenhouse gas, water vapour, from its studies.

Cost-effective options

The Kyoto protocol listed three mechanisms by which the countries, and by implication corporations, could find cost-effective options of meeting greenhouse gas emission targets: International emissions trading

- Joint Implementation (JI) This allows one Annex I party to meet its emissions reductions obligations through a project in another Annex I country. For example, a UK company which constructs a gas-fired power plant in central or eastern Europe that replaces older and dirtier coal-fired plant receives credits for net emissions reductions, known as emission reductions units (ERUs), generated through the lifetime of the project. The idea is that these may be repatriated to the investor's home country, such as the UK, where they may be offset against both a company's climate tax obligations and the country's emission cap as a whole. The UK plans to introduce climate taxes on industry from April next year. This is due to come into force in 2006 but already the Netherlands has issued a tender for the purchase of ERUs as faster than expected economic growth has meant that its net greenhouse gas emissions are rising rather than falling.
- The Clean Development Mechanism (CDM) – This is essentially the same as JI but where the host country is a non-Annex I country, ie uncapped, party and where the project itself must demonstrably contribute to sustainable development. The credits generated, in this case known as Certified Emissions Reductions (CERs), may be used by Annex I countries to comply with its Kyoto commitments.

BG is mulling a CDM project in São Paulo state, Brazil, that will be an extension into rural areas of the Comgás gas distribution network. Shell International is considering a rural electrification scheme in South Africa. In both cases the aim is to substitute fuel oil used in power generation and thus earn CERs, which may be repatriated to the UK, in the case of BG, or used in the company's internal emissions trading markets as in the case of Shell. Shell and BP have both created an internal emissions trading system. Company spokesmen point out that it is a good idea to get such a system running as a template perhaps for future national or international emissions trading, as even the science behind it is uncertain.

But the past five climate conferences which have led to, and later developed, the Kyoto Protocols – known as Conferences of the Parties (COP1 to COP5) – have left open basic questions such as the financial value of an emission unit and what will be an internationally accepted method for defining a baseline for such projects, ie the level of emissions which would have occurred without the project. Neither is there a general agreement on who should verify that the project is achieving its goals, and not cheating, and who, on both national and international levels, should be the overall regulator of the schemes.

According to the Kyoto Protocol, a bilateral project such as the JI requires approval from the governments of both investing and host countries while the CDM should be supervised by an international board. The World Bank has created a Prototype Carbon Fund (PCF) which hopes to set a benchmark for the carbon emissions costs. The fund will invest in green technologies in developing countries. There are proposals for an emissions banks which will provide credit as well as compliance procedures under which recalcitrant countries would be fined. France has called for the creation of an international body to enforce this.

The bureaucratic hassles that this could involve potentially already has business going on the defensive. Environmental specialists in some oil majors believe that the multinationals can pave the way by trading among themselves. This June, Canada's TransAlta announced the first-ever trade of carbon dioxide emissions with Germany's Hamburgische Electricitäts-Werke. The 24,000 tonne emission reduction is equivalent to the annual output from about 3,000 cars. By concentrating on commercial trade the companies hope to avoid interference from conflicting political agendas. This includes ongoing criticism from developing countries and NGOs that developed countries are using the Kyoto mechanisms as a way of avoiding their own responsibility to tackle greenhouse emissions.

However companies are loathe to discuss to deeply the implications of repatriating emissions credits from uncapped developing countries. From the host country's point of view this credit would be an asset, presumably subject to the same legal and fiscal terms as oil and gas production. In theory there is no reason why developing countries should not devise a production-sharing contract with attendant taxes and royalties, for emissions credits.

A further complication is that financial incentives provided by governments, such as Britain's intent to use ERUs and CERs as credits against future climate taxes to encourage companies to become involved in emissions trading, will be seen as an unacceptable subsidy under the rules of the World Trade Organisation (WTO). According to a European Commission study published in June this year, an EU-wide emission trading system including all industrial sectors would save 34% of the total costs of complying with the Kyoto protocol.

Fierce opposition

The fact that proposed controls over greenhouse gas emissions do not apply to developing countries that are expected to become major producers of oil, gas, and emissions, has met with fierce opposition in the US and Australia in particular. Critics here argue that an effective regime must include developing countries as these are likely to produce a rapidly growing share of world greenhouse gas emission in coming decades. China is expected to overtake the US in greenhouse gas emissions in a few years. The argument continues that if developing countries are excluded from emission controls, many energy intensive industries will simply migrate from the developed world to the developing world.

Meanwhile developing countries will not agree to control greenhouse emissions unless the costs are low enough to be acceptable in the context of other problems these countries face, such as poverty. Calculation by specialists in Australia, the US and the International Energy Agency (IEA) conclude that the costs of implementing Kyoto could be between \$42bn to \$50bn, or maybe 0.2% of world GDP in 2010, which would be borne by taxpayer in the developed world. For this cost the reduction in global temperatures would be in the region of 0.07°C to 0.2°C. An IEA report states that transfers related to international greenhouse gas trading would be equivalent to a 400% increase in foreign direct investment to countries with economies in transition. 'One can legitimately question the realism of these financial transfers which would take place only for the sake of climate change,' the report said.

Studies in Australia have linked the growth of greenhouse gases with both population growth and immigration, concluding that the country's policies towards controlling these emissions should be linked with population and immigration policies.

With such scepticism it comes as little surprise that environmentalist and sympathetic NGOs are elevating the volume of their campaign against fossil fuels and their carbon emissions. Seasonal melting of ice in Greenland and the Arctic is presented as a thawing plant. Recent floods and droughts in India and Africa are no longer the consequence of unwise land use, deforestation or shrimp farming, but a warming planet.

Climate change emissions trading

Changing perceptions

While it is indisputable that the world has done much to increase its exposure to natural catastrophes, such as building expensive property in what should be a river's flood plain, there is no evidence to prove that natural catastrophes are increasing in number or severity. What has changed is the public perception, especially media coverage that has heightened public awareness but shortened memory spans.

The popular reaction to devastating cyclones in Mozambique and East Africa this year was to attribute them to a combination of El Niño effects and global warming, satellite observations indicate a slow decrease in the number of intense cyclones in the Atlantic, though not in the Pacific. But climate scientists point out that on a global level although the number of tropical cyclones has increased since the 1970s, this increase has come mainly from the southern hemisphere where, before the advent of satellites, only those affecting land were really identified. US scientists analysing tornadoes in the US note that there is both an underreporting of weaker events and an overestimation of stringer events in those regions where tornadoes are assumed not to happen.

The international reaction to James

Hansen's paper 'Global Warming in the 21st century, an Alternative Scenario', that claimed that he had retracted his earlier views that carbon dioxide emissions cause a climate forcing, prompted the NASA Goddard Institute for Space Studies to say on its website that the paper should not be exploited by global warming sceptics.

Hansen wrote in the paper that the growth rate of forcing by carbon dioxide doubled between the 1950s and the 1970s, but was flat from the late 1970s until the late 1990s despite a 30% increase in fossil fuel use. This implies a recent increase of terrestrial and/or oceanic sinks for CO_2 'which may be temporary.' But there has been a dramatic growth in methane emissions over the same period.

However, in an apparent nod to the conventional wisdom that equates increasing energy use with economic growth, he notes that the CO₂ growth rate increased little in the past 20 years in which much of the developing world had rapid economic growth and the US had strong economic growth based on energy *IN*efficiency. He concludes that non-CO₂ greenhouse gases are probably the main cause of observed global warming, with methane (CH₄), causing the largest net climate forcing. This is also the conclu-

sion that BP's environment scientists have reached.

Hansen identifies black carbon aerosols as contributing significantly to global warming. A key feature of tackling this problem is to focus on air pollution, especially aerosols and tropospheric ozone, which have human health and ecological impacts. 'If the World Bank were to support investments in modern technology and air quality control in India and China, for example, the reductions in tropospheric ozone and black carbon would not only improve local health and agricultural productivity, but also benefit global climate and air quality,' he writes. As electricity plays an increasing role in future energy systems, it should be relatively easy to strip black carbon emissions at fossil fuel power plants. 'Stripping and disposing of CO2, though more challenging, provides an effective backup strategy,' Hansen concludes.

Although hardly a full retraction of his earlier views, Hansen's more measured tone has given a boost to both global warming sceptics, who feel increasingly vindicated, and the environmentalist camp, which is forecasting an ever more dire apocalypse tomorrow. In the run-up to November's conference in The Hague, the volume on both sides will become much louder.

New publication

A critical review of current biological monitoring techniques for the assessment of exposure to low levels of benzene

Although direct evidence of harm at low levels of exposure to benzene is absent, benzene is a genotoxic carcinogen and as such there is continuing concern over the effects of long-term continuous exposure in both occupational settings and the general environment. The toxicity of benzene in human populations, particularly those exposed at workplace is well established in studies, where levels are in excess of 10ppm. Air monitoring, however, even when carried out using personal air sampling, does not give an indication of the total dose of benzene absorbed by the human body, particularly at low levels of exposure. Biological Monitoring and Biological Effect Monitoring, therefore, can be important supplements to air monitoring.

Under the Advisory Committee on Health and with the guidance of the Department of Environmental and Occupational Medicine at the University of Newcastle upon Tyne, the Institute of Petroleum has developed this publication which provides a review of current biological monitoring techniques for the assessment of exposure to benzene and the routes of exposure, uptake, metabolism and excretion.

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Reuse in focus as decommissioning market develops slowly

Recent forecasts of a buoyant North Sea

decommissioning market have come to nothing as

economic conditions have changed, Nick Terdre reports.

hatever has happened to the decommissioning market? High oil prices over the last year have wrecked all those forecasts that suggested that, come the new millennium, this new market would emerge in force. In contrast, given how low prices sank in the prior period, it might have been expected that decommissioning would take off early, but in the event, surprisingly few fields succumbed.

The oil and gas sector has, however, been reshaped by that traumatic period. Some parts of the contractor industry, notably fabrication, will probably never be the same again which could have implications for future decommissioning. Attempts to estimate costs have always assumed that the contractor workforce available for decommissioning tasks would have the same capabilities as today. As contractors number are cut, and many skilled personnel go abroad to find work, this assumption may need examining more closely. The implication of a more restricted range of expertise in the contractor community would be upward pressure on costs.

One of the themes that have come to the fore over the past year is reuse of offshore installations. Not only have companies involved in decommissioning operations given a high priority to finding reuse opportunities for installations and equipment, but the first example of reuse in recent times has just taken place. This is the platform installed by Clyde Petroleum in August on its Q4 field in the Dutch sector.

Second life

The Q4 platform was originally used by Wintershall on its K10 field, also in the Dutch sector. It was removed in 1997 and taken to the Swan Hunter yard in the UK where it was cleaned and decontaminated. Clyde purchased it earlier this year, and delivered it to the Genius VOS yard in Holland where it was originally built. Here it was refurbished, some of the equipment changed out, and the jacket reduced in height by 10 metres to suit the shallower water depth at Q4. Benefits to Clyde include the reduced cost of buying and refurbishing an existing installation, and a shortened time between project sanction and first gas, compared with using a newbuild platform.

Another interesting reuse project is also under way in the Netherlands, where Tamalone International has a contract to supply second-hand platforms for use offshore China. This will be for use on CNOOC's Shengli oil field in the Bohai Sea. The water depth at Shengli is only 20 metres, so the search for suitable platforms is being concentrated on the Dutch sector and the UK basin, according southern to Tamalone's Managing Director Fred Bok. As the platforms in these areas are almost all gas production platforms, much of the topside equipment will have to be changed out.

Tamalone's aim is to acquire, modify, install and bring the first platform into operation in about two years. However, Bok says his company and the Chinese customer agree that since the provision of the first platform is viewed as a pilot project, performing it successfully rather than sticking to a rigid timetable is seen as the priority.

One redundant platform currently up for sale is ExxonMobil's Camelot CB platform in the UK southern basin, which ceased production in 1998. The water depth at Camelot is 43 metres, almost twice the Shengli depth. ExxonMobil has contracted Heerema Marine Contractors to remove the CB platform, but not yet set a date as the operation may be combined with the removal of the Camelot CA platform, which is still in operation.

More platforms for sale

A growing number of platforms are coming onto the market. A prime one is TotalFinaElf's Frøy platform, which is expected to cease operation by the end of the year but is only five years old. Another is Kerr-McGee's Hutton tension-leg platform, the world's first, which could be shut down at any time from 2001 onwards. Use of the platform for a field development could significantly reduce development times and costs, enhancing net present value, Kerr-McGee points out in its sales pitch.

Even where reuse opportunities cannot be found for whole platforms or decks, there is still great potential for the reuse of equipment items, and in recent years a certain amount of equipment, notably drilling derricks, has been sold from Phillips' platforms in the Ekofisk area. Subsea equipment has proved somewhat harder to shift, but now Statoil has sold the six Tommeliten Gamma subsea trees to Golar-Nor Offshore, part of the PGS group, for reuse on the Glitne field. They were originally installed subsea in 1988 and retrieved this summer by Coflexip Stena Offshore.

Reuse was also on the agenda at the Offshore Northern Seas show in Stavanger this August (see review p28–29), where it was the main topic at the newly established Investment Recovery Forum. Here presentations were given on current decommissioning projects at Ekofisk and Frigg, and by a number of contractors working with equipment refurbishment and resale. But the sessions were not entirely devoted to presentations, as the forum was also intended to provide a meeting place for potential buyers and sellers.

Phillips Petroleum in the UK has also long been seeking a buyer for the Maureen platform, a steel gravity-base platform virtually unique in the world, which was designed to be floated away once the field was depleted (see photos). While the company continues to market the platform worldwide, it has contracted Aker Offshore Partner to refloat the platform in summer 2001 and tow it to the Aker Stord yard. Here the contractor has a dedicated decommissioning site where it dismantled Esso's Odin platform, the largest platform yet decommissioned in the North Sea. If no buyer is found, Maureen will be dismantled, equipment items sold where possible and the remainder scrapped.

UK tax change

The Inland Revenue in the UK has recently announced that it intends to

change tax provisions whereby the offset allowed for scrapping an offshore installation is not allowed in the case of a reused installation. The change was lobbied for by the offshore industry, which saw the different tax treatment as imposing in effect a financial penalty on reuse.

Although Maureen is unique, the operation to refloat it will be watched with interest as some of the challenges also apply, albeit in a more difficult form, to refloating concrete structures. In its decommissioning plan which was submitted during the summer, Phillips describes the difficulties that may be met in the process of achieving breakout – release – of the concrete storage tank whose skirts anchor the structure to the seabed.

The structure's buoyancy will be increased by replacing ballast water in the tanks with pressurised nitrogen, while injecting water under the tank bases. In case the seabed soils around the bases fail to contain the pressure exerted under the bases, it proposes placing a soil surcharge – ring – of gravel and iron ore around the bases to help consolidate the soils.

TotalFinaElf is likely to view the operation with great interest. In October, it is due to submit the cessation plan for the Frigg gas field, where production is expected to come to an end in the 2H2002. At the core of Frigg decommissioning is the disposal of five platforms, three with concrete bases, and a wrecked jacket.

TotalFinaElf is understood to be sceptical about the feasibility of safely refloating the Frigg concrete bases, all of which were installed before the Norwegian Petroleum Directorate introduced a requirement in 1978 that such platforms should be designed to be removable.

The three Frigg concrete bases, the weights of which vary from 168,000 to 261,000 tonnes, are of different designs: one is a Sea Tank, one a Condeep, and one the same Doris design as the Ekofisk Tank. All were installed prior to 1978. It will be no great surprise if TotalFinaElf recommends leaving the concrete bases in place, as Phillips has done in the case of the Ekofisk Tank.

Such a possibility is foreseen in the Ospar regulations approved at the Sintra meeting in 1998. However, a recent joint industry project in Norway, which used the massive Gullfaks C structure as a model, has concluded that the safe removal of concrete gravity-bases is feasible. Dr Techn Olav Olsen, who performed the study, has now completed a follow-up project looking into the landing and onshore disposal of large concrete structures, though details of its findings have yet to be released.

Apart from the Ekofisk Tank, Phillips proposes bringing the other redundant platforms at the Ekofisk centre and on outlying fields to land, as required by Ospar. It recommends doing this over a lengthy period stretching out to 2018, with three phases for topsides removals and a final phase for all the jackets.

Single-lift developments

Phillips and Elf, together with BP, Kerr-McGee and Shell, are also sponsoring further work on a number of promising single-lift concepts which are seen as providing much needed competition for the heavy-lift crane-barges in platform removal. After a screening exercise of 14 such concepts, seven are now being supported in joint industry projects.

Three of these are being backed by the whole group of oil companies: Excalibur's *Pieter Schelte*, Marine Shuttle's Offshore Shuttle, and Versatruss's Versatruss system. Phillips and Elf are supporting projects involving MPUs MPU Heavy Lifter and Prosafe's GM-Lifter. Master Mind's *Master Marine* has a project backed by Phillips alone and Doris' Archipos 20000 is supported by Elf alone.

The projects involve around nine months' study work concentrating on several key issues such as how much platform modification would be required, approach and positioning of the removal vessel, load transfer, tow to shore and off-lift. They will all use data from Phillips' Albuskjell Foxtrot platform. The studies are not intended to provide a basis for comparison between the different concepts, but to bring them to the point where their application is sufficiently well understood to allow them to be prequalified for a removal project. The results are unlikely to lead directly to the sinking of any of the concepts, but should give the sponsoring companies a good idea of which of them have a chance of succeeding in practice.

Meanwhile, the UK Offshore Operators Association (UKOOA) is attempting to improve the state of knowledge in another less than perfectly understood area - the drill cuttings initiative - are moving into a final phase, with a new round of contracts due in late summer. The most high profile project here will be an offshore lifting operation to be held at BP's North-West Hutton platform - in August the lifting equipment was being tried out in a dock. The offshore trial will put some flesh on the bones of studies that have concluded that lifting may not be economically practical and could cause secondary pollution.



Encouraging young minds

Gill Haben, IP Education and Training Manager, reviews some of the Institute's most recent developments in the education sector, all of which aim to encourage the next generation to enter the oil and gas industry.

Inside industry

One of the key ways of educating young children is to use real-life case studies for illustrative purposes. With this in mind, the Institute recently published *Inside an Industry: Coryton Oil Refinery* (see Publications, *Petroleum Review*, May 2000).

The Coryton case study was produced through research and development with the Institute's network of industry/education partners and special thanks go to the staff at Coryton, the Essex Branch and the Institute of Education.

Although designed primarily to meet the requirements of the GCSE geography syllabuses, the publication also includes sufficient information for use at A-level.

Flyers, introducing the booklet, were sent to the Heads of the Geography Departments at all secondary schools in the UK, well ahead of the summer break so that geography teachers had time to plan its usage before the new academic year. As always, we plan to carry out a full evaluation exercise to gauge how the publication has been received within the education sector, in order

to ensure that the Institute continues to provide its customers with materials that add value.

Copies of Industry: Coryton Oil Refinery are available through the IP Library (Fax: +44 (0)20 7255 1472; e:**lis@petroleum.co.uk**).

It is also planned to shortly include the full publication on the IP website (www.petroleum.co.uk).

New school prize

The Institute recently awarded an IP School Prize to ADT College in Putney, London, for its imaginative use of information communication technology (ICT) in secondary school science teaching.

Rebecca Coker-Adeleke, Teacher of Chemistry, was asked to set objectives and define a project using our two new e-sources *Fossils into Fuels and Exploring for Oil* to deliver an aspect of the Key Stage 3 curriculum in a novel way to her 11 to 14-year old students.

An enthusiastic and supportive teacher, Rebecca reported that when it comes to teaching young students ICT, it is like ducks taking to water! Today's young people are the first generation to know more about technology than their parents. They see it as being fun and entertaining rather than a 'threat'. This was certainly borne out by what I saw when I visited the school.

The pupils were set to work in small



teams to 'interrogate' the two e-sources and just before the school broke up for the summer holidays I went to Putney to see the presentation of their findings. Their confidence and ability, both in using ICT and making presentations, was extremely impressive.

It was a pleasure to award the Institute of Petroleum ICT School Prize to Rebecca and her students at ADT College.



Role-play package

Children are always more enthusiastic about the learning process if it includes some hands-on experience. The Burnbridge Role Play Pack is a practical tool kit that has been developed by the Institute as an aid for IP Branches to use in local schools to show children that the oil and gas sector can be an interesting and exciting place to work.

The role-play is based on a fictional scenario and outlines a proposal to develop a new oil and gas find beneath the sea off the coast of Britain. GCSE pupils are asked to argue the position for various interest groups. Development of the find is then subject to a vote.

The Institute originally tested the role-play package in schools in the Aberdeen area, using its Aberdeen Branch members as Industry Experts to engage in dialogue with the children. We had been requested, and recommended, to carry out the exercise by our partner, the Science and Technology Regional Organisation (SATRO).

The exercise was a huge success, in more ways than one.

- It helped to deliver some of the GCSE Geography curriculum.
- It aided the development of students' 'soft skills' – presentation, team working etc.
- It offered the opportunity for Aberdeen Branch members to bring the oil and industry to life by talking about their own real experi-

ences and knowledge of jobs in the sector. This was a particularly powerful element in the programme, that students and teachers alike found very enlightening.

It was a perfect vehicle for Branch members to extend their own lifetime learning portfolio.

This was a classic win-win situation. The teachers were pleased to be offered curriculum/careers support and to learn more about the oil and gas industry. The pupils had an imaginative, interactive means of learning, including a real insight into this sector. They were also given the chance to practice some of the soft skills that will be very valuable to them when they reach the workplace. The Branch members reported that they 'had the time of their lives'!

As in all best practice, we debriefed after our Aberdeen experience. The final pack, which was modified in light of the findings of this exercise, contains practical tips on how to set the the role-play scenario up, timings etc. It also contains extra resources such as additional visuals, relevant website details, industry information and copies of the Institute's various education publications.

The Burnbridge Role Play Pack is very simple and straightforward, but highly effective. I strongly recommend that all of our Branches try it out at schools local to them.

For further information, contact Gill Haben on Tel: +44 (0)20 7467 7135. e:ghaben@petroleum.co.uk

International partnerships

The Institute of Petroleum and the Petroleum Agency South Africa have joined forces, together with Shell, to produce a set of careers posters for the Petroleum Agency SA. The posters were exhibited at Scifest 2000, held recently in South Africa.

The Institute donated some of its educational and careers information while Shell International donated posters entitled the 'Quest for Oil,' 'Exploration for Oil and Gas' and 'Petroleum Geophysicists.' The resulting set of posters produced by the Petroleum Agency SA is excellent and the Institute plans to make copies available to schools, universities and other educational bodies in the UK.

The Institute also recently provided Russian oil company Sibneft with educational and careers data for it to use in the development of its new website that is to go live in a couple of months. You can find out more about

Sibneft at www.sibneft.ru

New e-sources

Some readers of *Petroleum Review* may be familiar with the Institute's *Fossils into Fuels* publication that was first produced in 1998 to aid the teaching of the National Curriculum for Science. This booklet has proved extremely successful and feedback has aided the further development of our educational strategy.

In line with the Institute's longterm plans to offer more oil and gas resources via the Internet, *Fossils* is now to be developed into an 'e-source.' In addition, a completely new science e-source – *Exploring for Oil* – will complement it. Both can be found at **www.schoolscience.co.uk**

Schoolscience.co.uk enables UK students to find out why science is at the heart of their lives. It encourages them to continue science education beyond the age of 16 and into careers in the scientific industries. The website provides up-to-date information about the applications of science at the frontiers of industry as well as research.

Both e-sources are linked to the National Science Curriculum.

The Schoolscience website is also endorsed by the UK Government's 'National Grid for Learning' and is therefore a very effective means of supporting science education in relation to our industry.



Modern Petroleum Technology reviewed

The Institute of Petroleum has just published the latest edition of *Modern Petroleum Technology*. *Dr Rex Gaisford* CBE, FIMechE, reviews this most recent update of a classic work.

The purpose of any review of a technical book is to establish its utility. Is it a useful book that meets a need and contributes to knowledge?

Once more, coming in two volumes, Modern Petroleum Technology covers the dauntingly extensive area of both the upstream and the downstream oil businesses. It contributes to knowledge in several different ways and is useful to three quite distinct readerships.

First and foremost, it offers to all current practitioners at the real technological heart of the business, a practical guide to what is currently being done by their peers in other companies and around the world operating at the forefront of their particular branch of technology. Perhaps surprisingly, the previous edition, now 16 years young, is still performing a valuable role in this respect today. This new edition is timely.

Secondly, it offer a first class and authoritative primer to new entrants and aspiring practitioners in the petroleum business to learn about and start to understand the scope and complexity of the modern petroleum industries. It provides them with an opportunity to make informed decisions about what future path they might want to tread.

The third readership is management. Most of us involved in the management processes of the petroleum industry have come to a particular point in our careers through an initially fairly narrow personal expertise that gradually expanded to cover a widening set of job related experiences at higher levels of personal responsibility until we arrived at whatever we happen to be doing today. Thus, as we move on in our careers we are expected to manage and take responsibility for wider and wider aspects of the businesses in which we operate without the foundation in true knowledge and detailed experience that makes this a sensible and secure position.

Seldom do we find an authoritative yet readable volume of work that allows us to gain an insight and understanding into those aspects of our business and our own responsibilities within it, which have not been a part of our individual experience. *Modern Petroleum Technology* fills the gap admirably. While a little knowledge can indeed be dangerous, if you don't want to admit to your peers that you don't know 'everything', this is a book that you can take it to bed with you and have a thoroughly absorbing read while filling those gaps that you hope that others do not perceive.

Each of the chapters of Modern Petroleum Technology covers a distinct area of science and technology, laced sometimes with other, perhaps commercial expertise in a refreshingly straightforward manner. This allows the expert reader to test and reference new ideas and the reader with a good general knowledge of the industry to grasp new facts and new ideas very rapidly. Each chapter also provides an excellent grounding for all new science and technology literate entrants into the industry. They can in a relatively short period of time, gain a good general understanding of the widest and most modern aspects of the industry in which they are to spend perhaps a large proportion of the remainder of their careers.

I am an engineer and an upstream man. For most of my career I have been engaged in large project development and overseas business start-up. As a project man, although I have spent 30 years in the oil business, many technological aspects of it are still relatively unknown territory, or at the very least opaque. Not surprisingly, it was the parts of the book where my knowledge was weakest that captured my greatest interest and attention.

In general I found the chapters to be written to a high and consistent standard, containing authoritative material with an easy readability that allowed the book to be enjoyably browsed rather than laboriously studied.

The upstream book takes the reader through the fundamentals of exploration and production and then on through all the technical sciences associated with the upstream business and on into the engineering aspects with special emphasis given to particular aspects of the business such as natural gas and transportation.

Some of the chapters descend to a greater level of detail than others and perhaps unsurprisingly the geophysics section is one such. This science by its very nature is a complex business and the author has done well to reduce this rather arcane subject to a level of readability and understanding with which



even an ex-mechanical engineer can make reasonable headway.

The ordering of the chapters was generally speaking quite logical although the positioning of drilling operations as a topic between geophysics and petrophysics, while having some chronological logic, it nonetheless seemed somewhat obscure. Nevertheless, this book is not intended to be read cover to cover. It is intended as a reference book and a learning experience – both of which it fulfils admirably. Most of the diagrams are blissfully clear and the plates and illustrations are impressive.

To me, the main attraction of the book was its focus on modernity. This is a book that brings people up to date. It describes the history of technology, which is useful and necessary for one of its reader constituencies, but this also puts into context the modern position. In short, you couldn't become an instant explorationist simply by reading this book. However, as an expert in one particular discipline you could play a much more useful parts, in a multidisciplinary team by having read all the other chapters.

Moving now to the downstream book, this is an area of business where my own experience is to say the least limited and reviewing it is therefore more of a challenge. The relative novelty however made it all the more interesting.

To start with it is of a different style. The upstream book has 11 chapters, whereas the downstream one crams 35 chapters into the same space!

The initial chapters of the book concentrate on processes and then into fuel technology and lubricants. The book concludes with chapters on marketing and codes. Again the diagrams are clear and understandable the writing succinct and lucid.

A last word? – This latest addition of Modern Petroleum Technology is a worthy successor to the previous edition while not in any sense replicating it.

community initiative award

recognising your contribution to the community

At LASMO, we believe that a positive contribution to community is key to sustainable business success. We encourage and support this outlook in companies and individuals. To demonstrate this commitment, we are delighted to help bring recognition to the achievements of our industry.

This is why we are sponsoring the IP community initiative award.

This award will be offered to the best new initiative to benefit the community. Nearly all industry areas of operation have a direct impact on the local, and sometimes national, community. Cost and efficiency targets must be met within proper consideration of community expectations. This award will recognise the year's most successful response to this challenge.

Your entry may be self-nominated or accepted with the knowledge of the nominee. Entries must be based on a project or achievement completed within the last 12 months.

Deadline for entries is 30 June.

For further details visit www.ipawards.com/2000

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Solving the energy world's problems at ONS

How should energy companies develop to meet future needs? How will the European gas market develop following liberalisation? How should oil companies approach operating in countries with problematic political regimes? And the future for Statoil, and the state's directly owned oil and gas assets? All questions raised at this year's Offshore Northern Seas conference held in Stavanger in late August reports *Nick Terdre*.

These were hardly unexpected topics, but certainly relevant for the industry in the early 21st century. And the issues were discussed in a markedly optimistic atmosphere, especially compared with that prevailing two years ago. Since that depressing period, when new work all but disappeared, Norway has come back to life this year on the back of a clutch of new development projects.

According to Statoil Chief Executive Olav Fjell, who gave a positive account of prospects in Norway's offshore sector, investments over the next 10 years will amount to just over NKr1,000bn, not much less than the figure invested in the last 10 years.

Changing times

Shaping the future of the energy industry was the theme for the conference. 'Today, the energy industries are undergoing massive transformation worldwide,' explained Conference Chairman Dr Burckhard Bergmann, Vice Chairman of Ruhrgas. 'As a result of mergers, acquisitions and alliances, companies are growing and becoming global players. We see traditional oil and gas companies engaged in power generation and renewables. We talk about multi-utilities and convergence of energies.'

Ruhrgas itself is a good example – Bergmann later told the press how the group is 'on the road to becoming an integrated European gas company.' He also welcomed moves by the Norwegian government to allow downstream gas companies into its upstream sector, and admitted that a stake in Statoil would be extremely interesting if privatisation proposals are put into effect.

Reshaping Norway

How the future of the energy industry is to be shaped was tackled from various points of view. Norwegian Prime Minister Jens Stoltenberg said that Norway – a small country in many is committed to rejigging the framework conditions for oil and gas companies, with a number of significant measures proposed in the white paper it issued mid-year.

Stoltenberg also took up the issue of state ownership. 'I believe we can strengthen Statoil's opportunities by allowing private owners into the company,' he said, but added, 'I do believe that the state should continue to own the major part of Statoil, not least because of the great importance of the company to Norway.'

He was less forthcoming on the issue of the assets held by the State's Direct Financial Interest (SDFI), saying only that, '...we need to consider whether both a restructuring and a more active management of the SDFI is necessary in order to ensure future value creation.' The government will finalise its proposals concerning Statoil and the SDFI once the ruling Labour Party has decided its policy at its national assembly in October.

Future prospects

From an energy company point of view, Sir Mark Moody-Stuart, Chairman of the Royal Dutch/Shell group, described



Sir Mark Moody-Stuart at this year's ONS conference in Norway

respects but big in energy terms – would play its part, not least by helping the development of the European gas market. He himself had recently been in Poland initiating talks on gas exports. Domestically the government the various ways in which the company is facing up to the challenges of a changing world and the new opportunities which are arising. 'Traditional value chains are fragmenting,' he said. '...but there are also opportunities for



APPLICATION FOR INDIVIDUAL MEMBERSHIP



Map no:	IP Branch name:
1	Aberdeen
2	East Anglia
3	Edinburgh/SE Scotland
4	Essex
5	Humber
6	Irish
7	London
8	Malta
9	Midlands
10	Netherlands
11	North East
12	Northern
13	South Wales
14	Southern
15	Stanlow
16	West of Scotland
17	Yorkshire

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Please complete this form and return to:

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1. PERSONAL DETAILS

Surname
First Name(s)
Miss/Mr/Dr etc Date of birth
Home address
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Telephone
Fax
E-mail
Job title
Name of company
Company address
Postcode
Country
Direct telephone
Direct fax
E-mail
Preferred mailing address: Home / Business (circle one)

2. ACADEMIC OR PROFESSIONAL QUALIFICATIONS AND SUBJECTS (Higher first)

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3. EMPLOYMENT STATUS

Employed	Self-employed	
Retired	Student	Other

4. TYPE OF ORGANISATION BY WHICH YOU ARE CURRENTLY, OR WERE MOST RECENTLY, EMPLOYED (Please tick one only)

00	Major international integrated oil company
01	Other integrated oil company
02	Independent oil company upstream
03	Independent oil company downstream
04	Supply/distribution/storage
05	Other energy industry (gas/coal etc.)
06	Engineering contractors/manufacturers or
	suppliers of equipment
07	Shipping
08	E & P services
09	Inspection/laboratory service company
10	Chemical/additive company
11	Transport industry and retail services
12	Information technology/computing/publishing
13	Traders/brokers
14	Investment/finance/banking/legal
15	Educational/training establishment
16	Government/military/local authority
17	Consultancy
18	Industry association
19	Research establishment
20	Geophysical/seismic company
22	Aviation
21	Other (please specify)

5. IS/WAS YOUR WORK PRIMARILY:

..... Upstream Downstream Both

HOW WERE YOU INTRODUCED TO THE IP? (Please tick one only)

Personal recommendation
Company requirement
Via IP Library/information service
Via IP conferences/meetings
Via IP's technical work
Via Petroleum Review
Via Internet
By the IP contacting me

7. JOB which	FUNCTION (Please tick maximum of two functions best describe your current or most recent job)	 INTERESTS (Please Indicate, using the code numbers in 7, the three subject areas which most interes 						
00	Director/General Manager	1000						
01	Planning/economics/project management							
02	Finance/computer services/IT							
03	Personnel/industrial relations/training	O DDAN	CUTC (News all the Des	and the second state of the				
04	Administration/legal/public affairs	9. DRAI	VCHES (Please tick the Bra	nch you would like to be				
05	Product & process research & development	associa	ited with – no more than two	D)				
07	Exploration and geophysical							
02	Drilling and production	1	Aberdeen					
00	Supply and trading	2	East Anglia					
10	Transport/pipelines/shipping	3	Edinburgh/SE Scotland					
11	Refining/manufacturing	A	Combarginot Scotland					
12	Marketing/sales/distribution	4	ESSEX					
13	Product quality/analysis/testing/measurement	5	Humber					
14	Engineering/design/construction	6	frish					
15	Medical/health and safety	7	London					
16	Environment	0	Malta					
17	Academic	0	Ividita					
18	Gas	9	Midlands					
19	Media/publications	10	Netherlands					
20	Storage	11	North East					
21	Microbiology	12	Northern					
22	Loss control	12	Content					
23	Retail	13	South Wales					
24	Inspection	14	Southern					
25	Potrochamical	15	Stanlow					
20	Libran/information convices	16	West of Scotland					
28	Other (place specify)	17	Vorkshire					
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Applications for the year commencing 1st January 2001 must be accompanied by payment as follows: Applicants of 25 years of age or more - £65.00; Applicants of under 25 years of age - £10.00

(On receipt of your completed application the IP will send Section 10 to your Bank or Building Society. Please do not remove it yourself.)

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I. Bank or Building Society account number
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afeguards assured by the Direct Debit guarantee
ignature(s)
Date

You require a proposer who is an IP Member or, if you do not know one, a letter of recommendation from someone who knows you professionally.

11. PROPOSER

I (name – please print clearly)	, being an individual member of the Institute of Petroleum						
(membership number							
), and having known the candidate personally for							
recommend him/her in accordance with the Bye-Laws as a fit and proper person to belong to the Institute.							
Signature	Date						

12. APPLICANT'S DECLARATION

I, the undersigned, declare that the statements made herein are corre	ect to the best of my knowledge and belief. I agree, if admitted to
membership, to be governed by the rules and regulations of the Inst	itute of Petroleum as they now exist and as they may hereinafter
be altered. I agree that the information given on this form may be he	eld at the IP and its Branches and that my name may be published
in Petroleum Review.	
Signature	Date

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10. (continued)

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creating new value chains – delivering new products and services, in new ways and combinations.'

Success depends on responding to customers' needs, he said, and identified one way in which these seem to have changed: 'We believe our customers seek differentiated rather than commodity products. We have introduced a programme of differentiated fuels – providing combinations of additional cleanliness, performance as well as engine protection – in more than 20 countries. This has shown that the assumption that fuels are a commodity is premature. Many people are willing to pay extra for their specific requirements.'

The service company perspective came from Don Vaughn, Vice Chairman of Halliburton. As oil companies are driven by technical, political and price pressures to merge, and forced to narrow their focus to their core competencies, he said, many of the functions they previously performed are being passed to outsiders, especially the service companies. But at the same time oil companies are changing their procurement approach, putting more jobs out to bid on a narrow basis. 'Clearly, these two trends are in conflict,' Vaughn said. 'The simple contracting company that responds to invitations to bid and compete on price is a different animal from the knowledge company that provides technology and project management expertise. This aims to add value by increasing the net present value of the reservoir."

A new contractor/customer relationship is called for, according to Vaughn: 'If we want service companies to do more and to add more value... then we're going to have to develop new ways of working together. At Halliburton we call these new ways "innovative business relationships".'

EU gas directive

With the European Union's gas directive having just come into force, gas was a prominent topic. Norway itself can look forward to participating in the expansion of the European gas market. In an interview published in the show newspaper ahead of the conference Peter Mellbye, Statoil's gas supremo, commented, '...it would be surprising if our overall [gas] exports were not to continue to grow to 80–90bn cm over the next five years. From a supply perspective I see no problem in delivering such a volume.'

That outcome would represent an increase of up to 25% on the 72bn cm which the country is committed to supply in coming years. Mellbye, who chaired the natural gas session, declined to speculate on whether

Norway's centralised form of negotiating gas sales would survive liberalisation. 'This is a matter between the Norwegian Government and the European Commission,' he said.

He also pointed out that the directive 'will create uncertainties when it comes to negotiating long-term agreements.' Long-term agreements have been the basis for developing the gas market in the past, and speakers at the conference generally concurred that they still have an important part to play in the future.

The issue was touched on by Georg Verberg, Gasunie's General Managing Director, who accepted that a deregulated market provided good conditions for short-term security of supply. But, he went on to say: 'For long-term security of supply, it is a matter of contracting large volumes in order to meet future market demand, and it makes less sense to rely on the dynamics of the marketplace.'

According to Verberg, major banks also see a long-term view as an essential for undertaking the massive investments that will be required to develop the sector – some \$400bn over the next 20 years.

Socio-political instability

The political and social circumstances under which the energy industry carries on its activities are a regular subject of debate at its conferences these days. Carl Bildt, the UN Secretary General's Special Envoy to the Balkans, addressed the issue of conflict management at a 'topical luncheon'.

According to Bildt, involvement in conflict areas created problems for oil companies in the short term, but by providing access to the raw materials needed for economic growth, their contribution would eventually be decisive, he said. He advised companies in difficult situations to remember that their enemy of today may be a partner tomorrow.

Technology award

Technology enjoyed its share of the limelight at ONS, with a whole day set aside for it at the conference, while the innovation award for technological creativity was given a high profile by being presented by Prime Minister Stoltenberg under the watchful eyes of King Harald during the inaugural conference session.

The prize was taken by Norsk Hydro, for the H-Sep downhole separation system which it has developed with assistance from Kværner Oilfield Products and Weir Pumps, and which is to undergo field trials next year (see *Petroleum Review*, September 2000).



Carl Bildt, Special Envoy of the UN Secretary General to the Balkans

A couple of new initiatives were successfully tried out at ONS this year. Foreign delegations invited by Intsok, the Norwegian Oil & Gas Partners, to meet the Norwegian supply and service industry were also offered the opportunity to present their sectors at open meetings under the auspices of the Exploration Promotion Forum. Such moments become valuable in proportion to the scarcity value of the information that may be available, as was attested to by the good crowd that attended Iran's presentation.

Here they learnt that Tehran is targeting oil production with a planned annual increase in oil production of 200,000-250,000 b/d to lift capacity to 6mn b/d by 2010. Among other items. an update on the development of Iran's largest gas field, South Pars, was given. Of the 10 phases currently being planned, the first five have been contracted, and phases 6-8 are expected to be contracted imminently. The first 10 phases will give total output of 10bn cf/d and 400,000 b/d of condensate, though the target date for this was not given. A further five development phases are also envisaged.

The other new initiative was the Investment Recovery Forum, which was held in a booth in the exhibition. This was mainly dedicated to promoting the reuse market, with both presentations by involved players and opportunities for those present to mingle and meet. The forum helped to fill a hole at the conference, where it was overlooked. But with two sizeable cessation projects now under way in the Norwegian sector – Ekofisk and Frigg – this failing could well be amended at ONS 2002.

Management of small bore tubing systems

Doug Ross of Amec Process & Energy and Chairman of a joint industry/HSE team developing an engineering guideline for Instrument Tubing and Compression Fittings describes the need for such guidance, recently published by the Institute of Petroleum and the UK Offshore Operators Association (UKOOA).

Small bore tubing systems are commonly used in the process industries on many kinds of fluid service. Their primary use is in the connection of instruments to process plant. The range of tubing and fittings can be from $1/8^{-1}$ inch to 2-inches or metric equivalent.

Ease of installation makes such systems economically attractive and, when correctly designed and constructed, they can provide high integrity over the installation lifecycle.

Fittings in service

There is a range of types of fitting currently used by industry. The most common types include:

- Twin ferrule compression fittings
- Single ferrule compression fittings
- JIC fittings
- Vacuum seal fittings
- Butt welded fittings
- O-ring seal fittings

The twin ferrule compression fitting is one of the most commonly used for high integrity, high performance applications, as it has good resistance to vibration.

Single and twin ferrule fittings employ a similar principle in their operation. It is the designed deformation of the ferrules and tube that provide the integrity of the installed fitting.

Fittings failures

If incorrectly designed, selected, modified, installed or maintained, small bore tubing systems can rupture catastrophically. The resulting loss of containment may present a serious hazard.

The failure of these systems makes a significant contribution to hydrocarbon release incidents in the United Kingdom Continental Shelf (UKCS), as reported by the Health & Safety Executive (HSE).¹

A joint initiative between the UK Offshore Operators Association (UKOOA), the Institute of Petroleum (IP) and the HSE was formed to produce an engineering guideline to increase awareness and improve knowledge of these systems.

The following are some of the key technical issues:

- The intermixing of compression fittings (for example, from different manufacturers) carries serious risks.
- Tubing hardness and wall thickness is critical.
- Pressure testing and leak detection should be applied to new or reinstated systems.²
- Manufacturers instructions must be followed to the letter.
- Relevant ANSI/ASME/NACE standards must be applied to the selection of materials.
- Process isolation by double block and bleed valving should be provided.
- The type of thread sealant for NPT threads should be specified.
- Established good practice should be used in the assembly of small bore systems.

There are also a number of key management issues:

- The operating company should have a formal competency assurance scheme.
- Hazard management principles should be applied to small bore tubing systems.
- The control and standardisation of fitting and tube types on individual installations is essential.
- A Technical Authority should be nominated to ensure that the operating company's small bore tubing systems are managed over their complete lifecycle.

Reducing the risk

The findings of related studies reinforce the paradigm that the cause of most accidents is human failure, not equipment failure, and that the majority of those accidents are avoidable.

The development of the guideline described here is an important element in the drive to increase safety in the petroleum and petrochemical industry.

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The assistance and cooperation of the Health & Safety Executive and the manufacturers and suppliers of compression fittings is gratefully acknowledged. Funding for the project and guidance on the content were provided jointly by UKOOA and the IP. The study work was carried out by Alan Aitkenhead of Integrity Management Ltd. The guideline team members were Chris Hill of the IP, Bruce Lawson of Elf Exploration and Ian Thomson of the HSE.







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Development



When the Åsgard field starts commercial gas production on 1 October, the event will mark the completion of a chain of projects whose overall budget is a massive NKr65bn, reports *Jeff Crook*.

The Åsgard offshore development is one of the Norwegian giants, and it involves the Midgard, Smørbukk and Smørbukk South fields in the Halten Bank area off the coast of mid-Norway. Over 50mn barrels of oil has so far been exported by tanker from the Åsgard A, but interest now focuses on Åsgard B – the largest floating gas platform in the world.

Saga Petroleum discovered Midgard in 1981, with Statoil finding Smørbukk and Smørbukk South in 1984 and 1985 respectively. The two companies unitised the three fields into a single production license in 1995, with Statoil as operator. The recoverable reserves are estimated to be 830mn barrels of oil/condensate and 7.9tn cf of gas. The offshore development faced a number of challenges including water depths of 330 metres, an extremely tough climate and high reservoir pressures and temperatures.

Project first

It is the first project in the Norwegian Sea that involves unitised development of three separate fields covering a total area of 60 km by 20 km. It is also one of the first projects to be run according to the Norsok principles. Norsok aims to enhance cooperation between organisations so as to strengthen the competitive position of Norway's offshore industry. It is thus the Norwegian equivalent of the Cost Reduction in a New Era (CRINE) initiative.

The offshore project consists of three interlinked floating production units connected to one of the most extensive subsea production systems in the world. The Åsgard A floating production, storage and offloading (FPSO) vessel, Åsgard B gas production platform, and the Åsgard C condensate storage and offloading vessel (FSO) are connected to a total of 52 wells grouped in 16 seabed templates by 300 km of flowlines. Some 115 km of umbilicals and 157 km of 3-inch service lines for methanol or glycol have also been laid.

A second project was undertaken to build a 730-km, 42-inch diameter gas transport system from the offshore fields to a treatment plant at Kårstø, north of Stavanger. The expansion of the gas treatment plant at Kårstø is being carried out under a third project. The fourth project is the Europipe II gas trunkline running from Kårstø to Dornum in northern Germany, which was the first major project completed by Allseas massive new pipelayer, *Solitaire*.

The Åsgard A FPSO sailed under its own steam to the field location and has been exporting oil by shuttle tanker for over a year – it began production on 19 May 1999. The FPSO has a production capacity of around 200,000 b/d, and a storage capacity of over 910,000 barrels of oil. It can also produce over 500mn cf/d of gas and has facilities to inject up to 630mn cf/d of gas at a pressure of 425 bar.

The high pressure and temperatures of the well fluids called for high technology risers and subsea jumpers. Coflexip Stena Offshore was awarded a \$71mn order from Statoil covering the supply of these items for the Åsgard A project. The final supply included 500bar rated gas injection risers with Teta structure, a high temperature crude oil riser (130°C) with three layers of Coflon, and a multibore riser.

Excess gas production capacity from Åsgard A will be exported 10 km to the Åsgard B gas production platform which was recently brought into operation. Åsgard B is claimed to be the world's largest semi-submersible gas production platform and measures 115 metres long, by 96 metres wide and 47 metres high. It has a production capacity of nearly 1,400mn cf/d of gas. The construction of this unit suffered a serious cost overrun with the final figure reaching NKr12.18bn.

The Åsgard B hull was built at the Okpo yard in South Korea by Daewoo Heavy Industries (DHI) to Norsok standards to allow for a 50-year life. Complications arose during construction due to the structures need for welding of high-grade steel, and further problems arose from the need for high-grade paint that would meet the Norsok 50-year standard. DHI says that it also had to overcome difficulties due to short design period and frequent design changes.

After completion at the Okpo yard, the 19,000 tonne hull was transported by Dockwise on board the heavy lift carrier *Mighty Servant 3* to Norway in a six week voyage that included a tricky Suez canal transit. The 33,000 tonne topsides was then mated with the hull at the Kvaerner yard in Rosenberg. The completed gas production platform was towed to the field by six tugs where it was moored in position in late April.

There was substantial standardisation of subsea equipment between Asgard and the Gullfaks satellites project with the benefit of volume discounts and common tool packages for the two projects.

Coflexip Stena Offshore was awarded another \$95mn contract for 24 dynamic high pressure/high temperature risers for Åsgard B. Stolt Comex Seaway was later awarded a \$25mn contract covering the installation of risers, riser bases and tie-in spools for this project. The work was being carried out by the Seaway Eagle and Seaway Kingfisher over the summer months. The Seaway Eagle was the support vessel sent to the Barents Sea in August to help with the rescue operation for the Russian submarine Kursk. She is now back in service for the returned Åsgard

Subsea flowlines from the Smørbukk subsea wells to the Åsgard B production facility employ an innovative electric heating system. The intention of this system is to reduce the quantity of chemicals needed to suppress hydrate formation in the production flowlines by heating the wellstream.

The Åsgard C condensate FSO was moored in its field site in May, shortly after the gas production platform was installed. The vessel has been chartered by Statoil from Haugesund-based Knutsen OAS Shipping. The vessel's storage capacity is 868,000 barrels of condensate which is separated from the gas stream.

After being delivered from Spain's Sestao yard in Bilbao on 2 May 2000, the 264-metre long vessel lay in the Åmøy fjord near Stavanger for tests of the dynamic positioning system. After reaching it's field position, the FSO was connected to a condensate loading buoy. It was then connected via a flexible riser to the seabed flowline leading to the Åsgard B which lies about four kilometres away.

A 42-inch diameter gas trunkline will carry gas 719 km from an export manifold on the seabed close to the Åsgard B gas platform to the treatment plant at Kårstø, north of Stavanger. The capacity of this pipeline is around 750bn cf/y, which provides some spare capacity for transport of gas from other fields in the area. Flexible risers with 14inch internal diameter connect the floating gas production platform to its riser base.

Routine pigging of the trunk pipeline presents a major problem with this piping arrangement because it is impractical to launch the 42-inch pigs needed for the trunk pipeline through the 14-inch flexible risers. The pigs thus need to be launched into the export trunkline on the seabed. Technology for subsea pig launching was developed for the BP Amoco-operated Machar Field in the UK sector (see *Petroleum Review* September 1999) and it is thought likely that the Åsgard system will be similar.

An alternative to subsea pigging was explored earlier in the Åsgard project involving the use of 25.5-inch internal diameter (ID) free-hanging titanium riser for connection of the floating platform to the subsea riser base. This larger diameter riser would have allowed a multi-diameter pigging tool to be launched from the deck of the gas platform, so that it would pass through the trunkline, to a pig receiver at Kårstø. This scheme would have eliminated the need for a subsea pig launch system.

However, the free-hanging riser, otherwise known as a catenary riser, would have pushed technical barriers because of the relatively shallow water depth. Steel catenary risers have been used before in greater depth in the Gulf of Mexico and Brazil. The pre-engineering for the 25.5-inch ID titanium catenary riser was carried out by Aker Riser Systems during spring 1999.

First gas

Gas was first introduced into Statoil's Åsgard transport trunkline at the Kårstø treatment plant north of Stavanger on 20 May. This followed the formal transfer of the 730-km transport system from the project team to the transport operations organisation. Filling the system with gas allowed facilities on the Åsgard B gas platform to be commissioned and tested.

The expansion project will enable the treatment plant at Karsto to handle the gas production from Asgard. The expansion plan includes process facilities for separation, storage and export of ethane, with a capacity of 600,000 t/y. Two rock caverns are also being constructed with capacity to store 250,000 cm of liquefied propane at temperatures of -42° C.

Kårstø was originally built in the mid-1980s to treat rich gas from the Statfjørd, Gullfaks and Heimdal fields; a number of other fields have been tiedin to the system in recent years. Lean gas is shipped from the process plant via the Statpipe trunkline to continental Europe. NGLs and condensate are exported by tanker – the plant is in fact the largest processor and exporter of NGLs and condensate in Europe.

The Norwegian gas transport system to Europe has been expanded to handle the Asgard production with the construction of Europipe II, which began operating on 1 October 1999. The pipeline runs 637 km from Kårstø to Dornum on the German coast. The Dornum station reduces the pressure and increases the temperature of the gas before the final stage of the journey to Emden, from where gas is delivered to customers in Germany, Austria and The Netherlands.

The Åsgard trunk pipeline will handle gas exports from the Norne and Heidrun oil developments, but start-up of this system has been postponed from 1 October to 15 November. A 128-km gas pipeline has been run from Norne with a further 39-km pipeline from Heidrun. The completion of the system was delayed by the late arrival of the heavy duty crane vessel *Maxita* which is due to install a 150 tonne module containing safety valves at the tie-in point with the Norne production ship.

Project problems

The Åsgard project has had many financial difficulties and came close to being abandoned after the Norwegian authorities reduced the gas sales quota by 15.9bn cm, knocking NKr9.2bn off the predicted gas sales in comparison to the original plans. The project also suffered from cost overruns of NKr16.9bn due to design changes, an increase in workscope and other factors. This took the final budget for the four interconnected projects to over NKr65bn.

Despite all this, the Åsgard project is still expected to be a commercial success. Statoil predicts that it will achieve a rate of return on capital above the company's required minimum of 8%, provided that the crude price remains above \$ 13.50/b.

Gas

gas-to-liquids

Fischer-Tropsch GTL enters new competitive phase

The question is no longer whether the Fischer-Tropsch (F-T) gas-to-liquids (GTL) process is economic, but which companies can offer the most attractive technologies to implement it, writes *Fred Thackeray*.

ompetition is quietly fierce. But it is not competition for markets. Markets for high quality diesel – potentially the principal GTL products – will not be difficult to find. Rather, the competition is to secure favourable gas supplies as feedstocks for projects by proposing the most profitable technologies.

F-T GTL technologies differ significantly in each stage of an F-T GTL plant. In each of the first two stages – the production of synthesis gas and the Fischer-Tropsch process itself – there are at least four principal technologies actively developed by different companies, and within each there are important variations. Proprietary technologies and proprietary catalysts are the essence of the scene; patents abound.

Every major international oil company in the private sector is committed to one or more technologies for F-T GTL. Most have been carrying out extensive research and development (R&D) for many years and those that have not (such as Conoco) are now hurrying to catch up. Several technology companies are also significant players, including Rentech, Haldor Topsoe and Syntroleum.

If the most likely announced projects for F-T plants go forward as planned, it is expected that the combined capacity of existing and new plants in operation by 2005 will reach 176,000 b/d*. This figure is assumed to include one of two large projects currently under discussion by Shell in Indonesia and Iran. But the pace of development has been accelerating in recent months. If this continues, total capacity approaching 200,000 b/d by 2005 appears to be a possibility. By 2015, a conservative forecast, based on the continuation of recent trends, indicates that total F-T capacity could reach about 1.5mn b/d*.

But there is a possibility – perhaps a probability – that plant costs will be much further reduced within the next seven or eight years, if current R&D work is successful. In that case it is not unreasonable to anticipate that the growth of F-T production will be even faster, perhaps bringing it to as much as 2mn b/d* by 2015.

Up and running

At present there are only two F-T plants operating on natural gas feedstocks.

These are the Shell plant of about 12,000 b/d at Bintulu in Malaysia and the 22,500 b/d Mossgas plant at Mossel Bay in South Africa. The Shell plant first went onstream in 1993. It operated successfully for over four years, producing a range of products including diesel but focusing much of its output on high-grade lubricants and waxes. Operation was halted in December 1997 owing to an explosion in the ASU (air separation unit), which was due to contamination by debris from forest fires and unrelated to the F-T technology itself. It returned onstream after reconstruction, upgrading and the installation of newly developed catalysts in May this year.

The Mossgas plant started operations in 1991 using three Synthol reactors, each of 7,500 b/d, and processing natural gas from a number of small offshore fields. This plant also processes condensate and has an overall capacity of 38,000 b/d, following a very recent expansion from 32,000 b/d. The Synthol technology employed in the plant is Sasol's HT (high temperature) process. This yields mostly gasoline range products rather than higher molecular weight products such as high grade diesel, which is the key feature of Sasol's Slurry Phase Distillate process and also of most other proposed F-T technologies.

Proposed projects

The pace of new F-T proposals and projects has been accelerating during the past two years. Furthest forward at this time is a small F-T project by US technology company Rentech, which is retro-fitting a closed-down methanol plant at Sand Creek in Wyoming with a target to start up by the middle of next year. This will be only 1,200 b/d and would not be viable in the setting of US prices for natural gas feedstocks - now at the level of \$4/mn btu - were it not for special features of the project. Most important is an expected saving of between 40% and 60% in capital costs due to the use of the existing synthesis gas unit and other infrastructure. This will also save in construction time, enabling the early operation of the plant. Additionally, Rentech plans to produce 68% high-priced waxes and only a small proportion of diesel and naphtha.

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gas-to-liquids



Rentech has been seeking other retrofit opportunities to take advantage of the chronic over-capacity and low prices of the international methanol markets. If it succeeds in this and if others follow - the concept could provide a significant additional stimulus to the development of F-T projects. Planning similarly Methanex, the methanol industry's biggest player. It has been closing down unprofitable methanol plants and has recently signed a letter of intent to buy natural gas from Shell/Woodside to supply a proposed synthesis gas plant in Australia's Northern Territory (Petroleum Review, June 2000). This could become the first stage of an F-T GTL plant, providing an important element in Methanex's plans to refocus its business away from dependence on methanol in the next few years.

Next onstream after Sand Creek could be the 10,000 b/d Sweetwater plant proposed by technology company Syntroleum to be built in Western Australia, in which Enron may take 13% equity. This plant is being engineered by *TessagINA*, an affiliate of RWE. If all goes well, Syntroleum expects that the plant will go onstream towards the end of 2002. Again, this will be directed mainly at the more profitable markets for high-tech drilling muds, lubes and other specialities.

However, high-priced markets for lubes, waxes, drilling muds etc are small and will not provide sufficient outlets as the F-T GTL industry grows. Neither does the future of F-T technology lie with small plants of 10,000 b/d or so. Economies of scale are of over-riding importance in reducing the costs of F-T GTL. The first two plants of more economic size, using natural gas feedstocks, will be Sasol's two projects – one in Qatar and one in Nigeria. These are each of 30,000 b/d (upscaled from original proposals of 20,000 b/d) and expected to embark on front-end engineering by the end of this year. They will use Sasol's Slurry Phase Distillate process, corresponding with the technology employed in a 2,500 b/d plant in operation in South Africa, using coal feedstocks, since 1993.

Achieving full benefits

An F-T plant of 30,000 b/d, however, while it is of a size to limit investment risk, is still not large enough to gain the full benefits of economies of scale. These benefits appear likely to be attainable only by plants two or three times bigger. This is undoubtedly the rationale behind the proposal for a 70,000 b/d plant recently announced by Shell as under discussion with the Indonesian Government as well as Pertamina. Similar discussions have also been publicised by Shell for a plant in Iran, presumably also of 70,000 b/d, or possibly even larger.

Shell is staying with its proprietary technology of a fixed bed F-T reactor, in which the synthesis gas is passed through multiple tubes containing a cobalt-based catalyst. Some in the industry have questioned why the company is adhering to this technology while most others are using various slurry-type reactors. Shell, however, emphasises that its technologies have been extensively proven in a commercial-sized plant. This fact, coupled with improvements in catalysts due to highly successful R&D, it says, underlie the big reductions in costs that it has recently announced.

Whereas up to a year or so ago, it was generally accepted that the capital costs of an F-T GTL plant were about \$25,000-\$30,000 per b/d of capacity, Shell is now confident that a 70,000 b/d plant such as it has proposed in Indonesia can be built at a cost of \$1.4bn or \$20,000 per b/d. Depending on individual circumstances, this cost is inclusive of all costs both inside and outside battery limits, except any expenditures necessary to provide an export harbour. At this cost, the company says, the plant would be economically viable in competition with petroleum products based on crude oil prices of \$14-15/b.

ExxonMobil is pursuing the same objective of large scale. It has discussed proposals for F-T GTL plants of 100,000 b/d in both Qatar and Alaska, also doubtless unannounced proposals for similar plants elsewhere. To date, however, the company has not operated its AGC-21 technology at more than pilot plant size.

Showing particular promise

Of particular promise is the distinctive technology developed by BP for the production of synthesis gas. This first step in F-T GTL plants can account for as much as 60% of the total capital costs of the whole plant. About one-third of this, or 20% of the total plant cost, is due to the ASU (air separation unit). This is the unit that separates oxygen from air by refrigeration for addition to natural gas in a process that combines the oxygen with the carbon in the natural gas to yield synthesis gas (a mixture of hydrogen and carbon monoxide in the ratio of 2:1). BP's technology, however, does not employ an ASU. Instead, it uses blown air as the source of oxygen. It also incorporates other unique features, of which the most important is a patented technique for the rapid removal of the heat of combustion applied to the tubes in which the reaction of the catalyst and feedstock occurs in the synthesis gas reactor. This has made it possible to place the tubes closer together and to construct a very much smaller reactor with a considerable reduction in estimated cost.

Cutting capital costs

The attack on the high costs of synthesis gas production in fact forms one of the principal avenues by which it is hoped to make further big reductions in the capital costs of F-T GTL plants. It is the purpose of two major R&D projects each currently nearing the end of the third year of eight-year programmes. These are aimed at the development of technologies that will make it possible to produce pure oxygen for the production of synthesis gas by passing air through ceramic membranes, thus eliminating the need for an ASU.

One of these programmes is sponsored by the US Department of Energy (DOE) which is contributing \$30mn to the costs of \$85mn. This programme is led by Air Products. An early indication of the prospects for costs reduction is hoped for by about the end of 2000, according to the DOE's Federal Energy Technology Unit. The other programme is led by industrial gas company Praxair, with a project leader seconded from BP. Inter alia, it also includes Sasol. While neither Shell nor ExxonMobil are participants in either programme, BP is in both, having inherited Arco's role in the DOE's programme.

The high priority for F-T technology of cutting syngas production costs is, of course, illustrated pragmatically by Rentech's venture to retrofit ailing methanol plants in order to incorporate their already existing syngas units. The importance of syngas production also underlies the emerging strategies of Methanex. Alongside its commercial moves – referred to above – to build a syngas plant in Australia, it is collaborating with Synetix (a unit of ICI) in R&D work to develop a lower-cost proprietary technology for the production of syngas.

The two companies have developed

a Gas Heated Reformer (GHR), intended for the production of syngas to produce methanol or, when suitably adapted, to produce F-T liquids. Their ongoing work is now concentrated on a materials demonstration unit to go onstream next year. They are hoping to have a fully proven process for commercialisation in 2002.

Alaskan action

Missing from the above account is the exciting scene in Alaska. Estimated proven reserves of natural gas there, at about 45tn cf, are of the same order of size as those in Indonesia, Libya and Kuwait, according to BP's annual Statistical Review of World Energy. About 26tn cf of these reserves are on the North Slope at Prudhoe Bay. They are held principally by ExxonMobil, Phillips Petroleum (which has acquired Arco's interests there) and BP.

As mentioned earlier, ExxonMobil has undertaken studies on the possibility of an F-T GTL plant in Alaska of 100,000 b/d. Phillips Petroleum is no doubt at this time wrestling with the implications of its new wealth of natural gas resources. BP is still mulling its options and at present appears to be

giving priority to proposals for a biginch line across Canada to supply Alaskan gas to US markets. For F-T GTL it has recently confirmed plans for a 300 b/d pilot plant to go onstream by early 2002. This is proposed to operate for between three and eight years as a 'testing bed' for alternative technologies. One other company which also deserves mention is the Alaskan Natural Gas to Liquids Company, which has been talking technology with Sasol and seeking the support of the Alaskan Government for an F-T GTL project of 50,000 b/d.

Despite the complexity of the economic and political aspects of developing Alaskan gas, its high importance as one of the US' few still remaining large indigenous hydrocarbon resources makes it probable that projects for its early exploitation will go forward soon. Such projects will almost certainly include at least one F-T GTL plant.

The Alaskan Government is very keen to see the development of the state's gas resources. So to is the US DOE, which is attracted by the possibility of F-T GTL projects that would produce synthetic crude for export via the Trans-Alaska crude oil pipeline. This would maintain the volume of pipeline throughput at economic levels, making up for the declining volume of Alaska's crude oil production.

This strategy, it is estimated, could add possibly 2mn to 3mn b/d to the availability of indigenous oil supplies for US markets. With this in view the DOE is providing strong backing for R&D on F-T GTL. The new technology, it emphasises, will also have a key role for the development of environmentallyfriendly diesel.

*These estimates are taken from a management report entitled Fischer-Tropsch Gas-to-Liquids, Prospects and Implications, by Fred Thackeray, just published by SMi Publishing in London.



Vessel type can impact crude oil transportation losses

At first thought it may seem unlikely that the type of carrier could affect the apparent losses that occur between load and discharge ports during the transportation of crude oil. However. when the process is considered more carefully it can be seen that there are vesselrelated factors which may affect measurement differences, writes Paul S Harrison. Consultant to PM-L-4(A). The Institute of Petroleum's Marine Oil Transportation Database Panel (PM-L-4A) has carried out two studies investigating relationships between vessel type and age and measurement differences. Work in 1997 used data from 1995 and 1996 and a second study, in 1999, used 1997 and 1998 data. The main findings from both studies – presented here – were similar.

Possible vessel-related effects

Expansion/contraction of the vessel hull can lead to an apparent difference in the volume that is measured onboard between loading and discharge. This should have a smaller effect on double hull vessels and on larger vessels with a higher proportion of the cargo carried in centre tanks insulated by wing tanks.

The amount of oil left on board after discharge (ROB) is generally due to clingage and should be less if tank walls are warmer. Much of the ROB cannot be measured after discharge and appears as onboard quantity (OBQ) at the next load port. The difference between measured ROB and OBQ may therefore be expected to be less for double hulled and larger vessels. Modern double hull vessels with more regular and less obstructed tanks also allow better measurement of that ROB and OBQ that has drained to the bottom of the tanks.

Ballast arrangements could affect

losses with vessels without segregated ballast tanks 'losing' more cargo when de-ballasting than those with segregated ballast (SBT). In addition, real losses due to evolution and venting of vapour at load, in transit and at discharge may be expected to be lower for more modern vessels with more sophisticated vapour handling systems.

In general, newer vessels with double hulls, segregated ballast and more efficient crude oil washing and vapour control facilities should show reduced losses when compared with older vessels. The study set out to determine whether these effects are real and can be demonstrated through analysis of voyage data.

Vessel characteristics

Before investigating links between vessel characteristics and loss it was necessary to select logical groupings, or classes, into which the vessels in the IP database can be divided when assessing possible differences. It was also necessary to determine how representative the vessels in the IP database are of the world crude carrier fleet.

To build a profile of crude carriers currently in use worldwide tanker data was obtained from Clarkson Research Studies (CRS) as follows:

- Vessel name
- Build year
- Displacement (DWT)



- Capacity (barrels)
- Number of tanks
- Segregated ballast tanks (SBT) Yes/No
- Clean ballast tanks (CBT) Yes/No
- Hull type single skin, double bottom, double sides, double hull
- Vessel type chemical and oil carrier, bulk/oil carrier, product carrier, tanker, shuttle tanker, other minor types

As can be seen from the vessel type specification it is not possible to define which vessels are in use as crude carriers. However, deleting the product carriers and minor types leaves 2,641 vessels in total on the CRS list. The IP database for 1997/1998 has 1,165 vessels, of which 1,086 are readily traceable through CRS. The IP database therefore contains measurement data on a minimum of 41% of operating crude carriers. The true figure will be larger as it must be assumed that at least some of the dual use vessels in the CRS list will not be in use as crude carriers.

It can therefore be concluded that the IP database contains data covering sufficient vessels for it to be representative of the global situation in terms of crude carriers. Numbers and proportions of vessels in various classes used in the following report therefore refer only to those vessels in the IP database and traceable through CRS.

The age profile of the vessels in the database clearly indicates the heavy build programme in the mid-1970s, with a similar surge in the early 1990s (see **Figure 1**). The database is larger than for the 1997 study and this is reflected particularly in the increased number of newer vessels.

In terms of capacity the vessels fall into three obvious classes:

- Those of 1.5mn barrels or less (long range or LRs) that have been built throughout the period 1970–1998.
- Those of more than 1.5mn barrels, (very large crude carriers or (VLCCs) built between 1973 and 1980.
- Those of more than 1.5mn barrels (VLCCs) built between 1985 and 1998.

It is noted that all VLCCs built between 1985 and 1998 have been between 1.5mn and 2.5mn barrels capacity with no more of the super large vessels greater than 2.5mn barrels built in the late 1970s being built.

In order to take note of general improvements to vessel design over the years the analysis divided vessels by age into pre-1985 and post-1985 classes so that, for instance, the pre-1985 group of VLCCs is not compared







with all LRs but only those also built before 1985.

The majority (84%) of the vessels in the database have segregated ballast tanks (SBT), the proportion being higher for LRs (88%) than for VLCCs (70%).

The overall distribution of hull type is 60% single skin, 31% double hull, 5% double bottom and 4% double sides. The move towards double hull vessels is apparent from **Figure 1**, with only double hull vessels registered in 1996, 1997 and 1998.

Measurement data

The measurement data used in the study is contributed to the PM-L-4A database each year by most of the major oil companies. For the years 1997 and 1998 it was estimated that full load

measurement



Shipping





and discharge data was available for 35% of all crude oil traded by sea worldwide.

Combining data for 1997 and 1998 gives a total of over 13,700 voyages, of which just over 13,200 were by the 1,086 vessels traceable through CRS.

The database contains data for ship and shore measurements at both load and discharge. The study concentrated on those differences, or values, that seemed most likely to be influenced by the efficiency of the vessel. These are as follows:

NSV loss – The difference in net standard volume (NSV) measured at load port; bill of lading (BOL) and at discharge port (outturn). This absolute difference is divided by the BOL NSV to arrive at a percentage loss figure. BOL is subtracted from outturn such that a negative figure denotes a loss.

- Water loss The difference in the volume of water in the cargo determined at loading and at discharge. This absolute difference is divided by the BOL total calculated volume (TCV) to arrive at a percentage loss figure. Outturn water is subtracted from BOL water such that a negative figure denotes a loss.
- Ship loss The difference between the vessel TCV after loading and before discharge, divided by the TCV after loading to arrive at a percentage figure. This figure is also referred to as in-transit loss, and again loss is negative.
- OBQ (onboard quantity) The TCV onboard the vessel before loading divided by the BOL TCV to give a percentage figure.
- ROB (remaining onboard) The TCV remaining onboard the vessel after discharge divided by the outturn TCV to provide a percentage figure.
- OBQ-ROB difference The difference between the two quantities defined above. ROB is subtracted from OBQ such that a negative figure denotes a 'loss'. This is divided by the vessel TCV after loading to provide a percentage figure.

These are standard loss definitions used in the annual PM-L-4(A) loss reports.

Analysis method

Losses correlate closely with crude type and load port and then less closely with discharge port. It is necessary to avoid any influence from these factors creating bias in the comparisons. The analysis method used therefore involved normalising the data by crude type. The mean of the difference from the norm for each crude for the vessel class being considered was calculated and the class mean and standard deviation for all crudes was then compared with the overall figures.

In this way the influence of crude type and almost all the influence of load ports was removed. Crudes with less than 10 entries were excluded, together with any crudes within a vessel class which had less than five entries from which to derive a mean to compare with the norm.

As the method compares differences from a normal value which itself contains the values for the class being considered, the test is a strict one and significant differences noted are considered very reliable.

Typically, comparisons were made

40

between norms derived from 3,000 to 9,000 voyages for up to 100 crude types. A minimum of 500 and for some cases up to 4,000 voyages for each class being considered were then involved in the comparison.

Due to the large number of data points involved the uncertainty of the final difference figure is kept within reasonable limits and significance for the comparisons discussed below has been determined at the 95% level unless stated otherwise.

Performance comparisons

No strong correlation between NSV loss and vessel characteristics was expected. However, as the key commercial measurement NSV loss has been determined for the two main vessel classes as shown in **Figure 2**.

As with all the comparisons which follow, the 'y'-axis shows the difference from the normalised loss. The normalised loss varies slightly from class to class due to inclusion or exclusion of certain crudes but was around -0.20% for 1997/1998 data.

None of the differences from the norm are statistically significant at the 95% level. However VLCCs appear to perform worse than LRs overall. Using a simple breakdown by age it is seen that this is due to particularly poor performance of pre-1985 VLCCs. These results are similar to those from the 1997 study.

Water loss

'Water loss' is the gain in measured water between load and discharge that can result in a net oil loss. This has been assessed against vessel classes in the same way as NSV loss (see **Figure 3**).

The main finding is the positive performance of the post-1985 VLCCs and negative performance of the pre-1985 VLCCs. Note that the scale of the y-axis has been altered from the previous chart. Both of these differences are significant. The norm for 1997/1998 data was typically -0.10%.

It was felt that ballast arrangements may have some influence on water loss and it was found that non-SBT vessels have a significantly greater overall water loss. However, this could be due to the SBT vessels being generally more modern than those without SBT.

In Figure 4 age and ballast arrangements are considered. In addition to vessels with and without segregated ballast tanks (SBT) those vessels which have SBT but which can also use clean ballast tanks for ballasting (CBT) under certain conditions are considered separately.

All of the pre-1985 vessels significantly underperform compared with the norm while the later SBT non-CBT vessels show a significant positive performance (see **Figure 5**). There is no consistent difference between vessels of the same age with different ballast arrangements.

No significant differences are very apparent within the LR group but all classes of VLCC perform significantly worse than the norm. Note again that the scale of the difference has been altered to accommodate the negative performance of the SBT non-CBT VLCCs

Ship loss and hull type

Ship loss, or in-transit loss, is based on gross measurements (TCV) after loading and before discharge (see **Figure 6**). As mentioned in the introduction this difference could be affected by hull temperature changes. All VLCC classes show losses significantly worse than the norm and poorer than the LRs.

Vessels fall mainly into two types – single skin (60%) and double hull (31%). The analysis has looked for significant differences in the key loss figures for these two types. Results are shown in **Figure 7**.

The better NSV and water loss performance of the double hull vessels is significant, as is the slightly poorer performance of the double hull vessels for vessel loss. As the norm here is a small gain, presumably due to general cooling of vessel hulls in passage, reduced gain for double hull vessels might be expected. The reduced OBQ-ROB difference for the double hull vessels is also significant. This can be explained through reduced clingage as tank sides are generally warmer, although an additional factor will be

lation on the carriage of dangerous goods.

better measurement of both OBQ and particularly ROB on this type of vessel due to the more regular tanks.

A correlation between tank size and OBQ-ROB difference was established in the 1997 study and confirmed in 1999. This demonstrated the clingage theory with vessels with smaller tanks having increased OBQ-ROB Differences.

In conclusion

There are significant differences in the performance of vessels of different types. Similar differences have been found in the 1997 study and the 1999 study.

The difference in ship loss and OBQ-ROB difference can be explained when the typical measurement situation is considered in detail. However, the poor performance of VLCCs, and particularly the older ones in terms of NSV loss and water loss, is more difficult to explain.

More modern vessels of all classes perform better than their older counterparts and the impact of improved technology on vessel design is clearly illustrated in the measurement performance. There has been an apparent increase in scrappings since 1997 with the fleet in 1999 containing a higher proportion of newer vessels. This accelerated replacement can be expected to have a continued effect in reducing measurement differences related to both real and apparent losses.

The IP as a body is neither responsible for the statements or opinions presented in this article, nor does it necessarily endorse the technical views



Further details are available from Vanessa Cook (FPS) on 01565 631313. For a registration form, contact Pauline Ashby (IP) on 020 7467 7106.



Blue Stream – the world's deepest pipeline

Blue Stream, the world's deepest gas pipeline project, came one step closer to fruition in June with approval of the fiscal protocol by both the Russian Duma and the Turkish Parliament. Completion of this delicate political stage should allow the contractors to get on with the construction work, reports *Jeff Crook.*

n preparation for the construction work and ahead of the final approvals, the difficult 380-km long piperoute across the Black Sea has already been surveyed. In addition the *Saipem 7000* heavy lift vessel has been made ready to lay pipelines in depths of up to 2,150 metres.

Eni, through its contractor Saipem, has announced that it began preparatory work on the project in February. If the project runs to schedule, transportation of gas is expected to commence in 2001, with construction work completed by 2002.

A number of pipeline projects have been proposed in the Caspian and Black Sea region, but the politics are difficult and Blue Stream is the first project to come close to realisation. Not surprisingly, Eni's Chief Executive Officer, Vittorio Mincato, sounded bullish when he announced the political progress in June. 'The Turkish Parliament's decision represents a fundamental step for the construction of one of the largest gas projects ever envisaged,' he said.

'It is also an important result in light of the substantial potential of the Caspian region, where the growth



Saipem 7000 - Semi-submersible derrick and pipelaying DP vessel

prospects in the hydrocarbon sector are very encouraging. Blue Stream is the first gas transportation project to get close to being realised. Many were sceptical, but Eni's history has been marked by great challenges.'

The ambitious plan is to link the gas pipeline network in the Krasnodar region of southern Russia to the Turkish primary gasline running from Ankara, via a three-section 1,250-km pipeline system. This will allow the export of up to 16bn cm/y of gas from Russia to Turkey, whose gas market has the highest growth rate in Europe.

The 370-km long Russian onshore sec-

tion will be constructed and financed by Gazprom. A pair of 24-inch subsea pipelines will run 380 km across the Black Sea from the Bergovaya compressor station to Samsun on the Turkish coast. This will be constructed and financed by the Blue Stream Pipeline Company, a 50:50 strategic alliance between the Russian gas giant, Gazprom, and Italy's Eni. The final 470-km long onshore pipeline will be constructed by the Turkish gas company, Botas.

The Black Sea crossing is regarded as the most challenging pipeline project in the offshore industry because of the water depth and the morphology of the seabed. The depth is 2,150 metres for over 70% of the route. Even deeper pipe routes have been considered in the past – the Oman-India pipeline route across the Arabian Sea was surveyed by Racal in 1994, and water depth along the route reached 3,500 metres. Although this particular project was shelved it provided a spur for the advance of deepwater pipelaying technology.

The Blue Stream Pipeline Company signed a \$1.7bn contract on 23 November 1999 for the design and engineering, procurement and construction of the offshore section of the pipeline system. This contract was awarded to a strategic alliance formed between Saipem, Bouygues Offshore as well as a Japanese consortium that includes Mitsui, Sumitomo and Itochu. The contract was, however, dependent on fulfillment of various conditions, such as an inter-governmental agreement on tax breaks.

Bouygues Offshore's scope of work consists of providing the Beregovaya gas compression station on a turnkey basis, the value of this project amounts to \$300mn.

Route survey

A feasibility study conducted by Petergaz with the assistance of Racal NeSA in 1997 confirmed that, after steep descent close to the Russian and Turkish coastlines, some 70% of the proposed route will be over the featureless Abyssal Plain. Although potentially straightforward as a pipeline route, the extreme water depths are expected to impose significant technical demands.

Petergaz subsequently awarded Racal NeSA a contract to carry out a high-resolution route survey of critical sections across the Russian and Turkish slopes. The morphology of these slopes is complex, with ridges and canyons and other features. The survey was conducted by the DP-vessel Mare Oceano between May and September 1998 in cooperation with the ROV company Canyon Offshore and vessel owner Diamar.

The high-resolution survey was carried out by Seabat multi-beam echo sounder, side-scan sonar and a subbottom profiler deployed on a Triton XL-20 remote operated vehicle (ROV) which hovered just 25 metres above the seabed. Mounting the sensors on the ROV eliminated the errors that might otherwise be created by a large water column. Special housings capable of withstanding pressures above 250 bar were custom-made for the instrumentation to ensure their operation at these extreme depths.

Guiding the ROV's in these great water depths presented a challenge because of

the unpredictable effect of currents on the umbilical needed to transmit power, data and control signals between the ROV and the support vessel. The drag forces acting on this great length of umbilical could make accurate guidance of the ROV very difficult.

Racal overcame this problem by use of a tether management system. This system consists of a submersible winch, which is lowered to the working depth and acts as a base for ROV operations. A short length of umbilical is paid out horizontally under constant tension from the tether management system to allow the ROV to move precisely along its intended path.

Accurate subsea positioning was of paramount importance and an extensive array of navigational and position-fixing equipment was installed on board the ROV and the survey vessel. A computer processed all sensor data recovered from the ROV on the survey vessel enabling charts and 3D images to be created.

This enabled a Petergaz representative on board the vessel to take decisions and modify survey activity as circumstances demanded. The high-resolution data allowed the piperoute to be finalised, and will also assist with detailed pipeline design, geohazard assessment and seismic risk analysis.

Pipelaying

Pipelaying is to be carried out by the giant semi-submersible crane vessel *Saipem 7000*, which is equipped with two 7,000 tonne cranes. It was fitted with a 130 metre high J-lay tower during a major refit last year. Trials of the J-lay system, involving laying 48-metre, 10-inch diameter 'quad joints', were carried out in Jelsea Fjord, Norway, in July 1999. The J-lay tower was first used for laying flowlines for Exxon's Diana field where the depth reaches 1,420 metres.

The J-lay system has been used by various contractors for deepwater pipelaying, the first application appears to have been the Maui B pipeline installation offshore New Zealand, in 1991. The system involves welding and testing the pipe joints within a tower at a near vertical angle, thus eliminating the need for a stinger. (A stinger is a long structure that extends from the stern of a conventional S-lay pipelayer to launch the pipeline smoothly into the water without excessive bending.)

The pipeline plunges straight down into the water from the J-lay tower thus eliminating the huge stresses that would occur in the top bend when a pipeline is launched into very deepwater. Launching the pipe at a natural angle also assists station keeping – this is an important factor in deepwater since thrusters will hold the pipelayer in position, rather than anchors.

The 6,000 tonne J-lay tower on the Saipem 7000 has been designed to lay pipeline 'quad joints' up to 32-inch diameter, and incorporates three conventional track-type tensioners, each with a 175 tonnes capacity, between the welding station and the non-destructive test (NDT) station. The tower can be set at a laying angle from 90–110°. Joining four pipe sections onshore forms the quad joints. The 'quad joint' are stored in a container on deck before being prepared and raised up to a vertical angle to mate with the pipeline end in the J-lay tower.

The vessel is also equipped with highpowered dynamic positioning (DP) systems to maintain station during pipelaying, since it is impractical to deploy anchors for ultra-deepwater operations. The vessel was upgraded to class III dynamic positioning during the refit in which the J-lay tower was installed.

The 198-metre long self-propelled semi-submersible is classed by both Lloyd's Register and RINA, and meets the Norwegian Petroleum Directorate's Class 3 notation for fully redundant DP. The vessel's 12 diesel generators are located in four fire-segregated enginerooms, and are capable of generating 70,000 kW of electric power at 10,000 volts. The vessel is propelled by tunnel, azimuthing and retractable thrusters.

Subsea support

The Saipem-7000 heavy lift vessel is equipped with two Innovator (Trade Mark) ROVs provided by Sonsub International which will play a key role in the Blue Stream pipelay operation. Sonsub completed an in-house programme to build 11 units of these units, last year.

Each ROV is provided with a high voltage power drive system (4,500V), and is rated for water depths greater than 3,500 metres. The systems are intended for a wide range of applications from deepwater construction and drilling support to pipeline and telecoms cable burial.

Sonsub International successfully operated one of these units at a depth of 3,000 metres in the Gulf of Mexico, which is thought to be a record for a managed tether system. This ultra-deepwater trial was part of a project to test system reliability and performance prior to deployment on the Blue Stream project.

A unit was mobilised on the Saipem 7000 heavy lift vessel during the J-lay trials which took place in the fjord outside Stavanger in July, where it performed touch-down point monitoring and preliminary survey work. • THE INSTITUTE OF PETROLEUM

Training Courses 2000

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organised in association with Invincible Energy

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Delegates will examine the various activities of the fictional Invincible Energy Company to explore the economic forces which drive the oil supply chain. They will concentrate on the main areas of risk and opportunity from the crude oil supply terminal, through transportation, refining and trading to the refined product distribution terminal.

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Technical managers/specialist personnel
Civil servants/regulators
Environmental/project engineers

Engineering/facilities management contractors
HSE managers/specialists
Reputation managers/specialists

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PETROLEUM REVIEW OCTOBER 2000

New 'Hot Office' facilities at the IP

You are probably already aware that the IP's Library holds the UK's largest collection of data about the international oil and gas industry.

But did you know that you can use our Library as an 'office away from base', to access that information via online databases, CD-ROMs, and the latest journals, books and statistics?

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For more information, or to request an invitation to the Press Reception, contact Catherine Cosgrove on 020 7467 7111 or e: ccosgrove@petroleum.co.uk

Join us for our First Anniversary Celebrations

We are about to celebrate the first year of the Library's new facilities, with a Press Reception on Tuesday 17 October, to be followed by a Library Open Day on Wednesday 18 October.

The Press Reception will begin at 5.30 for 6.00pm, and will include a full tour of the new Library facilities with the chance to meet our senior information experts.

We are taking this opportunity to launch IP Week 2001, our stimulating week of international conferences and events, and Modern Petroleum Technology, an authorative new book about global state of the art technology. A Free Prize Draw will be held, with a copy of Modern Petroleum Technology and tickets for IP Week 2001 on offer.

Everyone is invited to attend the Library Open Day on 18 October, when admittance and use of facilities will be free. We hope you will recommend the visit to your colleagues.

Letters to the Editor

The Myths of Oil

Dear Sir,

Last month's *Petroleum Review* carried an article, in which I was accused of being a Pessimist — the IEA called me the same, a year or two ago. Pessimism carries overtones of moral turpitude, but on the other hand, it is said that the difference between an Optimist and a Pessimist is that the Pessimist knows more. So, I have no reason to repent.

The cause of this opprobrium is that I have been studying a very sensitive subject, namely the depletion of oil. Given that the world's prosperity over most of the past Century was fuelled by cheap oil-based energy, it is not surprising that there are many vested interests seeking to obscure and deny the obvious conclusion that peak production is nigh. After peak comes decline. Why is this so obvious? For the simple reason that you have to find oil before you can produce it. Accordingly, the peak of discovery in the 1960s imposes a corresponding peak of production. Admittedly, different regions peak at different times. The United States did so long ago. The North Sea is now at peak and set to decline at about 6% a year. Inevitably, the world peak approaches. Oil prices predictably soar.

How do the vested interests practice their denial and obfuscation? By the well known technique of myth creation. The analysis of each myth could occupy a full issue of the Review, and so I will be content simply to list the main ones:

- Exploration is a high risk business
- True Reserve estimates are reported
- Reserve "growth" reflects advances in technology
- Reserve revisions apply to the date they are reported
- Technology will extract more from old fields
- Higher prices will lead to more discovery
- OPEC can flood the world
- Spare Capacity
- An oil company has a life Beyond Petroleum
- Synergies of merger
- The Caspian is another Saudi Arabia

- North America does not depend on Middle East oil
- 'We're testing fewer wells to cut emissions'
- The privatization of gas is in the national interest
- 'The resource is so large that for practical purposes, it can be taken as infinite'
- 'Geologists have consistently under-estimated the size of the resource'
- Hydrates are a fuel for the future

There is one word that is absolutely taboo. It starts with D, ends with N, and is nine letters long.

What is not a myth, however, is that the Club of Realists is growing. The chief executives of two major oil companies joined it when they announced that peak production would come around 2005. But they could do so only when they escaped from their spin doctors on leaving office.

The Chairman of Daimler-Chrysler writes "Crude oil will get scarce in the next 10 to 15 years......we will therefore have to face up to the question of where to find energy. I would therefore strongly appeal that we try to find an answer to this question before we reach that point."

Goldman Sachs, with two well-known oil executives on its board, should know what passes behind the lace curtains of corporate make-believe. It comments:

"The oil companies are not going to keep rigs employed to drill dry holes. They know it but are unwilling and unable to admit it. The great merger mania is nothing more than the scaling down of a dying industry in recognition of the fact that 90% of global conventional oil has already been found".

The IEA itself is an associate member, having clearly delivered the depletion message in its 1998 World Energy Outlook and Report to the G-8 — albeit doing so diplomatically between the lines.

There is nothing wrong with fairy tales: they are used to lull children to sleep. Waking up needs an alarm.

C.J.Campbell

The Bering Strait tunnel

Dear Sir

I read with interest the articles in the September 2000 edition of *Petroleum Review* on the subject of oil reserves and the current global situation. I was, however, very surprised to read that Russia's hydrocarbon reserves have probably peaked – at least oil.

You may not have heard of the proposal to build a rail tunnel connecting the USA and Russia. Not across the Atlantic Ocean, but across the Bering Strait. The crossing in only some 50 miles with a natural island in the middle and, of course, the sea is very shallow since it was once a land bridge about 10,000 years ago. It is proposed to build an all-weather railtrack to the tunnel through Russia and then on down through Alaska, Canada and on to the USA. Relatively high speed freight trains, a mile long, are said to be a cheaper form of transport than shipping. If you look at a globe, not a map, you will see that such a railroad could be extended to cover most the world with the main exception being Australia. I give a lecture entitled 'Tunnels of the Future' that incorporates a discussion of this proposal and below is one of the slides:

Bering Strait tunnel

New all-weather route in the northern hemisphere 'The Interspheric Bering Strait tunnel and railway Group' 1991 (New Civil Engineer)

Facts:

- The Bering tunnel is in two sections, each some 22 miles long to an island in the middle of the 50-mile gap between Russia and America.
- The distance from Kansas, USA, to Bombay, India, is shorter than by sea – faster and cheaper for freight by rail." continued on next page...

- Opens up vast remote areas of Canada, Alaska and Siberia which have tremendous natural resources.
- 4,600 miles of new high-speed railroad.
- 4 trillion tons of coal in northern Alaska = 30,000 years of the Alaska pipeline flow.
- Oil and gas in Siberia, east of the Urals, is double that of the whole of the Middle East reserves.
- The value of coal and minerals in Siberia is even greater.
- Cost at 1987 Tunnel \$9.5bn, £40,000/m
 Railway \$27.5bn, £3.0mn/km
 At year 2000, total cost is about £30bn,

not including special construction for an all-weather route.

Sale of a 50-mile strip of land and mineral rights on either side of the route at only £350 per acre would pay for the project many times over.

I would be interested in your comments. Mike Bennett, Consulting Engineer

The Editor would like to thak both writers for their most interesting comments and looks forward to receiving further letters on this or other industry related topics. Please email correspondence to **petrev@petroleum.co.uk** or mail to The Editor, Petroleum Review, 61 New Cavendish Street, London W1G 7AR, UK.

BRENT CRUDE GAS OIL NATURAL GAS ENERGY BRENT CRUDE GAS OIL NATUR

Europe's Leading Energy Exchange

We are Europe's leading energy futures and options exchange, with an unparalleled reputation for the very highest professional and regulatory standards. We provide a highly regulated market for those exposed to risk from energy price fluctuation, with nearly \$3 billion in underlying value traded daily, and constantly look to develop new energy contracts and markets. Achieving ever greater market awareness through education is a key factor in our success and we now seek a flexible Training Officer, comfortable working on their own initiative and in a team, to play a major role in this ongoing process.

Training Officer – Market Services

Reporting to our Head of Market Services as part of a results-oriented team, you will identify training needs and opportunities and then design and deliver relevant, up-to-date courses and workshops.

Well-organised and computer literate (Word/Excel/PowerPoint), you will ideally have experience of developing and presenting training courses. You must have the personal qualities to relate well with people at all levels, internally and externally, while knowledge of either futures and options and/or the energy industry would be a decided advantage.

We offer an excellent all round package and the chance to significantly progress your career, personally and professionally, in a unique company – with a unique environment.

Please send your CV, with salary details, quoting reference TOV-09/00 on the outside of the envelope, to: The Personnel Department, IPE, International House, 1 St Katharine's Way, London E1 9UN. For further information please contact the Personnel Department on 020 7481 0643. Closing date for applications is Friday, 20th October 2000.

www.ipe.uk.com

3RENT CRUDE GAS OIL NATURAL GAS ENERGY BRENT CRUDE GAS OIL NATUR

NE Publications

Well Logging for Physical Properties

Joseph R Hearst, Philip H Nelson & Frederick L Paillet (John Wiley & Sons, Baffins Lane, Chichester, West Sussex PO19 1UD, UK). ISBN 0 471 96305 4. Price: £150.

This handbook for geophysicists, geologists and engineers discusses the physical principles behind logging methods and the assumptions used in the conversion of the signals obtained from the logging equipment into values of the properties of the formations being logged. It also describes the pitfalls in obtaining data from logs; algorithms used to convert log values, and charts illustrating those algorithms; and routine techniques, including detailed borehole imaging, nuclear magnetic resonance logging and in-situ mineralogical analysis.

Comprehensive Dictionary of Earth Science

Magdeleine Moureau and Gerald Brace (Editions Technip, 27, rue Ginoux 75737 Paris, Cedex 15, France), ISBN 2 7108 0749 1. Price: FFr970; euro147.88; \$160.

With over 37,000 entries, this dictionary covers all fields of earth science, ranging from archaeology to volcanology. The terms, with translations in both French and English, are defined or explained and/or illustrated by examples of use. Abbreviations are explained and given their equivalence in the other language (when one exists). Greek and Latin roots are given, together with place names and persons. Appendices also provide additional tables and figures.

Reservoir Stimulation

Michael J Economides and Kenneth G Nolte (John Wiley & Sons Ltd, Baffins Lane, Chichester, West Sussex PO19 1UD, UK). ISBN 0 471 49192 6. Price: £95.

Now in its third edition, this book has been completely rewritten to reflect the changing technologies in the oil and gas industry. It contains 20 chapters written by 44 authors and provides an overview of reservoir stimulation from an all-encompassing engineering standpoint. It sets forth a rationalisation of stimulation using reservoir engineering concepts, and addresses topics such as formation characterisation, hydraulic fracturing and matrix acidising.

Energy for Tomorrow's World – Acting Now!

(The World Energy Council, 5th Floor, Regency House, 1–4 Warwick Street, London W1R 6LE, UK). ISBN 1 901640 06 X. 175 pages. See www.worldenergy.org to view full text of book, including Executive Summary.

This is the World Energy Council's Millennium Statement and outlines major energy goals and policy actions WEC plans to accomplish between now and 2020.

NACE Technical Standards on CD-ROM

(NACE International, The Corrosion Society, PO Box 218340, Houston, TX 77218-8340, USA). Price (includes biannual updates for one year): Single User - \$300 NACE-member; \$360 nonmember. Network Version - \$2,400.

This new version of the NACE Standards on CD-ROM, which is updated biannually, contains the complete collection of internationally accepted and consensus-approved NACE standards. Users have access to Standard Recommended Practices, Standard Test Methods and Standard Materials Requirements, including joint NACE/SSPC standards. Technologies addressed include coatings, linings, metallurgy, materials selection, cathodic/anodic protection, laboratory testing, surface preparation, and pipelines.

IP Library Anniversary – An Evening Wine Reception

Please come and join us for a glass or two of wine to celebrate the Institute's new library facilities and services at 61 New Cavendish Street, London, on 17 October 2000. The reception is invitation only – please contact Catherine Cosgrove at e: ccosgrove@petroleum.co.uk if you would like a ticket.

Library Open Day - 18 October 2000

Everyone is welcome to come and use the new facilities at the IP Library. An overview presentation of the facilities and services will be given at 11am and again at 3pm. Please see our website at **www.petroleum.co.uk** for more information.

New Editions to Library Stock

- Energy Policies of IEA Countries: 1999 Review. International Energy Agency Organization for Economic Cooperation and Development (IEA OECD), Paris, France, 1999.
- The History of the British Petroleum Company: British Petroleum and Global Oil, 1950–1975 – The Challenge of Nationalism. Ist Edition. By James Bamberg. Cambridge University Press, Cambridge, UK, 2000.
- Flow Measurement Handbook: Industrial Designs, Operating Principles, Performance and Application. Ist Edition. By Roger C Baker. Cambridge University Press, Cambridge, UK, 2000.

Library & Information Service Hours

Open 9.30am to 5pm Monday to Friday (except Bank Holidays). Non-members are welcome on payment of an entrance fee of £19 for a half-day or £27 for a full day.

Student non-members may use the library for ± 1.50 per day if they bring a letter of introduction from their tutor and their student ID card.

Contact Details

- Information Queries to:
 Chris Bakes Sector Inform
- Chris Baker, Senior Information Officer +44 (0)20 7467 7114 Sally Ball, Information Officer, +44 (0)20 7467 7115
- Library holdings and loans queries to:
 - Liliana El-Minyawi, LIS Assistant, +44 (0)20 7467 7113
- Careers and educational literature queries to: Information Assistant, +44 (0)20 7467 7116
- Website queries to:
- Perry Hackshaw, Webmaster, +44 (0)20 7467 7112
- LIS management queries to:
- Catherine Cosgrove, Head of LIS, +44 (0)20 7467 7111
- IFEG Queries to:

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

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

NEWschnology

High-visibility hydrant pit solutions increase apron safety

It has long been recognised that during aircraft refuelling from a hydrant system, both the hydrant pit valve and hydrant dispenser intake hose are extremely vulnerable to damage caused by ground handling vehicle collisions. In an attempt to reduce the number of such incidences, the UK Joint Inspection Group issued a Safety Bulletin entitled *Hydrant Pit Identification*. A mandatory requirement of the Safety Bulletin is to mark the position of the hydrant pit with a high visibility four-winged flag. An additional recommendation is to increase the visibility of the intake hose.

Chertsey-based Fuelling Components has developed a four-winged flag assembly to cater for this need. It is claimed to be as light as possible, yet robust enough to work in a severe operational environment. It can be easily folded flat, allowing it to be stowed away on the hydrant dispenser when not in use.

As a spin-off from this development, the company has also developed a highvisibility intake hose sleeve. The sleeve is secured around the hose by a dual Velcro/press stud system which permits

repeated removal and refitting to allow the hose to be fully inspected. The sleeves are said to be highly effective both in daytime and nightime conditions. They are also said to offer an extended working life when compared with earlier 'chevron' type intake hose covers.

Tel: +44 (0)1932 564848 Fax: +44 (0)1932 569878

New improved oxygen analysers

Servomex has unveiled 'new and improved' versions of its Xendos 1800 and 1900 ranges of process oxygen analysers. Claimed to be simple to install and operate, the Xendos 1800B1 and 1900B1 analysers have EN50104 approval and are now available with 4.5 digit display. The 1900B1 also has European (ATEX) hazardous area approval and can be supplied to comply with US Class 1, Div. 1 and Canadian Class 1, Div. 1 requirements.

Tel: +44 (0)1892 652181 Fax: +44 (0)1892 663144

Low risk subsea processing ready to go

Alpha Thames claims that its AlphaPrime modular system is a 'lowrisk solution' for maximising hydrocarbon recovery by separating the produced gas and water phases at the well head and pumping only oil to the surface.

The system is said to increase well productivity by up to 75%. It is also claimed to eliminate problems associated with hydrates and multiphase flow and is reported to reduce production costs by \$2 to \$3 per barrel.

According to the company, the high costs of offshore field development make the logic of subsea separation 'irresistible' with the potential cost savings helping to de-marginalise fields.

The company recently launched a simplified version of the system – AlphaPrime IST (industry standard technology) – which, although lacking the compactness and ease of installation of the more advanced design is said to perform in the same way, offering a 'more cautious introduction to subsea separation.'

Tel: +44 (0)1708 229229 Fax: +44 (0)1708 251273

NEWTechnology

Titanium manifolds

The Hoke titanium instrument valve manifold is now available in two-, three-, and five-valve form in either direct or remote mounting configuration. Designed to offer excellent corrosion resistance, even at elevated temperatures, the units are claimed to be ideally suited to the harsh demands of North Sea offshore applications.

A non-rotating stem tip avoids galling of the seats while a backseat provides a blowout-proof stem for increased safety. As an additional safety feature, each valve head is colour-coded to identify whether it blocks, vents or equalises.

Tel: +44 (0)20 8423 0113 Fax: +44 (0)20 8423 5933

Sub-surface safety valve testing

BG Technology has developed a subsurface safety valve (SSSV) testing rig at its Bishop Auckland test facility in the UK in response to approaches by an offshore operator and a number of valve manufacturers.

SSSVs are used in the oil and gas industry to stop production flow in the case of a well blow out and are key safety components in any offshore installation. They are normally located thousands of feet below the tree and are held open with control line pressure. Release of the pressure allows an internal concentric flow tube to move upwards, a flapper valve follows it upwards, cutting off the gas flow.

An important requirement in building the test rig was that BG Technology could duplicate the down hole environment in terms of flow conditions while enabling the valves to be mounted vertically. Although the test facility could achieve flow rates up to 20mn cf/d, the gas pressure is significantly lower than that in the well. Thus the flow rates needed to be modified to match critical fluid dynamics in the well, resulting in gas velocities of over 180 m/s (600 f/s) being produced.

The 16-metre high test rig has been constructed to allow the installation of each SSSV in the vertical plane with gas flow upwards – this being the SSSVs orientation in the field. The rig comprises two distinct parts:

- the operational pipework, and
- the supporting structure designed to absorb the substantial forces produced during the slam shut and thus reduce the bending stresses seen within the operational pipework of the rig.

Staging has been built around the structure to provide access to instrumentation and the SSSV test section.

The facility was recently used by Baker Oil Tools when a test required the valve to be slammed shut to stop a 'wide open' gas production flow rate and then seal to an API standard that allows a maximum gas leakage rate of 5 cf/minute. 'We have to test our tools in a "real world" environment to demonstrate they will perform correctly,' explained Steve Shirk, Engineering Director-Safety Systems, Baker Oil Tools. 'If the BG Technology facility had not been available, we would not have been able to do the test... Its testing facility will help us provide a more reliable tool and expand our product line."

Tel: +44 (0)1509 282525 Fax: +44 (0)1590 283131

Zone 2 explosion protection first for diesel engine

As part of an ongoing Pyroban and Detroit Diesel development programme, the Detroit Series 50 engine is claimed to be the first fully electronic industrial diesel engine to benefit from full Zone 2 explosion protection. The units are set to become the new standard for industrial applications, reports Pyroban Offshore Safety Division. Power output it rated at 400–600 hp, 1,800–2,100 rpm.

The flameproof Series 60 intelligent electronic control system (DDEC) is claimed to offer a number of benefits. Oil, coolant and exhaust temperatures are constantly monitored to maintain safety levels and optimum engine performance. This, in turn, leads to 'class-leading fuel economy and exhaust emissions,' reports the company. 'Such optimisation reduces the risk of engine overheating, meaning that the system will only shut own when there is a real risk of explosion. This ensures that costly downtime, particularly acute in offshore operations, is kept to a minimum. Temperature sensing utilises the DDEC system, eradicating the requirement for mechanical shutdown probes."

A full diagnostic facility is incorporated

in the flameproof electronic control system. This is accessed via computer and allows faults to be quickly identified. The unit can also be supplied with selfcleaning flame traps, that clear themselves of exhaust fouling, further reducing maintenance costs and downtime.

Tel: +44 (0)1273 466200 Fax: +44 (0)1273 465313

NEWschnology

Spectral analysis from the laboratory to process stream

The Diamond 20 from Orbital Applied Instrument Technologies is a lightweight and compact bench-top instrument that can be configured for analysing liquids, solids and gases. Based on the Analect range of FT-IR and FT-NIR spectrometers, the Orbital range of analysers are available for off-line, at-line and in-line applications in laboratories, pilot plants or production areas.

All the Orbital analyser configurations are built around the rugged Transept Interferometer, originally designed for process monitoring of liquid and gas stream in harsh and hazardous environments such as those found in refining. The Transept Interferometer is said to be a reliable, refractively scanned design, with precision cross-roller bearings and high-accuracy corner cube minors. Spectral ranges run between 450 cm⁻¹ and 12,000 cm⁻¹, with guaranteed vibration and temperature tolerant performance.

The Diamond 20 combines the permanently aligned optics of the Transept Interferometer with a full-size sample compartment that accommodates standard size cells and accessories. Calibrations can be transferred from one analyser unit to another with complete accuracy, states the company. Alternatively, data models can be transferred directly to an Analect PCM online process analyser that incorporates an identical Transept Interferometer.

The Orbital FT spectrometers are also available in a reaction monitor – Chem-Eye – which is sufficiently compact to operate within a laboratory fume cupboard. For further information, contact APK Analab, the UK distributor for Orbital. Tel: +44 (0)1380 729553 Fax: +44 (0)1380 728444

Anti-tamper lock for small process valves

Spinsafe is a new valve lock from Castell Safety International that is designed to prevent the accidental or unauthorised operation of valves and regulators. Using a lockable small valve wheel to replace the valve handle, the lock is claimed to fit most valves and regulators with bore sizes up to 25mm.

The device is able to lock a valve on, off or in any intermediate position to regulate flow. The status of the valve can only be changed when a key has been inserted into the valve wheel. Removing the key disengages the clutch and, while the valve or regulator remains locked in position, the disconnected valve wheel rotates freely. No further adjustments can be made until the key is inserted again.

Manufactured in zinc alloy with sealed high carbon chrome steel bearings, the robust valve lock is designed operate in temperatures up to 100°C. The unit is said to be simple to install on existing valves and optional coloured label inserts can be used to denote inline substances.

An extra safety device allows a maintenance team to lock the valve off with multiple padlocks if working on the system. Until all padlocks have been removed, the lock on the valve wheel cannot be accessed.

Tel: +44 (0)20 8200 1200 Fax: +44 (0)20 8205 0055

If you would like your new product releases to be considered for our Technology News pages, please send the relevant information and pictures to:

> Kim Jackson Associate Editor, *Petroleum Review* 61 New Cavendish Street, London W1M 8AR, UK

Membership News

NEW MEMBERS

Mr O A Agaga, Nigeria Mr C Akwukwuma, Transocean Sedco Forex Mr B Allerton, WCF Fuels Mr R Aloh, Nigeria Captain J M Anderson, Atlantic Energy Mr G Ariza, Hocol Mr M Awoderu, London Mr J A Bairstow, Aberdeen Mr R Baker, Marathon Oil UK Limited Mr I Bashir, Unipetrol Nigeria plc Dr J Bennett, Kelvedon Mr P J Q Benson, Arthur Andersen Mr M Bird, Slough Mr F Borgida, EDF Trading Limited Captain J C P Brown, JCP Marine Pte Limited Mr W Olalekan Busari, Acorn Petroleum Nigeria Limited Mr R Camball, Arthur Anderson Mr A M Chatfield, Exxon Mobil Chemical Mr O Clark, Nichimen Europe plc, Mr J Clarke, Inland Revenue Mr A Clarke, E&S Pump & Forecourt Services Mr P G M Clerc, Adamac Group Mr G De Jonge, AC Analytical Controls BV Mr F B Dias, SRI Consulting Mrs S Dixon, Kingston upon Thames Dr K Donkor, Ghana Mr G Eduefe, Nigeria Mr G J Engeler, Caltex International Technical Center Mr T A Fagbemi, Gasoline & Automotive Prd Co Limited Ms H Fazakerley, Oceans Environmental Engineering Mr A Fullarton, Barclays Bank plc Mr S R Galway, CB Hillier Parker Mr R Gburek, BMF (UK) Limited Mr T J Gillard, 516 Specialist Team Royal Engineers Mr G Gordon, London Mr D Grutterink, AC Analytical Controls BV Mr A Halsall, Liverpool Mr J Hannon, Wigan Mr R Harper, Enron Europe Limited Dr T Harrison, Refined Bitumen Association Limited Air Cdre D P Hedges, RAF Miss K A Hewitt, GeoDelft Environmental Mr H Ho, Norway Eur Ing M W D Howes Roberts, Spain Mr R J Humphreys, Corbridge Mr M Hurle, WMTC Mr N Hyldager, COWI Consulting Engineers & Planner Mr J Islorho, Nigeria Miss S Ismail, Reading Mr M Jafari, Global Star International Mr O M Jeroro, Nigeria Mr J C Jewison, ITS Caleb Brett (UK) Limited Mr P R Johnson, London Mr R I Jones, Leek Wootton Mr H G Jones, Lower Stretton Mr H Knobel, AC Analytical Controls BV Mr H Kolbe, Copene Petroquimica do Nordeste SA Mr M S Konnur, India Mr M E B Langlands Pearse, London Captain R P Leedham, Marine & Risk Consultants Ms M Lyons, MRBS Capital Partners

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STUDENTS

Mr E Agbonifo, Nigeria Ms O Akoko, London Mr H Bin-Dehaish, London Mr O Olufidipe, London Mr E Oragunye, London Miss S Salahuddin, London Mr A Sanchez, Colombia Mr P F Suzic, London Mr O J Udumebraye, Nigeria Mr S R Vivekananda, Malaysia

DEATHS

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

1938	
1920	
1916	
1916	

IP Discussion Groups & Events

Energy, Economics, Environment

A series of presentations on

'The Late Life of the North Sea'

9 Oct – Shearwater, the management of a major capital intensive project, by John Stubbs, Project Director, Shell Expro (to be held at Imperial College)

24 Oct – The fiscal system needed for the next 25 years of the UKCS, by Christine Wheeler OBE, CW Energy Tax Consultants

16 Nov – Changes in the banking paradigm, by Colin Bousfield and Kevin Price, Barclays Capital

IP contact: Jenny Sandrock

PETEX 2000

28–30 November Business Design Centre, London N1

Europe's premiere technical conference and exhibition for the exploration industry. The conference includes a half-day session jointly organised by the Institute of Petroleum and the PESGB on 'The Changing face of the Exploration and Production Industry'. The presenters of the session are all top level executives from the industry.

Further PETEX information from:

PETEX, 2nd Floor, 41-48 Kent House, 87 Regent Street, London W1R 7HF, UK Tel: +44 (0)20 7494 1933 Fax: +44 (0)20 7494 1944

e: petex@pesgb.demon.couk www.pesgb.org.uk

IP 🖗 THE INSTITUTE OF PETROLEUM

Midland Branch Meeting in conjunction with British Lubricants Federation Midland Branch

The Latest Design of Skid Automatic Batch Blend Units

by Dr Keith Nicholson

25 October 2000 Austin Court, Cambridge Street, Birmingham B1 2NP 6.00pm for 6.30pm start

A recent article in Lube magazine outlined the main features of these blend units and that their cost could often be largely underwritten by the savings made in a short period of time.

Dr Nicholson's paper will examine the design parameters of these units and explore their features and benefits to blend plant operators.

There will be a Buffet before the meeting, provided by Booth Industries. Numbers need to be known for catering . Please contact the Secretary if you wish to attend Margaret Ward Tel: (0)1299 896654 Fax: (0)1299 896955 e:margaretward@mikewardassociates.co.uk

P THE INSTITUTE OF PETROLEUM

Branch Activities

Aberdeen

Contact:	George Wood Tel: +44 (0)1224 205736				
24 Nov:	Dinner with Guest Speaker, Clare Spottiswoode				
Essex					
Contact:	Arnold Carlson Tel: +44 (0)1268 794615				
11 Oct:	Road Tanker Legislation, by Graham Holiday				
8 Nov:	Ladies' evening - confectionery and wine				
	tasting				
Midlands					
15 Nov:	See p 56				
North East					
Cantant	Labor Coordin Tale , AA (0)1CA2 EACA11				

Contact: John Sparke Tel: +44 (0)1642 546411 7 Nov: Afternoon visit to Pipeline Integrity International, Cramlington

Energy, Economics, Environment Discussion Groups

Please notify the contacts if you plan to attend any of the advertised events. All events will take place at the IP unless stated otherwise Institute of Petroleum , 61 New Cavendish Street , London W1M 8AR, UK Tel: +44 (0)20 7467 7100 Fax: +44 (0)20 7255 1472

INTERNAL SALES

Due to continued business expansion, we have the need to fill a new position within our small sales group of a major oil trader. The role will involve preparing quotations, customer service and co-ordinating external sales with the market and logistic operations.

The position will ideally suit someone with a couple of years' experience in the downstream oil industry, with either a major refiner or a distributor.

We can offer excellent working conditions within a small friendly team, situated in modern West End offices.

To apply, please send a career resume with current salary details to:

James Milne Head of Sales Futura Petroleum Limited 1 Portland Place LONDON W1N 3AA

IP Conferences and Exhibitions

Petroanalysis 2000 London: 26 October 2000

This conference will address a number of new techniques for the analysis and testing of Automotive and Aviation fuels.

Automotive Fuels (Gasoline, Diesel and LPG).

- An overview of the Sulfur Test Methods Fit for 2005 and Beyond
- New techniques for Determining Cetane Number
- Determination of Olefins and Aromatics in Gasoline
- Testing of Automotive LPG
- Aviation Turbine Fuels
- Determining the Copper Content of Aviation Turbine Fuel
- Rating of JFTOT tubes

International Conference for the Oil and Gas Industry on

Successful E–Commerce Strategies

London: 8 November 2000

The IP invites you to attend this timely conference which brings together experiences from a leading international panel of industry users, software providers and on-line exchanges. It will offer practical advice and guidance which will enable you to identify the benefits of using ecommerce, understand how it can enhance your position among other market players and become one of your key business tools.

Speakers include representatives from: BP BIM IndigoPool.com Oracle Include

Brochure with full conference programme is now available

IP Awards Lunch

London: 13 November 2000

Guest of Honour and Speaker: Lord Levene of Portsoken KBE, Chairman, Investment Banking Europe, Deutsche Bank AG

Responding to the Challenge of the New Economy

For nearly a century, the IP has encouraged and facilitated technical excellence in an industry that prides itself on attaining the highest possible standards. We are, therefore, uniquely placed to acknowledge outstanding new initiatives and examples of good practice within the international oil and gas industry. For the first time this year the IP, in association with Wood Mackenzie, will present seven awards at this prestigious IP event. In addition, there will also be a unique opportunity to hear an internationally renowned figure speak on 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.

The ticket application form is now available

For further information on any of the above conferences please contact: Pauline Ashby at the IP Conference Department Tel: +44 (0)20 7467 7100 Fax: +44 (0)20 7255 1472 e: pashby@petroleum.co.uk or view the IP Web Page: www.petroleum.co.uk Update on the HiReTs Test Method

The Pros and Cons of Online Analytical Techniques

A number of exhibitors will be showing and providing information on their latest equipment relevant to the subject matter of the proceedings.

Who should attend?

The Conference will be of interest to those involved with Product Quality Management, Laboratory Testing, Specification Writing, Standards Organisations and Instrument Manufacturers.

Please see below for contact details

Microbial developments in the oil industry

London: 21-22 November 2000

This conference has been organised by the Institute of Petroleum's Microbiology Committee with the aim of providing delegates with an overview of microbial issues within the oil industry and bringing them up to speed with latest developments.

This conference aims to update delegates on the issues and latest microbiological developments across the whole of the industry, and will cover topics such as microbially enhanced recovery, corrosion, reservoir souring, use of biocides, bioremediation, environmental impacts, monitoring, general fuels, aviation and metal working fluids. It will be of interest to those in both the upstream, downstream and oil service sectors.

Who should attend?

Those working in: Drilling and Production Supply and Trading Transport/pipelines/shipping Marketing/sales/distribution Finvironment Storage Microbiology Medical/health and safety Lubricants Product quality assurance/analysis/ testing/measurement

North Sea: Current Developments in Upstream Issues

Aberdeen: 23 November 2000

This half day seminar organised to coincide with the IP Aberdeen Branch Annual Dinner will discuss the economic aspects and technical solutions employed in the North Sea operations. Speakers include: Professor Alex Kemp, Aberdeen

Speakers include: 🤷 Professor Alex Kemp, Aberdeen University.

Interspill 2000 Brighton, UK: 28–30 November 2000

A major conference and exhibition featuring the activities of the European spill response, both at sea and on land, under the direction of the British Oil Spill Control Association and organised by the IP.

Interspill 2000 will be of interest to:

Port and harbour authorities Oil, chemical and transport industries Offshore oil field operators Central and local authorities Emergency services National and international environmental agencies.

Brochure with full conference programme is now available

VEN Forthcoming

OCTOBER 2000

Bedford, UK

London

Flow Measurement Update Details: Cranfield University, UK Tel: +44 (0)1234 754766 Fax: +44 (0)1234 751875 e: pase@cranfield.ac.uk

8-9

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

9-10

Liquefied Natural Gas Details: IBC UK Conferences Ltd, UK Tel: +44 (0)20 7453 5491 Fax: +44 (0)20 7636 6858

9-10

Hamburg 1st Bottom of the Barrel Technology Conference Details: Euro Petroleum Consultants Tel: +44 (0)20 1483 771061 Fax: +44 (0)20 1483 756932 e: Conferences@EuroPetro.com www.EuroPetro.com

9-11

London Renewables 2000 Summit

Cambridge, UK

Dubai

Details: The CWC Group, UK Tel: +44 (0)20 7704 6161 Fax: +44 (0)20 7704 8440 e: bookings@thecwcgroup.com

9-13

Marine Pipeline Engineering Course **Details: Pipes & Pipelines** International, UK Tel: +44 (0)1494 675139 Fax: +44 (0)1494 670155 e: ppi@pipemag.com www.pipemag.com

10-11

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

10-11

Vienna Oil & Gas Transportation in the CIS & Caspian Region - Major Pipeline & **Distribution Projects** Details: The Energy Exchange Ltd, UK Tel: +44 (0)1242 529090 Fax: +44 (0)1242 529060 e: wra@theenergyexchange.co.uk www.theenergyexchange.co.uk

12-13

Paris 5th Gas Executives' Summit Details: ENSPM Formation Industrie Tel: +33 1 47 52 72 93 Fax: +33 1 47 52 71 09

12-13

Beijing China Energy and Western Regional Economic Development Details: Royal Institute of International Affairs Tel: +44 (0)20 7957 5700 Fax: +44 (0)20 7957 5710

16-17

Libya, 2000 and beyond Details: SMi Ltd, UK Tel: +44 (0)20 7252 2222 Fax: +44 (0)20 7252 2272

17-19

F-Cells Week Details: IQPC, UK Tel: +44 (0)20 7430 7300 Fax: +44 (0)20 7430 7301

18-19

Amsterdam Dutch Energy Details: SMi UK, Fax: +44 (0)20 7252 2272 www.smi-online.co.uk

18-20 London The World E-commerce Forum Details: Deloitte & Touche, UK Tel: +44 (0)20 7303 6519 Fax: +44 (0)20 7303 4329 e: bonnie.gale@deloitte.co.uk www.deloitte.com

19 October Road Tanker Transport – The Way Ahead Details: Pauline Ashby, The Institute of Petroleum

Abu Dhabi 21-24 The Middle East Pipeline Integrity Assessment **Details: Pipes & Pipelines** International, UK Tel: +44 (0)1494 675139 Fax: +44 (0)1494 670155 e: ppi@pipemag.com www.pipemag.com

23-27 Aberdeen Subsea Awareness Course Details: Society for Underwater Technology Tel: +44 (0)1224 823637 Fax: +44 (0)1224 820236 e: admin@sutadmin.demon.co.uk

24-26

Warsaw

Scotland

3rd Central and East Europe Refining & Petrochemicals Roundtable Details: World Refining Association, UK

Tel: +44 (0)1242 529090 Fax: +44 (0)1242 529060 e: wra@theenergyexchange.co.uk

24-27

London

London

North Sea Flow Measurement Workshop Details: Marietta Hughes, National **Engineering Laboratory** Tel: +44 (0)1355m 272017 Fax: +44 (0)1355 272999 e: mhughes@nel.uk

26-27 November Petroanalysis 2000 Details: Pauline Ashby, The Institute of Petroleum

26-27

Aberdeen Sustaining & Improving Behavioural Safety Offshore Details: IIR Ltd, UK Tel: +44 (0)20 7915 5055 Fax: +44 (0)20 7915 5056 e: registration@iir-conferences.com

27-28

London APEA Seminar and Exhibition Evolution of Service Station Design & Engineering Details: APEA, UK Tel: +44 (0)1582 882753 Fax: +44 (0)1582 882754

30-1 November Environmental Risk Management Details: Nick Wilkinson, The Institute of Petroleum

NOVEMBER 2000

Barcelona

Submarine Communications Details: IBC Global Conferences, UK Tel: +44 (0)20 7453 5479 Fax: +44 (0)20 7636 1976

8 November Successful E-commerce Strategies **Details: Pauline Ashby, The** Institute of Petroleum

cont'd from p2

been recent moves to outsource increasing amounts of the oil distribution chain. By and large the loss of direct management control has (to date) not been seen as a significant problem. The UK experience suggests otherwise.

Outsourced delivery drivers (often ex oil company employees sometimes on inferior terms and conditions) identified with the protesting hauliers and owed no loyalty to oil companies or national interest. Both companies and governments will now have to seeks ways to improve supply security in economies that are demonstrably highly vulnerable to fuel delivery disruptions.

Direct supply links

It seems inevitable that some distribution points will have to be directly linked to the refineries and/or the product pipeline networks. This will involve a great deal of expenditure, but after the recent events in Europe and particulary the UK there is no choice but to improve delivery security. The real question is who will pay? The high price of oil, record oil industry profits and the probability of having to reduce fuel duties means that exchequers all over Europe are muttering about excess profits taxes on the oil industry. Governments would be wise to tread cautiously.

The UK Government needs to consider the rapid decline in oil and gas output currently anticipated in the UK North Sea (see diagram). All need to work closely with the oil industry to improve supply security. Governments need a commitment by the oil companies to a heavy investment in direct supply links from the refineries/pipelines to ensure supply security. They would also prefer the oil industry to pay for it.

Ever more complicated

Every time new research is published about climate change or global warming and the link with fuel sourced emissions it becomes clear that the phenomenon is even more complex and even less predictable than previously believed. We summarise the latest knowledge on p18. It is a great pity that so many commentators continue to treat a complex and imperfectly understood phenomenon as an established and incontrovertible fact. For a variety of reasons, implementing the next stage of the Kyoto Protocol is going to be very difficult.

Straws in the wind?

The most important news items often form the tiniest articles or the briefest news broadcasts. The most recent examples being the broadcast claim that Kuwait oil production was flat out and had no spare capacity and the news brief that Iraq was once again claiming that Kuwait was stealing its oil from the border oil fields.

Chris Skrebowski

IP THE INSTITUTE OF PETROLEUM

Institute of Petroleum, Midlands Brach Joint Meeting with Midlands Branch, Institute of Energy

LPG in Automotive Vehicles Opportunities and Practical Considerations

Joint paper by Calor Autogas and Power Torque Engineering

15th November 2000 Austin Court, 80 Cambridge Street, Birmingham B1 2NP

Commencing with a buffet at 6.00pm for 6.30 pm start

Full details of the meeting and other events are available on the Institute of Petroleum website at www.petroleum.co.uk

New publication

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Expert Panel on Air Quality Standards Discussion document on airborne particle: What is the appropriate measurement on which to base a

standard? A report commissioned by the Institute of Petroleum

This report has been produced as a response to the EPAQS discussion document 'Airborne particles - What is the appropriate measurement on which to base a standard?' The evaluation was carried out on behalf of the Institute of Petroleum by ExxonMobil Biomedical Sciences, and presents comments from a multidisciplinary team with expertise in biostatistics, epidemiology, exposure assessment and toxicology.

This document provides a review of the latest science and understanding on measurement and health implications of particulate pollution and will be of interest to those involved with air quality policy and the science underpinning that policy.

ISBN 0 85293 304 5

This report is available, free, on the Institute of Petroleum website: www.petroleum.co.uk, however if you wish to receive a hard copy of the document, please contact the IP Library.

www.petroleum.co.uk

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Annual Dinner 2001 Grosvenor House, Park Lane, London W1

Wednesday 21 February 2001 at 18.45 for 19.30

- Tickets can only be purchased by Individual Members and Corporate (Company) Members of The Institute of Petroleum (IP).
- The cost of a ticket is £143 plus VAT for Individual Members and for the nominated representative of Corporate Members, and £196 plus VAT for their non-Member guests. Full payment must be received before tickets can be guaranteed.
- Individual Members may apply for a maximum of five tickets. Corporate Members may apply for individual tickets, or for one or more complete tables of 10 places.

It is the responsibility of applicants to establish whether or not their guests are Individual Members. Corporate Members should note that only the company's nominated representative to the IP is entitled to the member rate, other employees or guests must be paid for at the non-Member rate, unless they are Individual Members in their own right.

Applications should be made by completing the form below and sending it to The Institute of Petroleum, with the full remittance, by Friday 27 October 2000. Applications received after 27 October 2000 will be considered separately.

- Companies or individuals wishing to share tables must state this when completing the application form, as changes cannot be made after tickets have been allocated.
- Tickets will be allocated and mailed during the week of 13 November 2000. Please note that the IP may be unable to meet requirements in full, and we suggest therefore that you do not invite guests until you have received your tickets. In the event that the Dinner is oversubscribed, allocation of tickets will depend on the degree of the applicant's involvement in IP affairs, and a waiting list will operate. Full refunds will be made as appropriate.
- Successful applicants should submit their details in writing to the IP by Friday 22 December 2000 at the latest. Details submitted after this date cannot be included. Further information regarding the guest list will be sent with the tickets.
- In the event of cancellation, a refund less a 20% administration charge of the total monies paid will be made provided that notice of cancellation is received in writing on or before 5 January 2001. No refunds will be paid after this date.
- Dress is black tie with decorations.

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To: Pauline Ashby, Conferen	nce Administrator, The Institute of	Petroleum, 61 N	ew Cavendish Street, London W1G 7AR, UK. Fax: +44 (0)207 255 1472
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