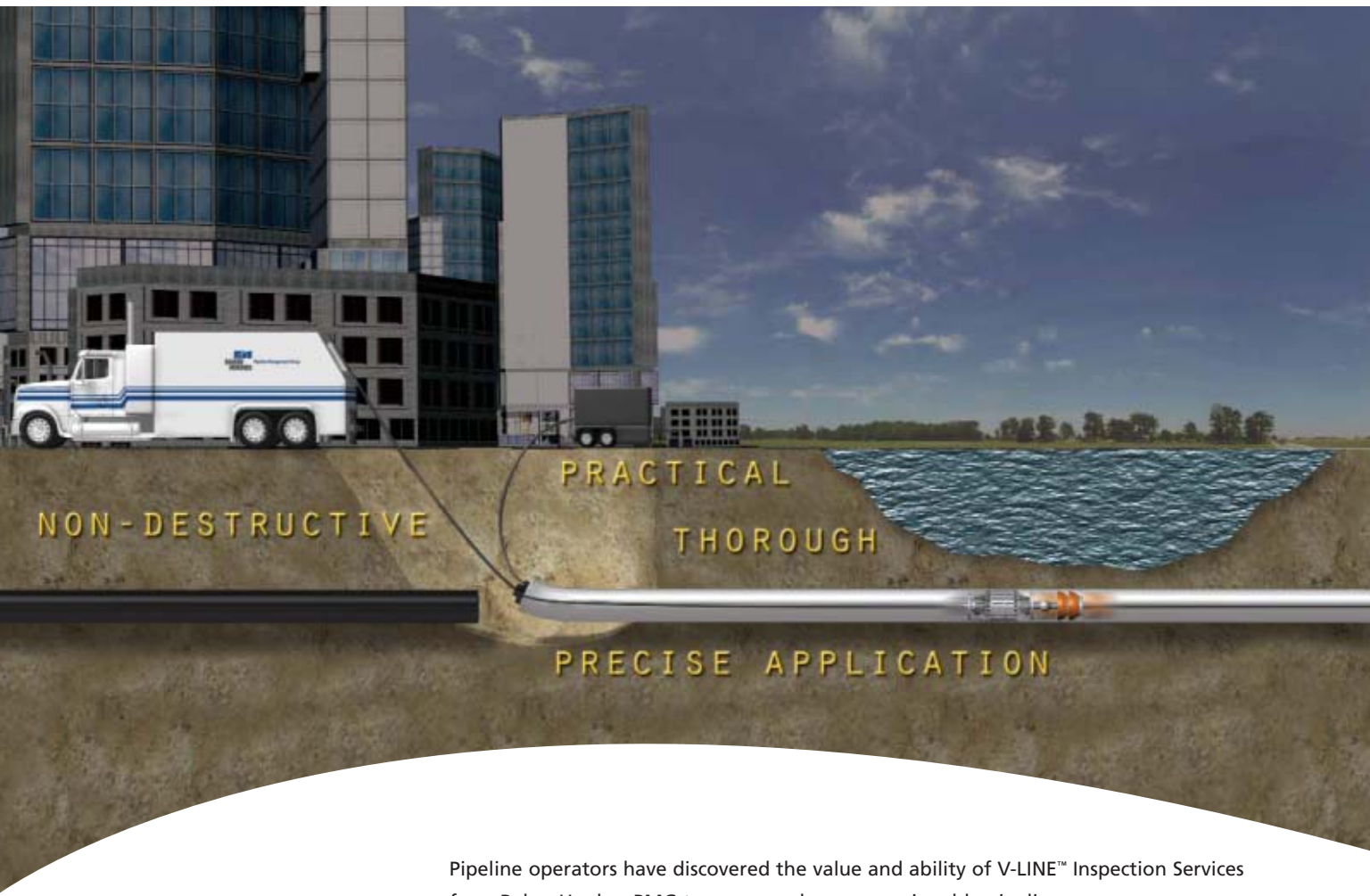
We're Taking Pipeline Inspection in New Directions



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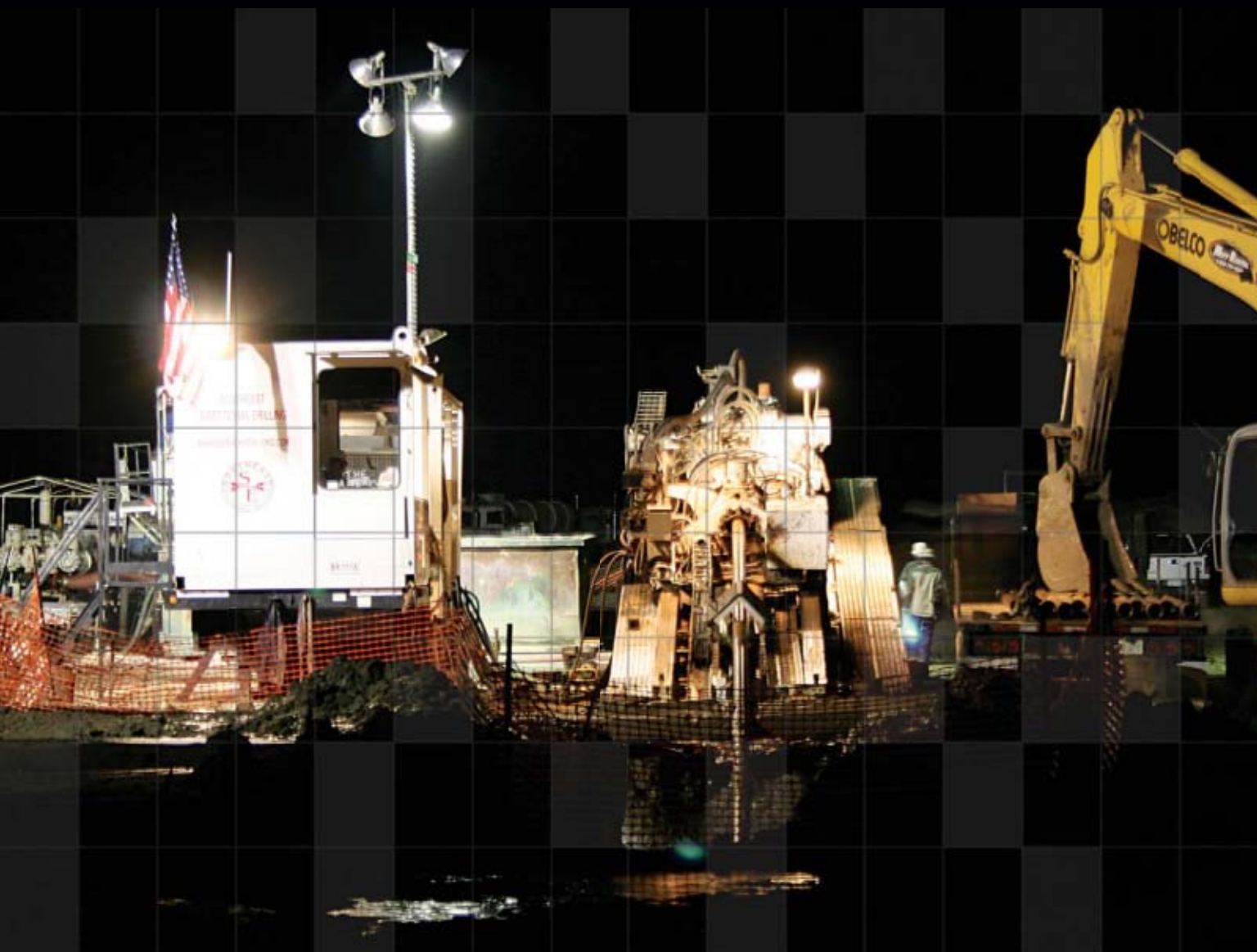

Worldwide Pipeline Construction

Chinese refining expansion to enable oil import variety
US-India study discovers large gas hydrate presence
Operators announce capex budgets, drilling programs
Method estimates solubility of petrochemicals in water

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OIL&GAS JOURNAL®

Feb. 18, 2008
Volume 106.7

WORLDWIDE PIPELINE CONSTRUCTION

REGULAR FEATURES

COVER

Southeast Directional Drilling performed a 5,636-ft pull of 42-in. pipe under the Mississippi River south of Vicksburg, Miss., for Willbros Construction. The pull was part of Willbros's work on the 105-mile Spread 1 of Spectra Energy and CenterPoint Energy's Southeast Supply Header. SESH begins at the Perryville hub in northeast Louisiana and ends at an interconnection with the Gulfstream Natural Gas System pipeline in Mobile County, Ala., connecting the Florida market with new gas production in the Barnett Shale in East Texas and Bossier Sands in North Louisiana. Such expansions have led to continued growth in proposed pipeline construction projects in North America and around the world. Oil & Gas Journal's special report on Worldwide Pipeline Construction, which begins on p. 46, provides more information on construction trends and plans for 2008 and beyond. Photo from Willbros USA Inc. by Lindy King.

General Interest

Exploration & Development

Drilling & Production

Processing

Transportation

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Is CP worthless?

What kind of question is this? Most in the pipeline industry agree that cathodic protection (CP) is the smart way to provide backup corrosion protection on underground pipelines.

But consider: If you use solid film backed corrosion coatings, you may be wasting money by adding CP to the pipeline.

There is a common sense reason for this statement. CP systems protect pipelines by delivering electrical current to the steel surface. Solid film back corrosion coatings have the property of *resistivity*, which means they *block* electrical current. This blocking effect is called *cathodic shielding*.

The phenomenon of *cathodic shielding,* or blocking of protective CP current, has been the subject of dozens of technical papers since the mid 1980's. You can review a cross section of these papers on Polyguard's website.You can also view a 10 minute explanation of the cathodic shielding process.

Worldwide, we estimate that over half of pipelines are being coated with solid film back coatings, such as shrink sleeves, tapes, and 2 or 3 layer systems. Most of these lines have CP systems. These are the operators who may be wasting their money on CP. Moreover, many install shielding coatings on girth welds, the most vulnerable area for corrosion.

Two corrosion coatings are proven to be non-shielding, and allow passage of protective CP currents. One of these coatings is FBE. The other is Polyguard RD-6.

NACE SP0169-2007 states: *"Materials … that create electrical shielding should not be used on the pipeline"* [1].

49 CFR §192.461 states: *"External protective coating …must …have properties compatible with any supplemental cathodic protection."* [2]

If you are concerned that your organization is behind this curve, we recommend:

1. **Visit polyguardproducts.com/failsafecoating.htm and review the large body of information about shielding problems.**

2. **Talk to operators who have used Polyguard's RD-6 system. *(There are many)* Ask them if they know of any serious corrosion or SCC ever found under RD-6. *(We don't, even after 19 years and thousands of installations).***

3. **Have someone in your organization attend the NACE course *"Coatings in Conjunction with Cathodic Protection".***

1. NACE SP0169-2007 *"Control of External Corrosion on Underground or Submergeed Metallic Piping Systems".*
2. 49 CFR Ch.1 (§192.461 see also §195.559)

OGJ Newsletter

Feb. 18, 2008

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General Interest — Quick Takes

EIA: OPEC oil export revenues climbed 10% in 2007

Members of the Organization of Petroleum Exporting Countries earned an estimated $674.7 billion in net oil export revenues during 2007, 10% more than in 2006 when revenues totaled $612.7 billion, the US Energy Information Administration said on Feb. 12.

Saudi Arabia had the biggest share, $193.8 billion, or 29% of the 2007 total, it indicated. That was $11 million, or 6%, more than its $182.8 billion of oil export revenues in 2006.

On a per capita basis, OPEC's net oil export revenues rose 8% year-to-year to $1,147 from $1,059, according to EIA. Qatar had the largest share of 2007's total, $29,235, followed by the UAE with $23,817 and Qatar with $21,619.

EIA bases its figures on estimates of countries' production and consumption in its latest short-term energy outlook and assumes that exports are sold at prevailing spot prices. When a country exports several different crude grades, EIA assumes that the proportion of total net exports represented by each grade represents its share of total domestic production.

The federal energy forecasting and analysis service predicted that OPEC's total oil export revenues could reach $863 billion in 2008 and $797 billion in 2009, based on its latest short-term energy outlook. In that forecast, EIA said it expects global oil markets to ease as production increases outside OPEC and planned capacity additions within the cartel more than offset expected moderate world demand growth.

Cold winter trims Iranian oil, petrochem output

An unusually cold winter has cut production of crude oil and petrochemicals in Iran, reports FACTS Global Energy, Honolulu.

The chill has raised residential and commercial use of natural gas, diverting supplies away from gas-lift operations in Iranian oil fields and from petrochemical manufacture, says FACTS analyst Siamak Adibi.

Since early January, Adibi says, residential and commercial demand has represented 90% of total Iranian gas consumption of 15.67 bscfd and has been 18% higher than its level of a year earlier.

Gas has been cut off to reinjection projects in Parsi, Karang, and Kupal oil fields. Reinjection at Maroon oil field has dropped to 200-300 MMscfd from 900 MMscfd, Adibi reports.

Together, those fields had been producing 930,000 b/d of crude, about 512,000 b/d of it from Maroon field alone.

National Iranian Oil Co. (NIOC) had planned to raise gas reinjection in all of Iran's oil fields to 7.9 bscfd in 2010 and to 10.9 bscfd by 2015.

Some Iranian engineers believe the country's predominantly fractured-carbonate reservoirs will require more gas reinjection than that, Adibi says, noting that the overall decline rate for Iranian oil fields is 9-11%/year.

"Many industrial projects such as gas-based petrochemical plants at Assaluyeh have no production because gas supply has been temporarily halted to meet the increased demand from the residential and commercial sector," Adibi says. "NIOC has also cut LPG supply to petrochemical projects."

Gas processing plants fed by gas from Phases 4 and 5 of giant offshore South Pars gas field have cut LPG exports and moved the gas into the national grid.

Iran has halted pipeline gas exports to Turkey, to which it had committed 970 MMscfd. Late last year it trimmed the exports to 140-180 MMscfd.

"Turkey will have a serious gas shortage if the Iranian supplies are not resumed," Adibi says.

The Iranian government has blamed the gas shortage on a reduction in imports from Turkmenistan related to price disputes.

But Adibi notes that the Turkem problem should have affected only northeastern cities in Iran and says, "This shortage, which has covered the whole country, has been caused by a failure in network management."

Adibi attributes the problem to conflicting gas requirements for gas reinjection in projects managed by NIOC and for rapidly developing downstream uses in projects managed by National Iranian Gas Co.

Nigeria's new gas policy favors domestic market

Producers of natural gas in Nigeria will be expected to sell gas at an affordable price to the domestic market under a new pricing policy approved by Nigerian President Umaru Musa Yar'adua.

Gas producers also will allocate a share of their production and resources to the domestic market rather than export it. No details were given on what this quantity would be.

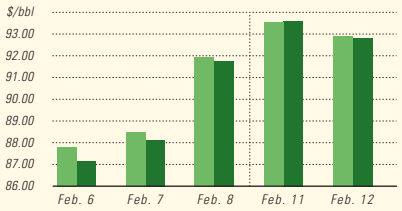
The plan underpins Yar'adua's commitment to ensure that Nigeria develops its gas reserves for domestic use focusing in particular on electric power generation. Industries such as fertilizer and methanol that require gas as feedstock will be able to compete with their counterparts in other low-cost gas producing countries, according to presidential spokesman Olusegun Adeniyi.

Adeniyi said the amount of gas reserved for domestic consumption will be periodically determined by the Minister of State (Gas) in the Federal Ministry of Energy. Also, a new gas department will be established in the federal energy ministry to implement the gas policy and regulations.

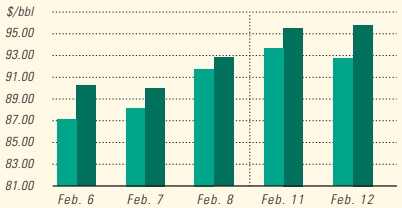
Nigeria's proved gas reserves are estimated at 184 tcf, but it has struggled to attract investment in the electric power sector because of low prices and a lack of regulations, leaving investors to prefer

Industry Scoreboard

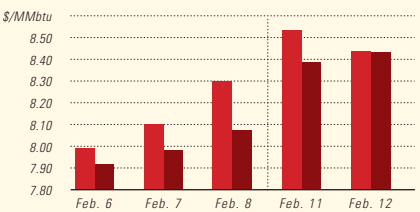
IPE BRENT / NYMEX LIGHT SWEET CRUDE



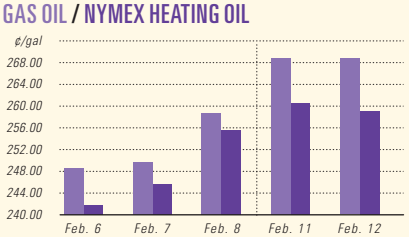
WTI CUSHING / BRENT SPOT



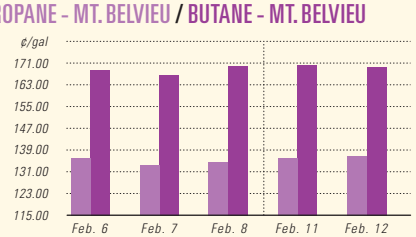
NYMEX NATURAL GAS / SPOT GAS - HENRY HUB



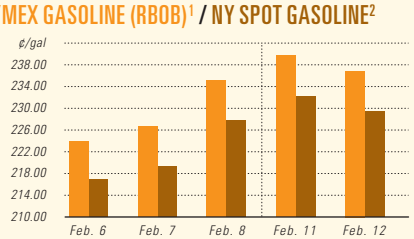
IPE GAS OIL / NYMEX HEATING OIL



PROPANE - MT. BELVIEU / BUTANE - MT. BELVIEU



NYMEX GASOLINE (RBOB)[1] / NY SPOT GASOLINE[2]



[1]Reformulated gasoline blendstock for oxygen blending.
[2]Non-oxygenated regular unleaded.

US INDUSTRY SCOREBOARD — 2/18

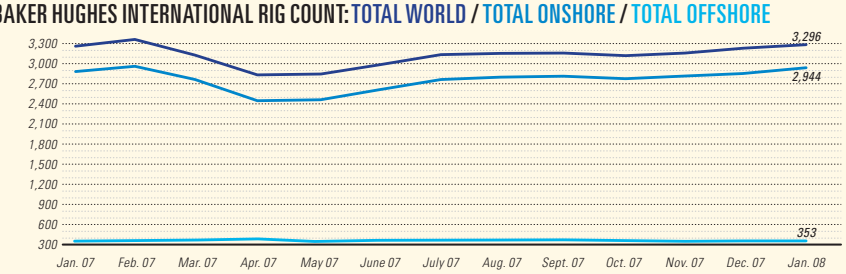
Latest week 2/1	4 wk. average	4 wk. avg. year ago[1]	Change, %	YTD average[1]	YTD avg. year ago[1]	Change, %
Demand, 1,000 b/d						
Motor gasoline	8,984	8,891	1.0	9,048	8,958	1.0
Distillate	4,235	4,267	–0.7	4,232	4,434	–4.5
Jet fuel	1,547	1,616	–4.3	1,545	1,626	–5.0
Residual	721	753	–4.2	778	848	–8.3
Other products	5,136	5,032	2.1	5,152	5,049	2.0
TOTAL DEMAND	20,623	20,559	0.3	20,756	20,915	–0.8
Supply, 1,000 b/d						
Crude production	5,017	5,196	–3.4	5,023	5,172	–2.9
NGL production[2]	2,512	2,250	11.6	2,416	2,235	8.1
Crude imports	10,279	10,192	0.9	10,184	9,650	5.5
Product imports	3,574	3,431	4.2	3,479	3,283	6.0
Other supply[3]	1,083	968	11.9	1,054	1,046	0.7
TOTAL SUPPLY	22,465	22,037	1.9	22,157	21,386	3.6
Refining, 1,000 b/d						
Crude runs to stills	14,962	13,137	13.9	14,962	14,712	1.7
Input to crude stills	15,142	14,823	2.2	15,142	15,087	0.4
% utilization	86.8	84.9	—	86.8	86.4	—

Latest week 2/1	Latest week	Previous week[1]	Change	Same week year ago[1]	Change	Change, %
Stocks, 1,000 bbl						
Crude oil	300,004	292,952	7,052	324,478	–24,474	–7.5
Motor gasoline	227,487	223,899	3,588	227,414	273	0.1
Distillate	127,139	127,004	135	136,345	–9,206	–6.8
Jet fuel-kerosine	41,166	40,609	557	40,300	866	2.1
Residual	63,459	35,531	928	42,338	–5,879	–13.9
Stock cover (days)[4]			Change, %		Change, %	
Crude	20.3	19.4	4.6	21.8	–6.9	
Motor gasoline	25.3	24.7	2.4	25.0	1.2	
Distillate	30.0	29.9	0.3	31.6	–5.1	
Propane	22.0	24.7	–10.9	25.6	–14.1	

Futures prices[5] 2/8			Change		Change	%
Light sweet crude, $/bbl	89.09	91.13	–2.04	57.86	31.23	54.0
Natural gas, $/MMbtu	8.04	7.99	0.05	7.47	0.58	7.7

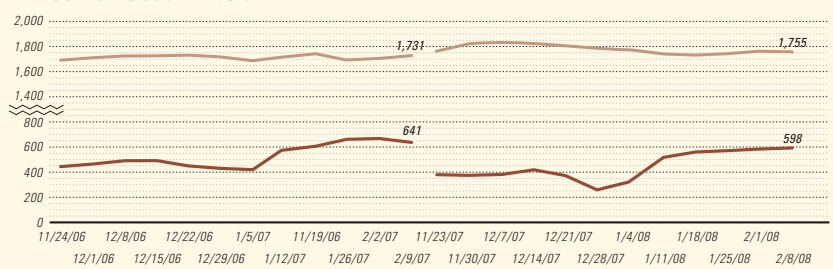
[1]Based on revised figures. [2]Includes adjustments for fuel ethanol and motor gasoline blending components. [3]Includes other hydrocarbons and alcohol, refinery processing gain, and unaccounted for crude oil. [4]Stocks divided by average daily product supplied for the prior 4 weeks. [5]Weekly average of daily closing futures prices.
Sources: Energy Information Administration, Wall Street Journal

BAKER HUGHES INTERNATIONAL RIG COUNT: TOTAL WORLD / TOTAL ONSHORE / TOTAL OFFSHORE



Note: Monthly average count

BAKER HUGHES RIG COUNT: US / CANADA



Note: End of week average count

exporting gas as LNG. Nigeria's gas flaring has amounted to 3.5 billion boe over the past 26 years because it does not have the infrastructure to distribute gas locally (OGJ Online, Jan. 29, 2008).

Experts said that the challenge for any projects in Nigeria would be to strike the right balance between selling gas domestically and selling more profitably in the international LNG market.

Iraq, Kurdistan continue row over oil contracts

Disagreement over the development of Iraq's oil and gas persists between the country's central government in Baghdad and the Kurdish Regional Government (KRG), as both sides continue to insist on their respective rights.

Kurdistan Region Prime Minister Nechirvan Barzani said he will lead a delegation to Baghdad in the next 2 days for talks with the central government over the country's draft oil law, among other topics.

Mahmud Uthman of the Kurdistan Alliance said the delegation will hold talks with Iraqi Prime Minister Nuri al-Maliki on the status of the Oil and Gas Law, as well as recent and pending contracts KRG signed with international oil companies.

KRG Oil Minister Ashti Hawrami told an oil conference in London that the Kurds have not made any decision to stop signing new contracts with foreign firms, despite threats from the central government to block oil exports as a result of disputes over the legality of KRG contracts.

"Talks with other firms are still under way," said Hawrami.

Meanwhile, reaffirming that the KRG oil contracts are illegal, Iraqi Oil Minister Husayn al-Shahrastani has threatened to blacklist international oil firms if they sign them.

In a published interview, Al-Shahrastani dismissed Kurdish aspirations by saying Iraq has lost decades of opportunities and wasted a year discussing the draft Oil and Gas law.

He noted that the government has decided to expedite the rehabilitation of oil wells, adding that the exact specifications required for developing oil wells in the long run have not yet been approved.

Al-Shahrastani also said a good contract that would give the Iraqi government full ownership and control over the country's oil will be designed to encourage international oil companies to introduce technology and provide financial resources to his country. ✦

Exploration & Development — *Quick Takes*

MMS expects $362.5 million in latest RIK oil sale

The US Minerals Management Service expects to gross $362.5 million from its latest royalty-in-kind crude oil sale from federal offshore leases in the Gulf of Mexico and Pacific Ocean, the Department of the Interior agency reported.

Six companies submitted winning bids for the 4,264,500 bbl of crude in the January sale, or 29,050 b/d over the terms of the contracts, MMS said Feb. 12. Delivery is scheduled to begin Apr. 1 and to conclude June 30, with the exception of one Pacific Ocean package that was awarded for 1 year.

MMS based its estimated revenue from the sale on the current $85/bbl for oil of this quality. It periodically conducts such sales as part of a program which allows it to take some crude in kind instead of receiving a cash payment. MMS then competitively sells this royalty crude on the open market.

Chevron Products Co., ConocoPhillips Co., Exxon Mobil Oil Corp., Sempra Trading Co., Shell Trading, and Plains Marketing LP submitted the winning bids in the latest RIK oil sale, MMS said.

Eni nets 18 exploration leases in Alaskan sale

Eni SPA has picked up 18 exploration leases off northern Alaska under Lease Sale 193 held Feb. 6 in Anchorage.

The blocks, described as having "high exploration potential," lie in 30-50 m of water in the Chukchi Sea. Of the 18 leases for which Eni was the highest bidder, 14 were joint bids with StatoilHydro AS, and the remaining 4 were solely Eni, the company said.

In Alaska, Eni owns 158 leases on the North Slope, and recently started development of Nikaitchuq oil field, its first project as an operator in the region.

The acquisition of the Alaskan blocks requires the approval of the local authorities before the deal can be finalized.

Norway awards 52 licenses in latest lease sale

Norway has offered 52 production licenses to 19 operators that applied to develop blocks in the Norwegian North Sea, the Norwegian Sea, and the Barents Sea.

Competition for the licensing round, dubbed Awards in Predefined Areas 2007, was intense as it received 113 applications, the Norwegian energy ministry said. "There is a large potential in proving new, smaller resources close to existing infrastructure in the mature areas of the [seas]," it said.

The energy ministry is keen to see rapid development of potential resources and maximize exploration in mature areas on the Norwegian Continental Shelf. Among the companies with successful bids were BG Norge AS, Centrica Resources Norge AS, Dana Petroleum Norway AS, E.On Ruhrgas Norge AS, Endeavour Energy Norge AS, Eni Norge AS, Esso Norge AS, Genesis Petroleum, and Faroe Petroleum Norge AS.. ✦

Drilling & Production — *Quick Takes*

StatoilHydro lets Troll C modification contract

StatoilHydro AS awarded Aker Kvaerner an engineering, procurement, construction, and installation contract for modifying the Troll C semisubmersible accommodation and processing platform. The modifications will allow processing low-pressure oil production from subsea completed wells in Troll West, about 80 km off Bergen, Norway.

The 450 million kroner project has a scheduled completion date of January 2010. Aker Kvaerner plans to immediately commence design and procurement work, with prefabrication of steel and piping starting in October at Aker Kvaerner Egersund.

The contract also includes a 400-tonne compressor module

that will be installed on Troll C during August 2009.

The offshore installation work is planned for 2009.

The Troll C platform is one of the assets included in Aker Kvaerner's long-term maintenance and modification contract with StatoilHydro.

Troll C was installed on Troll West in 1999, and also handles production from Fram West and East fields.

Partners in Troll West are Petoro AS 56, StatoiHydro 30.58%, Norske Shell 8.1%, and Norske ConocoPhillips AS 1.62%.

Kvitebjorn gas, condensate production resumed

StatoilHydro AS has restarted gas and condensate production from Kvitebjorn field in the Norwegian North Sea after repairs were identified for the pipeline from the field to the Kollsnes processing plant on the west coast. The line was damaged by a ship's anchor last fall. Gas exports from Visund, which uses the same pipeline, also have resumed to Kollsnes.

This summer StatoilHydro will repair the pipeline, which suffered damage to its weight coating. However, in the meantime internal experts and consultants said it has "sufficient technical integrity" for temporary operation.

Kvitebjorn was scheduled to start up again in November after production was temporarily stopped in May to stem falling reservoir pressure during its complex drilling program (OGJ Online, May 5, 2007). The field had operated at about 50% of its 190,000 boe/d capacity since December 2006.

Production problems with this field, which started in 2004 and came to 11 million cu m/day, was one of the reasons StatoilHydro missed its 2007 production target. "There are no capacity restraints now," a company spokesman told OGJ.

Kvitebjorn is on Block 34/11, east of Gullfaks field in the North Sea. According to current plans, some 55 billion cu m of gas and 22 million cu m of condensate will be produced.

Shell lets contract for Perdido oil field

Royal Dutch Shell PLC has let to Technip an engineering, fabrication, and installation contract for a flowline and riser on ultradeepwater Perdido oil field in the Gulf of Mexico.

Together the flowline and steel riser will cover 8.24 miles and the pipelines will extend 9,700 ft along the route. Technip will weld the pipelines in Mobile, Ala., and will install them with its Deep Blue deepwater pipelay vessel.

In November, Shell awarded Technip an EPC contract for the Perdido umbilicals, spar hull, and mooring system (OGJ Online, Nov. 27, 2007). Moored in about 8,000 ft of water, the spar will be the world's deepest spar production facility and the first with direct vertical access, Technip said.

Perdido is 200 miles south of Freeport, Tex. Shell is the operator with a 35% interest. Other partners include Chevron Corp. 37.5% and BP PLC 27.5%.

Aker Clean Carbon plans Karsto CO_2 capture unit

Aker Clean Carbon and the Norwegian government will establish a 725 million kroner carbon dioxide capture and sequestration unit at Karsto on the west coast of Norway. Operations are scheduled to begin in 2009. Aker said it expects the plant's carbon sequestration to be cheaper than releasing emissions.

"The plant will have a capacity to remove 100,000 tonnes/year of CO_2 from exhaust gasses. Operating costs are estimated at 150 million kroner over a 3-year period," Aker said.

Parent company Aker Kvaerner will design and construct the CO_2 capturing facilities. ✦

Processing — *Quick Takes*

Total to build coker at Port Arthur refinery

Total SA will build a 50,000-b/d coker and desulfurization, vacuum distillation, and related units at its 231,000 b/d refinery in Port Arthur, Tex. Commissioning is scheduled in 2011.

The $2.2 billion increase in the refinery's deep-conversion capacity will boost output of ultralow-sulfur automotive diesel by 3 million tonnes/year.

Hunt to boost output at Tuscaloosa refinery

Hunt Refining Co. plans to install two new units at its Tuscaloosa, Ala., refinery to increase crude throughput by more than 30% to 69,000 b/d, double its production of gasoline and diesel for the southeastern US, and help it meet benzene regulations.

US Environmental Protection Agency mandates require that refineries adhere to annual averages of 0.62% benzene content in gasoline by 2011.

Hunt selected Honeywell International Inc. subsidiary UOP LLC, Des Plaines, Ill., to supply basic engineering services, technology, and equipment, including its proprietary continuous catalytic reformer and unicracker. The technology will process light naphtha to produce high-octane gasoline blending components with low benzene content.

The CCR process produces high-octane gasoline from naphthenes and paraffins, and unicracking technology upgrades light cycle oil feedstocks to make ultralow-sulfur diesel and naphtha.

Construction on the new units will begin this year for service to begin in late 2009. The project is planned to complete in 2010.

Hunt's Tuscaloosa refinery provides 52,000 b/d of gasoline and distillate fuels, home heating oil, diesel fuel, and asphalt to the Southeastern US and East Coast. ✦

Transportation — *Quick Takes*

Maritimes & Northeast to expand pipeline capacity

Maritimes & Northeast Pipeline (M&NP), Halifax, NS, plans to invest $240 million to expand the capacity of the 330-mile US mainline portion of its natural gas pipeline system. The decision followed a successful open season for the additional capacity.

M&NP will install additional compression at existing stations and will lay about 4.5 miles of 24-in. loop on its existing 24-in. mainline to enable transmission of as much as 170 MMcfd year-

round and an additional 30 MMcfd during winter months.

These Phase 5 facilities will accommodate gas to be supplied by EnCana Corp.'s planned Deep Panuke project off Nova Scotia. It will be delivered to markets in Atlantic Canada and the US Northeast. M&NP expects to place the expanded system into service in November 2010.

M&NP is owned by affiliates of Spectra Energy 77.53%, Emera Inc. 12.92%, and ExxonMobil Corp. 9.55%.

Siberian pipeline commissioning may be delayed

The Russian government will hold a meeting next week to discuss postponement of the commissioning date for the ESPO pipeline from East Siberia to the Pacific Ocean.

"I will call a meeting on the ESPO project to discuss this issue," said Russian Deputy Prime Minister Sergei Naryshkin, who is responsible for the project to build the pipeline.

The announcement follows a public disagreement that took place in late January over the pipeline's commissioning date.

No official proposals to postpone dates of the construction of the ESPO line had been submitted to the Industry and Energy Ministry, according to Sergei Mikhailov, director of the ministry's department for state energy policies.

"There has been no talk about any postponement," said Mikhailov on Jan. 31. "Slight adjustments could be made in the construction schedule. No one has cancelled the agreed timeframe."

But on the same day, Andrei Sharonov, a member of the board of directors of state pipeline monopoly Transneft, said the company had established new deadlines for the launch of the first ESPO section, adding that letters had been sent regarding the changes.

Transneft Vice-Pres. Mikhail Barkov has since said the new dates were to be confirmed before mid-February by a commission of industry and energy ministry officials.

In late November 2007, Transneft's board reported a more than 25% backlog in welding and assembly work by contractor firms. That resulted in the pipeline's becoming some 700 km shorter than originally planned.

Due to that shortfall, Transneft reportedly sought to delay the launch of the first section until September 2009.

Sasol to expand Mozambique gas pipeline

The Republic of Mozambique Pipeline Investments Co. (Pty.) Ltd. (Rompco) has awarded Foster Wheeler South Africa (Pty.) Ltd. an engineering, procurement, and construction contract to increase to 147 megajoules the capacity of Rompco's 120-megajoule pipeline between Temane gas field in Mozambique and a Sasol coal-to-liquids complex in Secunda, South Africa. Initial plans for the pipeline called for an eventual capacity of 240 megajoules.

The 26-in. pipeline, which began operations in 2004, extends for 865 km, including 340 km in South Africa. The capacity expansion involves adding a new compressor station, including two gas turbine-driven compressors units, at Komatipoort, South Africa, near the border with Mozambique.

Mozambique's Instituto Nacional de Petroleos estimates Temane's reserves at 1 tcf, with a planned 25-year production life from initial start-up in early 2004. Temane is held by Sasol 70% and the Mozambican government 30%.

Foster Wheeler announced the pipeline capacity expansion award Feb. 7. Rompco is a joint venture of Sasol Gas 50%, Mozambique's state Companhia Mocambicana do Gasoduto 25%, and South Africa's state iGas 25%.

Queensland Gas, BG plan Queensland LNG plant

Brisbane coal seam methane producer Queensland Gas Co. and BG Group are proposing construction of a 3-4 million tonne/year gas liquefaction plant on the east coast of Queensland.

This makes the fourth proposal for LNG from coal seam methane in Queensland over the past 12 months following similar plans from Santos, Arrow Energy, and Sunshine Gas.

Queensland Gas says its facility will use a feedstock of 190 petajoules/year from its Surat basin fields in the State's southeast.

The $8 billion (Aus.) project will require construction of the LNG facility, to begin production in 2013, and a 380 km pipeline.

The company has not specified a location for the plant, but it is likely to be near the port of Gladstone, which is the chosen location of the other three LNG hopefuls.

The BG Group will pay $250 million to purchase 9.8% of Queensland Gas' issued shares. In addition it will pay an additional $415 million in cash for 20% of Queensland Gas' interests in the Surat coal seam methane acreage.

Queensland Gas will receive a further $207 million cash for the sale of an additional 10% stake when a final investment decision is made on the construction of the LNG plant and certification of 7,000 petajoules of 2P gas reserves.

Finally, BG Group has agreed to buy the whole of the planned LNG production under a 20-year contract.

To prove up sufficient reserves for the deal Queensland Gas is planning a $230 million exploration program to increase the current level of its certified 2P gas reserves (1,317 petajoules) to the required 7,000 petajoules.

At the moment the company has more than 7,255 petajoules of reserves and contingent resources as assessed by independent consultants Netherland Sewell & Associates.

FERC issues draft EIS for Midcontinent Express

The proposed Midcontinent Express natural gas pipeline would have minimal environmental impact under recommended mitigation measures, the US Federal Energy Regulatory Commission concluded in a draft environmental impact statement Feb. 8.

The 500-mile system will be developed by Midcontinent Express Pipeline LLC, a joint venture of Kinder Morgan Energy Partners LP and Energy Transfer Partners LP. It will extend from southeastern Oklahoma across Texas, Louisiana, and Mississippi, to Alabama.

The system would have 1.4-1.5 bcfd of gas capacity, which could be expanded to 1.8 bcfd of gas with compression. It is planned to go into service on Mar. 1, 2009, assuming regulatory approvals.

The project also would include a 4.1-mile lateral pipeline in Louisiana, 111,720 hp of compression at one booster station and four mainline compressor stations, and associated ancillary facilities, FERC said. ✦

Calendar

✦ Denotes new listing or a change in previously published information.

OIL&GAS JOURNAL online

Additional information on upcoming seminars and conferences is available through OGJ Online, Oil & Gas Journal's Internet-based electronic information source at http://www.ogjonline.com.

2008

FEBRUARY

Alternative Fuels Technology Conference, Prague, +44 (0) 20 7357 8394, +44 (0) 20 7357 8395 (fax), e-mail: Conferences@EuroPetro.com. website: www.europetro.com. 18.

IP Week, London, +44 (0)20 7467 7100, +44 (0)20 8561 0131 (fax), e-mail: events@energyinst.org.uk, website: www.ipweek.co.uk. 18-21.

International Catalyst Technology Conference, Prague, +44 (0) 20 7357 8394, +44 (0) 20 7357 8395 (fax), e-mail: Conferences@EuroPetro.com. website: www.europetro.com. 19-20.

Pipe Line Contractors Association Annual Conference (PLCA), Maui, (214) 969-2700, (214) 969-2705 (fax), e-mail: plca@plca.org, website: www.plca.org. 20-24.

International Petrochemicals & Gas Technology Conference & Exhibition, Prague, +44 (0) 20 7357 8394, +44 (0) 20 7357 8395 (fax), e-mail: Conferences@EuroPetro.com. website: www.europetro.com. 21-22.

AAPG Southwest Section Meeting, Abilene, Tex., (918) 560-2679, (918) 560-2684 (fax), e-mail: convene@aapg.org, website: www.aapg.org. 24-27.

Laurance Reid Gas Conditioning Conference, Norman, Okla., (405) 325-3136, (405) 325-7329 (fax), e-mail: bettyk@ou.edu, website: www.lrgcc.org. 24-27.

Middle East Refining Conference & Annual Meeting, Abu Dhabi, +44 (0) 1242 529 090, +44 (0) 1242 529 060 (fax), e-mail: wra@theenergyexchange.co.uk, website: www.wraconferences.com. 25-26.

CERI Natural Gas Conference, Calgary, Alta., (403) 220-2380, (403) 284-4181 (fax), e-mail: jstaple@ceri.ca, website: www.ceri.ca. 25-26.

SPE Intelligent Energy Conference & Exhibition, Amsterdam, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 25-27.

IADC Drilling HSE Asia Pacific Conference & Exhibition, Kuala Lumpur, (713) 292-1945, (713) 292-1946 (fax), e-mail: conferences@iadc.org, website: www.iadc.org. 26-27.

Middle East Fuels Symposium, Abu Dhabi, +44 (0) 1242 529 090, +44 (0) 1242 529 060 (fax), e-mail: wra@theenergyexchange.co.uk, website: www.wraconferences.com. 27-28.

MARCH

GPA Annual Convention, Grapevine, Tex., (918) 493-3872, (918) 493-3875 (fax), e-mail: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 2-5.

GEO Middle East Geosciences Conference & Exhibition, Bahrain, +44 20 7840

2139, +44 20 7840 2119 (fax), (fax), e-mail: geo@oesallworld.com, website: www.allworldexhibitions.com. 3-5.

Subsea Tieback Forum & Exhibition, Galveston, Tex., (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.subseatiebackforum.com. 3-5.

NPRA Security Conference, The Woodlands, Tex., (202) 457-0480, (202) 457-0486 (fax), e-mail: info@npra.org, website: www.npradc.org. 4-5.

ARTC Annual Meeting, Bangkok, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 4-6.

Global Petrochemicals Annual Meeting, Dusseldorf, +44 (0) 1242 529 090, +44 (0) 1242 529 060 (fax), e-mail: wra@theenergyexchange.co.uk, website: www.wraconferences.com. 4-6.

IADC/SPE Drilling Conference & Exhibition, Orlando, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 4-6.

SPE Indian Oil & Gas Technical Conference & Exhibition, Mumbai, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 4-6.

Annual Middle East Gas Summit, Doha, +971 4 336 2992, +971 4 336 0116 (fax), e-mail: sarita.singh@ibc-gulf.com, website: www.ibcgulfconferences.com. 5-6.

NPRA Annual Meeting, San Diego, (202) 457-0480, (202) 457-0486 (fax), e-mail: info@npra.org, website: www.npradc.org. 9-11.

World Heavy Oil Congress, Edmonton, Alta., (403) 209-3555, (403) 245-8649 (fax), website: www.petroleumshow.com. 10-12.

New Zealand Petroleum Conference, Auckland, +64 3 962 6179, +64 4 471 0187 (fax), e-mail: crown.minerals@med.govt.nz, website: www.crownminerals.govt.nz. 10-12.

Gastech International Conference & Exhibition, Bangkok, +44 (0) 1737 855005, +44 (0) 1737 855482 (fax), e-mail: tonystephenson@dmgworldmedia.com, website: www.gastech.co.uk. 10-13.

API Spring Petroleum Measurement Standards Meeting, Dallas, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 10-14.

European Fuels Conference & Annual Meeting, Paris, +44 (0) 1242 529 090, +44 (0) 1242 529 060 (fax), e-mail: wra@theenergyexchange.co.uk, website: www.wraconferences.com. 11-12.

IADC International Deepwater Drilling Conference & Exhibition, Rio de Janeiro, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 11-12.

SPE North Africa Technical Conference & Exhibition, Marrakech, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 12-14.

NACE International Conference & Expo, New Orleans, (281) 228-6200, (281) 228-6300 (fax), website: www.nace.org. 16-20.

Offshore Asia Conference & Exhibition, Kuala Lumpur, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.offshoreasiaevent.com. 17-19.

Sub-Saharan Oil, Gas & Petrochemical Exhibition & Conference, Cape Town, +27

Calendar

21 713 3360, +27 21 713 3366 (fax), e-mail: expo@fairconsultants.com, website: www.fairconsultants.com. 17-19.

Turoge and Black Sea Oil & Gas Exhibition & Conference, Ankara, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 18-20.

AAPG Prospect & Property Expo (APPEX), London, (918) 560-2679, (918) 560-2684 (fax), e-mail: convene@aapg.org, website: www.aapg.org. 24-26.

AAPG Pacific Section Meeting, Bakersfield, Calif., (918) 560-2679, (918) 560-2684 (fax), e-mail: convene@aapg.org, website: www.aapg.org. Mar. 29-Apr. 2.

NPRA International Petrochemical Conference, San Antonio, (202) 457-0480, (202) 457-0486 (fax), e-mail: info@npra.org, website: www.npradc.org. Mar. 30-Apr. 1.

SPE Middle East Petroleum Engineering Colloquium, Dubai, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. Mar. 30-Apr. 2.

PIRA Understanding Global Oil Markets Conference, Tokyo, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. Mar. 31-Apr. 1.

ERTC Sustainable Refining Conference, Brussels, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. Mar. 31–Apr. 2.

APRIL

SPE/ICoTA Coiled Tubing & Well Intervention Conference & Exhibition, The Woodlands, Tex., (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 1-2.

ERTC Biofuels+ Conference, Brussels, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 2-4.

GIOGIE Georgian International Oil & Gas Conference & Showcase, Tbilisi, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 3-4.

Middle East Petroleum & Gas Conference, Doha, +65 6222 0230, +65 6222 0121 (fax), e-mail: mpgc@cconnection.org, website: www.cconnection.org. 6-8.

✦Australian Petroleum Production & Exploration Association (APPEA) Conference & Exhibition, Perth, +61 2 9553 1260, +61 2 9553 4830 (fax), e-mail: appea2008@saneevent.com.au, website: www.appea2008.com.au. 6-9

ACS National Meeting & Exposition, New Orleans, 1 (800) 227-5558, e-mail: natlmtgs@acs.org, website: www.acs.org. 6-10.

American Institute of Chemical Engineers (AIChE) Spring National Meeting, New Orleans, (212) 591-8100, (212) 591-8888 (fax), website: www.aiche.org. 6-10.

CIOGE China International Oil & Gas Conference, Beijing, + (44) 020 7596 5000, + (44) 020 7596 5111 (fax), e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 7-8.

API Pipeline Conference & Cybernetics Symposium, Orlando, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 7-10.

EAGE Saint Petersburg International Conference & Exhibition, Saint Petersburg, +7 495 9308452, +7 495 9308452 (fax), e-mail: eage@eage.ru, website: www.eage.nl. 7-10.

IADC Well Control Europe Conference & Exhibition, Amsterdam, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 9-10.

ENTELEC Annual Conference & Expo, Houston, (888) 503-8700, website: www.entelec.org. 9-11.

North Caspian Regional Atyrau Oil & Gas Exhibition & Petroleum Technology Conference, Atyrau, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 9-11.

API Spring Refining & Equipment Standards Meeting, New Orleans, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 14-16.

API/NPRA Spring Operating Practices Symposium, New Orleans, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 15.

SPE Gas Technology Symposium, Calgary, Alta., (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 15-17.

SPE International Health, Safety & Environment Conference, Nice, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 15-17.

GPA Midcontinent Annual Meeting, Okla. City, (918) 493-3872, (918) 493-3875 (fax), e-mail: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 17.

AAPG Annual Convention & Exhibition, San Antonio, 1 (888) 945 2274, ext. 617, (918) 560-2684 (fax), e-mail: convene@aapg.org, website: www.aapg.org/sanantonio. 20-23.

SPE Improved Oil Recovery Symposium, Tulsa, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 20-23.

ERTC Coking & Gasification Conference, Rome, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 21-23.

WestAsia Oil, Gas, Refining, & Petrochemicals Exhibition & Conference, Oman, +968 24790333, +968 24706276 (fax), e-mail: clemento@omanexpo.com, website: www.ogwaexpo.com. 21-23.

International Pump Users Symposium, Houston, (979) 845-7417, (979) 847-9500 (fax), website: http://turbolab.tamu.edu. 21-24.

SPE Progressing Cavity Pumps Conference, Houston, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 27-29.

MAY

IOGCC Midyear Meeting, Calgary, Alta., (405) 525-3556, (405) 525-3592 (fax), e-mail: iogcc@iogcc.state.ok.us, website: www.iogcc.state.ok.us. 4-6.

PIRA Canadian Energy Conference, Calgary, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 5.

API International Oil Spill Conference, Savannah, Ga., (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 5-8.

Offshore Technology Conference (OTC), Houston, (972) 952-9494, (972) 952-9435 (fax), e-mail: service@otcnet.org, website: www.otcnet.org. 5-8.

GPA Permian Basin Annual Meeting, Odessa, Tex., , (918) 493-3872, (918) 493-3875 (fax), e-mail: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 6.

PIRA Understanding Global Oil Markets Conference Calgary, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 6-7.

ERTC Asset Maximization Conference, Lisbon, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 12-14.

International School of Hydrocarbon Measurement, Oklahoma City, (405) 325-1217, (405) 325-1388 (fax), e-mail: lcrowley@ou.edu, website: www.ishm.info. 13-15.

Uzbekistan International Oil & Gas Exhibition & Conference, Tashkent, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 13-15.

NPRA National Safety Conference, San Antonio, (202) 457-0480, (202) 457-0486 (fax), e-mail: info@npra.org, website: www.npradc.org. 14-15.

IADC Drilling Onshore America Conference & Exhibition, Houston, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 15.

SPE Digital Energy Conference, Houston, (972) 952-9393, (972) 952-9435 (fax), e-mail: service@spe.org, website: www.spe.org. 20-21.

Mediterranean Offshore Conference & Exhibition (MOC), Alexandria, Egypt, + 39 0761 527976, + 39 0761 527945 (fax), e-mail: st@ies.co.it, website: www.moc2008.com. 20-22.

NPRA Reliability & Maintenance Conference & Exhibition, San Antonio, (202) 457-0480, (202) 457-0486 (fax), e-mail: info@npra.org, website: www.npradc.org. 20-23.

Society of Professional Well Log Analysts (SPWLA) Annual Symposium, Edinburgh, (713) 947-8727, (713) 947-7181 (fax), website: www.spwla.org. 25-28.

Middle East Refining and Petrochemicals Conference & Exhibition, Bahrain, +973 1755 0033. +973 1755 3288 (fax), e-mail: mep@oesallworld.com, website: www.allworldexhibitions.com. 26-28.

SPE International Oilfield Corrosion Conference, Aberdeen, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 27.

SPE International Oilfield Scale Conference, Aberdeen, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 28-29.

JUNE

ERTC Management Forum, Copenhagen, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 2-4.

Caspian Oil & Gas Exhibition & Conference, Baku, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 3-6.

Oklahoma Independent Petroleum Association (OIPA) Annual Meeting, Dallas, (405) 942-2334, (405) 942-4636 (fax), website: www.oipa.com. 6-10.

SPEE Society of Petroleum Evaluation Engineers Annual Meeting, Hot Springs,Va., (713) 651-1639, (713) 951-9659 (fax), e-mail: bkspee@aol.com, website: www.spee.org. 7-10

PIRA Scenario Planning Conference, London, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 9.

Asian Geosciences Conference & Exhibition, Kuala Lumpur, +44 (0) 20 7862 2136. +44 (0) 20 7862 2119, e-mail: geoasia@oesallworld.com, website: www.geo-asia.com. 9-11.

Independent Liquid Terminals Association (ILTA) Annual Operating Conference & Trade Show, Houston, (202) 842-9200, (202) 326-8660 (fax), e-mail: info@ilta.org, website: www.ilta.org. 9-11.

SPE Tight Gas Completions Conference, San Antonio, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 9-11.

EAGE/SPE EUROPEC Conference & Exhibition, Rome, +31 30 6354055, +31 30 6343524 (fax), e-mail: eage@eage.org, website: www.eage.nl. 9-12.

ASME Turbo Expo, Berlin, (973) 882-1170, (973) 882-1717 (fax), e-mail: infocentral@asme.org, website: www.asme.org. 9-13.

PIRA London Energy Conference, London, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 10.

Asian Oil, Gas & Petrochemical Engineering Exhibition, Kuala Lumpur, +44 (0)20 7840 2100, +44 (0)20 7840 2111 (fax), e-mail: oga@oesallworld.com, website: www.allworldexhibitions.com. 10-12.

Global Petroleum Show, Calgary, Alta., (403) 209-3555, (403) 245-8649 (fax), website: www.petroleumshow.com. 10-12.

IADC World Drilling Conference & Exhibition, Berlin, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 11-12.

PIRA Understanding Global Oil Markets Conference, London, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 11-12.

Asia's Subsea Conference & Exhibition, Kuala Lumpur, +44 (0)20 7840 2100, +44 (0)20 7840 2111 (fax), e-mail: subsea@oesallworld.com, website: www.subseaasia.org. 11-13.

CIPC/SPE GTS Joint Conference, Calgary, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 16-19.

American Association of Professional Landmen (AAPL) Annual Meeting, Chicago, (817) 847-7700, (817) 847-7704(fax), e-mail: aapl@landman.org, website: www.landman.org. 18-21.

LNG North America Summit, Houston, (416) 214-3400, (416) 214-3403 (fax), website: www.lngevent.com. 19-20.

IPAA Midyear Meeting, Colorado Springs, Colo., (202) 857-4722, (202)

Calendar

857-4799 (fax), website: www.ipaa.org. 19-21.

PIRA Scenario Planning Conference, Houston, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 23.

API Tanker Conference, San Diego, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 23-24.

API Exploration & Production Standards on Oilfield Equipment & Materials Conference, Calgary, Alta., (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 23-27.

PIRA Understanding Global Oil Markets Conference, Houston, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 24-25.

Russian Petroleum & Gas Congress, Moscow, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 24-26.

NEFTEGAZ Exhibition, Moscow, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 24-26.

PIRA's Globalization of Gas Study Conference, Houston, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 25.

PIRA Understanding Natural Gas Markets Conference, Houston, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 26-27.

World Petroleum Congress, Madrid, +34 91 745 3008, +34 91 563 8496 (fax), e-mail: info@19wpc.com, website: www.19wpc.com. June 29- July 3.

JULY

International Offshore & Polar Engineering Conference, Vancouver, (650) 254 2038, (650) 254 1871 (fax), e-mail: meetings@isope.org, website: www.isope.org. 6-11.

Colorado Oil & Gas Association Conference, Denver, (303) 861-0362, (303) 861-0373 (fax), e-mail: conference@coga.org, website: www.coga.org. 9-11.

IADC Lifting & Mechanical Handling Conference & Exhibition, Houston, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 15-16.

Oil Sands and Heavy Oil Technology Conference & Exhibition, Calgary, Alta., (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.oilsandstechnologies.com. 15-17.

AUGUST

ACS National Meeting & Exposition, Philadelphia, 1 (800) 227-5558, e-mail: natlmtgs@acs.org, website: www.acs.org. 17-21.

IADC/SPE Asia Pacific Drilling Technology Conference, Jakarta, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 25-28.

Offshore Northern Seas Exhibition & Conference, Stavanger, +47 51 59 81 00, +47 51 55 10 15 (fax), e-mail: info@ons.no, website: www.ons.no. 26-29.

Summer NAPE Expo, Houston, (817) 306-7171, (817) 847-7703 (fax), e-mail: info@napeexpo.com, website: www.napeonline.com. 27-28.

SEPTEMBER

China Power, Oil & Gas Conference & Exhibition, Guangzhou, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.chinasenergyfuture.com. 2-4.

ECMOR XI-European Mathematics of Oil Recovery Conference, Bergen, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 8-11.

IADC Drilling HSE Europe Conference & Exhibition, Amsterdam, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 9-10.

✦ Rocky Mountain GPA Annual Meeting, Denver, (918) 493-3872, (918) 493-3875 (fax), email: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 10.

API Fall Refining & Equipment Standards Meeting, Los Angeles, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 15-17.

Rio Oil & Gas Conference & Expo, Rio de Janeiro, 55 21 2112 9078, 55 21 2220 1596 (fax), e-mail: riooil2008@ibp.org.br, website: www.riooilegas.com.br. 15-18.

API/NPRA Fall Operating Practices Symposium, Los Angeles, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 16.

GEO India South Asia's Geosciences Conference & Exhibition, New Delhi, +44 (0)20 7840 2100, +44 (0)20 7840 2111 (fax), e-mail: geo@oesallworld.com, website: www.geo-india.com. 17-19.

SPE Annual Technical Conference & Exhibition, Denver, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 21-24.

ERTC Petrochemical Conference, Cannes, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. Sept. 29-Oct. 1.

International Pipeline Exposition, Calgary, Alta., 403) 209-3555, (403) 245-8649 (fax), website: www.petroleumshow.com. Sept. 30-Oct. 2.

Unconventional Gas International Conference & Exhibition, Ft.Worth, Tex., (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.unconventionalgas.net. Sept. 30-Oct. 2.

OCTOBER

NPRA Q&A Forum, Orlando, Fla., (202) 457-0480, (202) 457-0486 (fax), e-mail: info@npra.org, website: www.npra.org. 5-8.

KIOGE Kazakhstan International Oil & Gas Exhibition & Conference, Almaty, + (44) 020 7596 5000, + (44) 020 7596 5111 (fax), e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 7-10.

IADC Drilling West Africa Conference & Exhibition, Lisbon, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 8-9.

International Gas Union Research Conference, Paris, +31 50 521 30 78, +31 50 521 19 46 (fax), e-mail: igrc2008@gasunie.nl, website: www.igrc2008.com. 8-10.

ERTC Lubes and Additives Conference, Berlin, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 13-15.

API Fall Petroleum Measurement Standards Meeting, Long Beach, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 13-17.

ISA EXPO, Houston, (919) 549-8411, (919) 549-8288 (fax) website: www.isa.org. 14-16.

PIRA New York Annual Conference, New York, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 16-17.

SPE Asia Pacific Oil & Gas Conference & Exhibition, Perth, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 20-22.

SPE International Thermal Operations & Heavy Oil Symposium, Calgary, Alta., (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 20-23.

Permian Basin International Oil Show, Odessa, Tex., (432) 367-1112, (432) 367-1113 (fax), e-mail: pbioilshow@pbioilshow.org, website: www.pbioilshow.org. 21-23.

AAPG International Conference & Exhibition, Cape Town, (918) 560-2679, (918) 560-2684 (fax), e-mail: convene@aapg.org, website: www.aapg.org. 26-29.

SPE Russian Oil & Gas Technical Conference & Exhibition, Moscow, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 28-30.

IADC Contracts & Risk Management Conference, Houston, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 29-30.

NOVEMBER

ASME International Mechanical Congress & Exposition, Boston, (973) 882-1170, (973) 882-1717 (fax), e-mail: infocentral@asme.org, website: www.asme.org. 2-6.

Abu Dhabi International Petroleum Exhibition & Conference (ADIPEC), Abu Dhabi, website: www.adipec.com. 3-6.

Deepwater Operations Conference & Exhibition, Galveston, Tex., (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.deepwateroperations.com. 4-6.

Mangystau International Oil & Gas Exhibition, Aktau, + (44) 020 7596 5000, + (44) 020 7596 5111 (fax), e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 5-7.

IADC Annual Meeting, Paradise Valley, Ariz., (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 6-7.

SEG International Exposition and Annual Meeting, Las Vegas, (918) 497-5542, (918) 497-5558 (fax), e-mail: register@seg.org, website: www.seg.org. 9-14.

IPAA Annual Meeting, Houston, (202) 857-4722, (202) 857-4799 (fax), website: www.ipaa.org. 10-12.

Houston Energy Financial Forum, Houston, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.accessanalyst.net. 11-13.

American Institute of Chemical Engineers (AIChE)

Annual Meeting, Philadelphia, (212) 591-8100, (212) 591-8888 (fax), website: www.aiche.org. 16-21.

ERTC Annual Meeting, Vienna, +44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 17-19.

IADC Well Control Middle East Conference & Exhibition, Muscat, (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 24-25.

Annual European Autumn Gas Conference (EAGC), Cernobbio, Italy, +44 (0) 1737 855281, +44 (0) 1737 855482 (fax), e-mail: vanessahurrell@dmgworldmedia.com, website: www.theeagc.com. 25-26.

DECEMBER

IADC Drilling Gulf of Mexico Conference & Exhibition, Galveston, Tex., (713) 292-1945, (713) 292-1946 (fax); e-mail: conferences@iadc.org, website: www.iadc.org. 3-4.

Deep Offshore Technology International Conference & Exhibition, Perth, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.deepoffshoretechnology.com. 3-5.

International Petroleum Technology Conference (IPTC), Kuala Lumpur, +971 (0)4 390 3540, +971 (0)4 366 4648 (fax), e-mail: iptc@iptcnet.org, website: www.iptcnet.org. 3-5.

PIRA Natural Gas Markets Conference, New York, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 8-9.

PIRA Understanding Global Oil Markets Conference, New York, (212) 686-6808, (212) 686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 10-11.

Seatrade Middle East Maritime Conference & Exhibition, Dubai, +44 1206 545121, +44 1206 545190 (fax), e-mail: events@seatrade-global.com, website: www.seatrade-middleeast.com. 14-16.

AAPG Annual Convention & Exhibition, San Antonio, 1 (888) 945 2274, ext. 617, (918) 560-2684 (fax), e-mail: convene@aapg.org, website: www.aapg.org/sanantonio. 20-23.

XSPE Improved Oil Recovery Symposium, Tulsa, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 20-23.

XSPE Progressing Cavity Pumps Conference, Houston, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 27-29.

2009

JANUARY

Oil & Gas Maintenance Technology Conference & Exhibition, Manama, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.oilandgasmaintenance.com. 19-21.

Pipeline Rehabilitation & Maintenance Conference & Exhibition, Manama, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.piipeline-rehab.com. 19-21.

SPE Hydraulic Fracturing Technology Conference, The Woodlands, Tex., (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 19-21.

FEBRUARY

ASEG International Conference & Exhibition, Adelaide, +61 8 8352 7099, +61 8 8352 7088 (fax), e-mail: ASEG2009@sapro.com.au. 22-26.

MARCH

GPA Annual Convention, San Antonio, (918) 493-3872, (918) 493-3875 (fax), e-mail: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 8-11.

Middle East Oil & Gas Show & Conference (MEOS), Manama, +973 17 550033, +973 17 553288 (fax), e-mail: aeminfo@batelco.com.bh, website: www.allworldexhibitions.com/oil. 15-18.

MAY

ACHEMA International Exhibition Congress, Frankfurt, +1 5 168690220, +1 5 168690325 (fax), e-mail: amorris77@optonline.net, website: http://achemaworldwide.dechema.de. 11-15.

JUNE

Oil and Gas Asia Exhibition (OGA), Kuala Lumpur, +60 (0) 3 4041 0311, +60 (0) 3 4043 7241 (fax), e-mail: oga@oesallworld.com, website: www.allworldexhibitions.com/oil. 10-12.

OCTOBER

International Oil & Gas Exploration, Production & Refining Exhibition, Jakarta, +44 (0)20 7840 2100, +44 (0)20 7840 2111 (fax), e-mail: ogti@oesallworld.com, website: www.allworldexhibitions.com. 14-17.

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Journally Speaking

Ethanol pipelines

Christopher E. Smith
Pipeline Editor

Many issues surround ethanol's growing prevalence as a component of the US gasoline pool. These include subsidies for its production, the relative distillation efficiency of various source products, import tariffs, the effect on prices of various food products, and the potential overuse of groundwater supplies. The issues also include its efficient transport from sources of production to consuming centers.

The American Coalition for Ethanol placed 2007 US ethanol production at 6.8 billion gal and expects 9 billion gal to be produced this year. The Renewable Fuels Association counts 131 ethanol refineries operating as of November 2007, with 10 expansions and 72 newbuild plants in the works. Production expansion at this pace will require increasingly efficient transportation to market.

Pipeline problems

Ethanol's tendency to separate from gasoline in the presence of water currently prevents gasoline-ethanol blends from being shipped through pipelines, causing ethanol to be transported primarily by rail at up to four times the cost of products shipped by pipeline. A water concentration of 1% will cause ethanol to separate from gasoline in E85 blends, while just 0.5% is sufficient in E10 gasoline.

The Association of Oil Pipelines is sponsoring three research and development projects to help address pipeline transport of ethanol. The Pipeline Research Council International will fund the projects, with research carried out by CC Technologies.

Research completed in early 2007 showed that different pipeline steels are vulnerable to stress corrosion cracking when transporting fuel-grade ethanol and that the presence of oxygen in ethanol is one of the most important factors determining a pipeline's susceptibility to SCC. Research also showed that removing oxygen from fuel-grade ethanol with nitrogen or oxygen scavengers effectively mitigates internal SCC.

These results and other research suggest that a new multiproduct pipeline could be designed with ethanol compatible polymers in valves, gaskets, and seals, using steel specified to reduce the possibility of SCC. What still needs to be determined, however, is both whether a smaller diameter dedicated ethanol pipeline may still pose a better alternative by removing any transmix or product quality issue that might otherwise arise and the terms under which ethanol transport might be possible in current multiproduct lines.

Current research

Continuing AOPL projects include determining requirements for existing pipeline, tank, and terminal systems to transport ethanol without cracking (PRCI SCC 4-4), identifying environmental factors that produce SCC in existing ethanol pipelines and terminals (PRCI SCC 4-3), and determining requirements for new pipeline systems to transport ethanol without cracking by studying environmental stress factors (PRCI SCC 4-5).

AOPL expects full results from PRCI SCC 4-4 to be available as early as September and lists three major objectives of the research. The first of these is developing the data necessary to make engineering assessments of the feasibility of transporting fuel-grade ethanol and ethanol blend in existing pipelines; either dedicated or batched as part of a multiproduct line.

It also hopes to identify which ethanol blends can be transported in existing pipelines without significant modification, which would require significant modification, and which couldn't be moved through existing systems but would instead require a specially designed line. Finally, SCC 4-4 seeks to characterize the time to initiation of SCC in a range of ethanol environments and identify safe operating and batching practices that prevent its initiation and growth.

SCC 4-4 also hopes to determine ethanol's effect on drag reducing agents, including whether it will render DRA ineffective, change required injection rates, or alter the amount of DRA that can be injected without affecting fuel quality. It is also examining ethanol and ethanol-water's effect on transmix reprocessing.

Key preliminary results from this work include finding that variances in quality of fuel-grade ethanol affect SCC development, decreasing the oxygen content of fuel-grade ethanol reduces SCC development, and that fuel-grade ethanol contains natural SCC inhibitors that degrade with time. CC Technologies is also testing identified means of mitigating SCC.

Beyond the AOPL-sponsored research, both Colonial Pipeline and Kinder Morgan Energy Partners LP are working to determine the terms under which fuel-grade ethanol can be transported through existing pipelines without inducing SCC. Both companies plan to conduct tests along parts of their respective operating clean products' systems this year.

The cumulative results of these efforts will go some way toward determining the true feasibility of economically transporting ethanol via pipeline. ✦

March 3 – 5, 2008 / Moody Gardens Hotel & Convention Center, Galveston, Texas

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As our industry confronts new challenges, it has never been more important to submerse yourself in them. This year's theme is "Subsea is here, the game is changing." As our game changes, the sharing of knowledge and collective experiences becomes more and more crucial to improving the quality, safety, and economics of the subsea tieback industry.

The conference board will once again solicit a number of key presentations by industry leaders. As in the past, only by participating in this conference will you be able to receive its benefits, as proceedings will not be published and no Press is ever allowed in the conference area. This is truly a closed forum with open discussion, where the information shared inside the conference room stays inside the conference room. We hope you will join us.

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Editorial

The empty Chavez blather

Threats by Venezuelan President Hugo Chavez to stop oil sales to the US amount to empty blather. How clarifying it would be, however, if he tried to act on them!

The Venezuelan economy and government depend on oil revenue. Chavez needs Petroleos de Venezuela SA to produce and sell as much oil as it can at prices as high as possible. He adds to the pressure by wooing Venezuela's neighbors with cut-rate oil deals, placating Venezuelans with oil and food subsidies, and channeling PDVSA's revenue into social programs instead of investments it should be making.

The US is Venezuela's biggest oil customer, absorbing in 2006 about 1.4 million b/d of its crude and product exports of 2.2 million b/d, according to the US Energy Information Administration. High-conversion refineries on the US Gulf Coast can run Venezuela's mostly heavy and sour crude. Selling the oil in less hospitable and more-distant markets would require steep price discounts. And halting crude sales to the US would divert heavy feed from Citgo, which PDVSA owns and which has a total of 756,000 b/cd of deep-conversion capacity in three wholly owned US refineries—597,000 b/d of it on the Gulf Coast.

Moderating the threat

So Chavez, unless he has lost all judgment, will not make PDVSA quit selling oil in the US. In fact, he quickly moderated the threat, which came when a British court froze as much as $12 billion in PDVSA assets in a case brought by ExxonMobil. The US company seeks reparation for Venezuelan properties nationalized by the Chavez government. "If you end up freezing and it harms us, we're going to harm you," Chavez blustered initially. "We aren't going to send oil to the United States (OGJ Online, Feb. 12, 2008)." Later, he talked only of suspending oil sales to ExxonMobil.

Oil serves Chavez better as a charade than as a weapon in international affairs, which can only backfire. His bluster, though, typifies the geopolitical mischief that US politicians seem to have in mind when they hold up "energy independence" as a policy goal. Promoters of energy independence seek either to eliminate importation of oil, which is impossible, or to slash the import rate by replacing oil with other energy forms, which is expensive. They forget that in an interdependent world independence comes not from zeroing out specified imports but from economic strength. Spending large amounts of money on noncommercial energy sources in pursuit of impossible goals, while refusing to produce as much commercial energy as possible domestically, is no way to stay economically strong.

Oil-exporting antagonists like Hugo Chavez are poor reasons to throw money at energy independence. The threat doesn't warrant the sacrifice.

If Chavez did lose his senses and halt sales of Venezuelan oil in the US, crude prices might jump in a trading panic but would quickly resettle as US refiners found new sellers—probably the traders moving in to buy from PDVSA. The move would hurt Citgo more than other US refiners and consumers hardly at all. Supply from outside Venezuela quickly would fill whatever logistical voids appeared. And the adjustment would remind worried Americans that exporters need to sell oil as much as importers need to buy it and thus give the independence issue perspective it now lacks.

The SPR option

A crazy move by Chavez also would provide an excuse—though not a justification—for the US to tap the Strategic Petroleum Reserve. The US could withdraw enough oil from the SPR to cover lost Venezuelan supply for longer than the Venezuelan economy could endure reduced PDVSA sales volumes and—more importantly—crude prices. The Chavez government wouldn't last.

US retaliation of that type would of course alarm other oil exporters, although some of them might consider a softened oil market a price worth paying to silence a reckless mouth that brings undue discredit to them and the commodity they sell. The windy Venezuelan president, though, isn't worth the trouble. Eventually, the market will crush the economy he is draining of vitality and his regime along with it. ✦

China's refining expansions to reshape global oil trade

Gabe Collins
US Navel War College
Newport, RI

Global oil refining capacity is set to expand by more than 10 million b/d over the next 7 years, with new refinery projects in Asia accounting for roughly 40% of this total.[1] New Asian refining projects include Indian and SE Asian export refineries, but are dominated by expansions and greenfield projects in China.

Driven by rapid oil product demand growth and a desire to slash feedstock costs, China's oil refining sector is expanding rapidly and augmenting its ability to refine a wider variety of crude oils. This will have geopolitical implications as China becomes able to use more crude from a wider range of suppliers. China's growing ability to refine lower quality sour and acidic crudes may also reduce large price differentials between these and higher quality light, sweet crudes.

Additionally, if Beijing continues to control Chinese oil product prices and restrict exports of refined products from China, Chinese refiners may face increasing pressure to invest in refining projects abroad as a way of escaping price controls and enhancing shareholder returns. PetroChina and other major Chinese oil producers and refiners are now partially owned by private investors, who likely will emphasize profit before politics. Fig. 1 shows key motivations for the participants in China's refining sector modernization.

China's rising motor vehicle ownership, plans to double the size of its road network, and its domestic firms' huge fixed investments in steel, petrochemicals, and other energy-intensive basic industries could drive oil imports to 7 million b/d of crude oil by 2020—double today's imports.[2] Fig. 2 shows an approximation of China's current oil demand structure based on 2005 data.

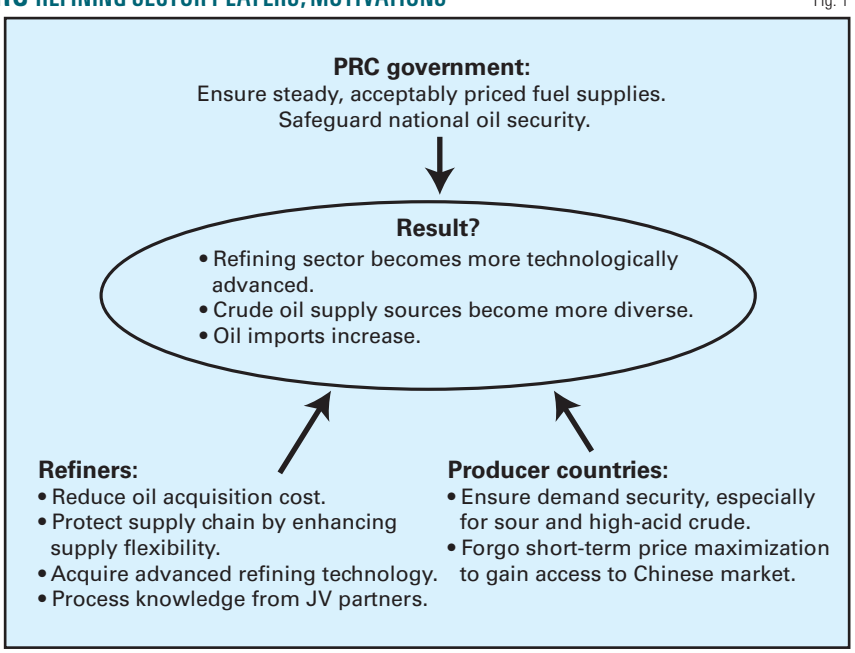
China's refining sector

China currently has more than 6.3 million b/d of domestic refining capacity and imports products such as fuel oil to meet its total demand of 7.4 million b/d of crude and products. Because the Chinese refining industry was built around light, sweet crude supplies from Daqing and other Chinese fields, it lags international refiners' ability to process lower quality, high-sulfur and high-acidic crudes, which raises feedstock costs and narrows the list of potential crude suppliers. Some Chinese sources estimate that crude oil acquisition can account for 90% of a refinery's operating cost. Thus, being able to process a wider variety of crudes can have a positive impact on a refiner's profitability.

China National Petroleum Corp. (CNPC) and Sinopec are China's two chief refiners, but the Chinese refining industry counts more than 120 individual refining enterprises. One byproduct of the large number of small refiners is that Chinese refineries are much smaller than the international average, processing 52,000 b/d of crude oil, compared with the international average throughput of 114, 400 b/d. The Chinese refining sector's relative lack of consolidation hurts efficiency, as indicated by its high energy consumption per ton of oil refined compared with the rest of the world.

Thus, consolidation and overall

PRC REFINING SECTOR PLAYERS, MOTIVATIONS Fig. 1



refining capacity expansion will be major future trends. The National Development and Reform Commission (NDRC), China's main energy planner, forecasts that China will add 1.8 million b/d of refining capacity by 2010 while shuttering 400,000 b/d of old capacity at small, uncompetitive plants.[3] NDRC notes that, as part of the country's11th 5-Year Plan, Chinese firms are slated to build at least eight 200,000 b/d refineries. Much of the new capacity will be intended to refine heavy, sour, and high-acid crude oils, which are more plentiful and often cheaper than the light, sweet crudes existing refineries handle (Fig. 3).

NDRC also notes that Chinese refiners' product outputs do not match the country's demand needs, triggering demand for product imports to offset this imbalance (Fig. 4). Product imbalances are particularly acute with respect to gas oil and naptha, which are key feedstocks for ethylene and other petrochemicals. These factors will create business opportunities for engineering and construction firms, technology suppliers, and international producers and refiners who are nimble and have high risk appetites.

Changing crude slates

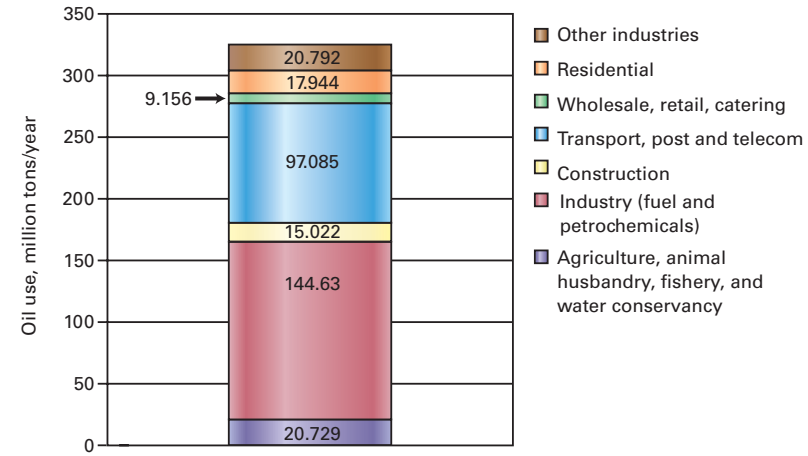
Chinese analysts state that their country's oil refining sector needs reforms, including:

- Increased refinery flexibility to reduce feedstock cost.
- Enhanced capacity for deep processing of heavy oils.
- Increased process efficiency.[4]
- Tighter integration between refineries, petrochemical producers, oil ports, pipelines, and commercial and strategic oil storage.

Chinese refining capacity will expand overall by 3.3 million b/d during 2006-11. Roughly 2.55 million b/d of this will come from building new refineries, while the remaining 651,000 b/d will consist of refinery expansions and additions of hydrocrackers to enable refineries to maximize high-value product outputs and hydrotreaters to allow

CHINA'S 2005 OIL CONSUMPTION

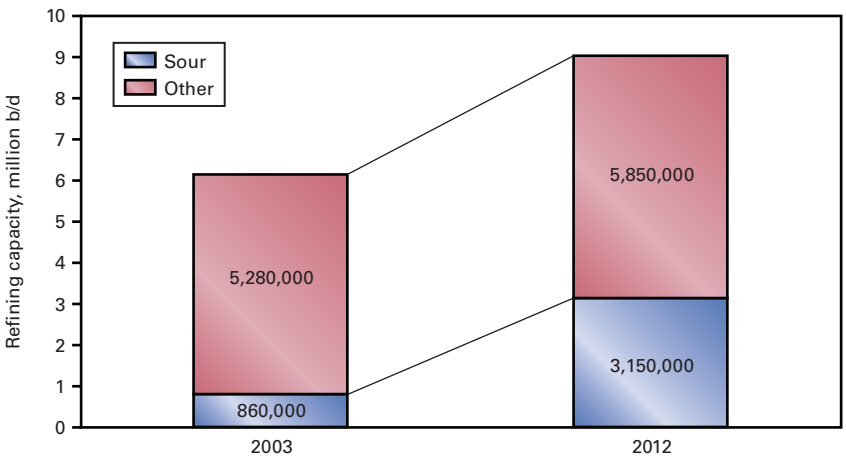
Fig. 2



Source: China Strategic Advisory

SHIFTS IN CHINESE REFINERIES' SWEET-SOUR CRUDE CAPACITY RATIO

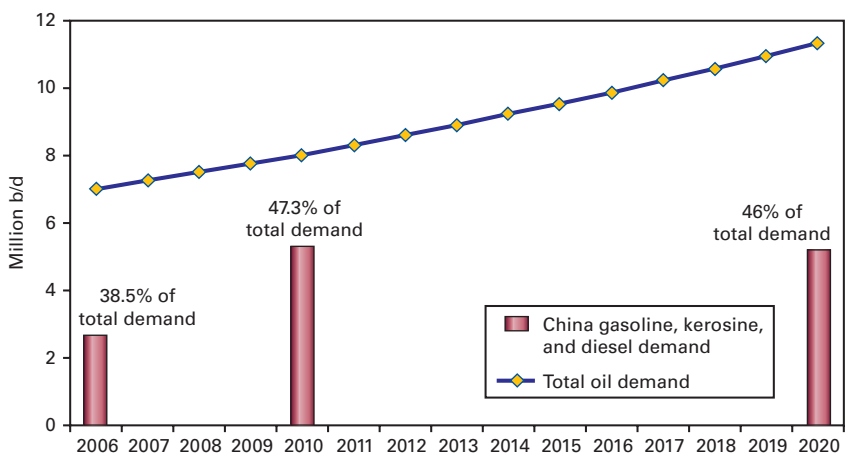
Fig. 3



Source: Platts, China Petroleum Enterprise

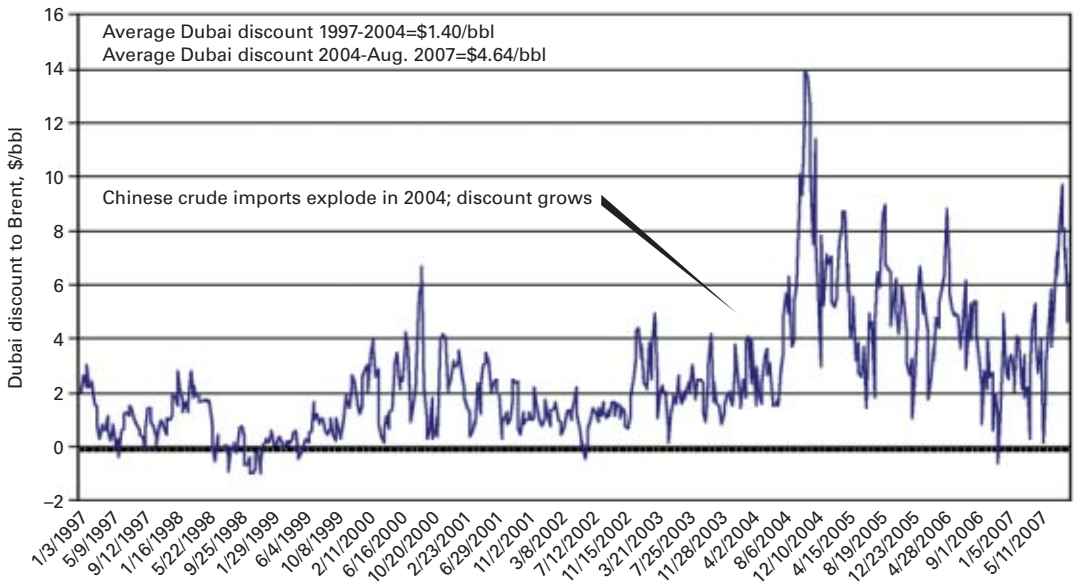
CHINESE REFINERS' PRODUCT MIX, EXPECTED SHIFTS

Fig. 4



Source: Xinhua, China Oil & Gas

DUBAI HISTORICAL DISCOUNT TO BRENT* (UK) Fig. 5



*Dubai medium, sour discount to Brent light, sweet.
Source: Price data from Energy Information Administration

them to process more sour crude.

A key trend is the addition of new refining capacity geared heavily toward heavy, sour, and high-acid crude. Much of China's original refining capacity was built to handle the output of its workhorse Daqing and Shengli fields, which produce light, sweet crude similar to Indonesia's benchmark Minas grade. As a result, China's ability to work with lower quality sour and high-acid crudes has been limited.

In 2006, only 15% of China's refining capacity could handle sour crude oil of the kind that comes from Iran, Saudi Arabia, and other core suppliers. To put this in perspective, 82% of US refiners can handle sour crude oil, with a lower percentage able to process a large proportion of high-acid crudes.[5]

Several factors are motivating Chinese refiners to expand their ability to handle sour and high-acid crudes. The primary driver is economic. The price of crude oil is a major operating cost, and if a refiner can lower his feedstock costs, all other things being equal, his profit margins will rise. The discounts on lower quality crude oils can be substantial. In July 2007, for example, high-acid Doba blend from Chad was selling at a discount of $17/bbl relative to Dated Brent, a key international crude pricing benchmark. Lowering crude feedstock price by incorporating such oils can have major bottom line benefits.

In 2006, Sinopec ran 200,000 b/d of high total acid number (TAN) crude.[6] Sinopec executives have claimed that experimenting with high-TAN Doba blend from Chad at its new Guangzhou refinery boosted refining profitability. US refiner Sunoco had similar results in 2005 from running heavily discounted Doba. In 2004, Sunoco refineries ran only light, sweet crude, causing average crude costs to exceed the West Texas Intermediate (WTI) benchmark by an average of $1.14/bbl. In 2005, using high acid crude lowered the company's average crude cost to 15¢/bbl lower than WTI, which substantially improved refining margins.[7]

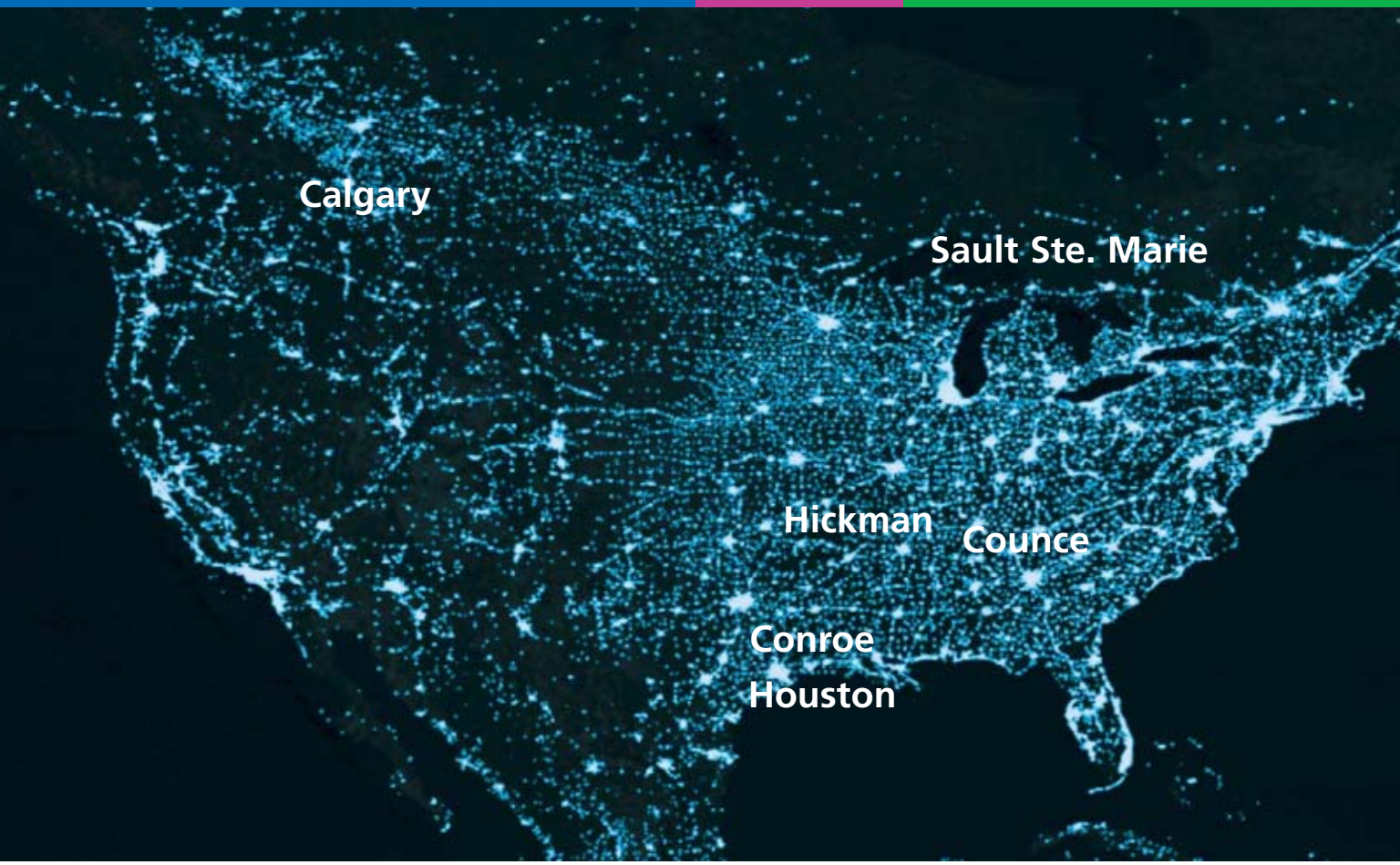
Middle East sour crudes also often sell at a large discount relative to light, sweet oils, which are easier to refine and often have higher gasoline and diesel yields. Figs. 5 and 6 show historical price differentials between Dubai and Saudi Arab Medium, both of which are heavy and sour, and Brent and Bonny, both of which are light and sweet. The differentials widened sharply in 2003-04 as Chinese demand for light, sweet crude shot up. During this time, China accounted for a good portion of global incremental oil demand growth.

So refiners have a strong economic incentive to increase imports of sour and high acid crudes. Refining sour crude typically requires refineries to install hydrotreaters and other desulfurization equipment. Refiners have three primary options for utilizing high acid crudes. First, those having large throughputs, such as Zhenhai, Guangzhou in China, and Reliance in India, can run high acid crude through "normal" refineries by blending it with other crudes. This allows refiners to capture economic benefits without retooling facilities.

In addition, certain crude blends complement each other when blended. Angola's acidic Kuito, for example, blends well with sour Saudi Arab Light because the Saudi dilutes the Kuito's acidity, while the sweet Kuito reduces the product stream's sulfur content and maximizes valuable middle distillate yields.[8] Refiners can also blend sodium or potassium hydroxide into the crude stream to reduce acidity. Finally, new refineries dedicated to a high-acid feedstock such as PetroChina's Guangxi refinery, which uses the Sudanese Dar Blend, are built from corrosion resistant steels.

New supply geopolitics

The global oil supply is gradually getting heavier and more sour. Being able to handle crudes from a wide range of suppliers will give Chinese refiners greater strategic and economic flexibility.



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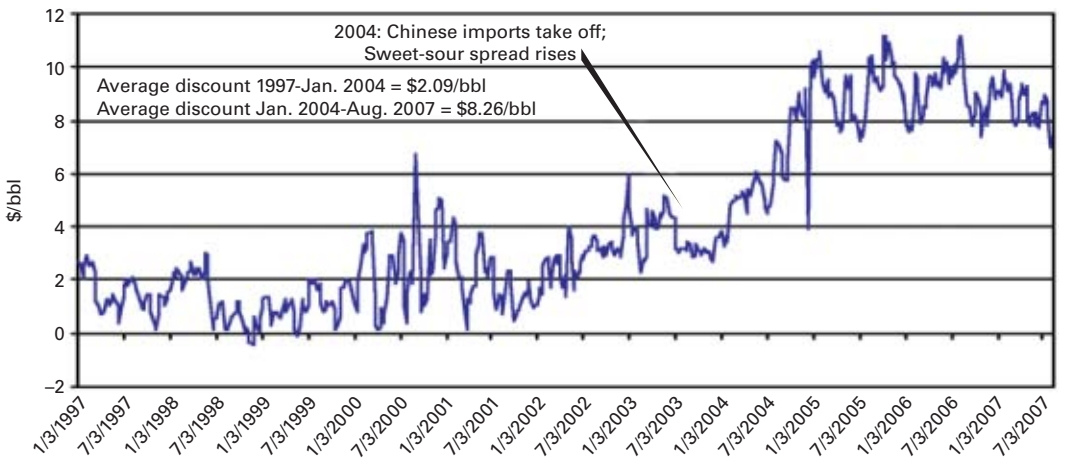
ARAB MEDIUM HISTORICAL DISCOUNT TO BONNY* (NIGERIA)

Fig. 6



*Saudi Arab medium discount to Bonny.

As Fig. 7 shows, China is drawing its crude oil supply from an increasingly diverse array of sources. Many are heavy, sour, or acidic. A large proportion of Chinese offshore production from Penglai and other fields is acidic—15% of total domestic production— while African crude streams also are increasingly acidic. China takes roughly one third of its crude imports from Africa as it works to diversify away from the Middle East.

China's primary Latin American oil suppliers, Venezuela and Brazil, are also "complex" crude suppliers. Brazilian offshore production is predominantly acidic, while Venezuelan oil is often simultaneously heavy, sour, and acidic. Venezuela wants to boost its crude exports to China, but the transportation economics remain uncertain. However, a study by Roy Nersesian of Columbia University and Poten & Partners notes that the economics of using very large crude carriers that offloaded in the US Gulf of Mexico to carry Venezuelan crude on their "backhaul" voyage compares very favorably to the costs per barrel of carrying Venezuelan crude to US Gulf refineries on smaller Aframax tankers, as done in the current trade.[9] Thus, if China continues to expand its heavy and sour refining capacity, it would become economically feasible to greatly expand the Sino-Venezuelan oil trade, should both sides agree to do so.

Finally, Middle Eastern supplies are likely to occupy an increasing percentage of the global oil supply in coming years, and these barrels are almost unanimously sour and relatively heavy. As Chinese refiners enhance their ability to deal with high-acid, sour, and heavy oils, it is likely that China's commercial and geopolitical oil relationships with complex crude producers in Africa and the Middle East, as well as Venezuela and possibly Canada, will deepen.

Product price reform

Domestic oil product pricing reforms will have a major influence on Chinese refining development. Chinese refiners are trapped in a tough situation, as they must pay international prices for imported crude oil, but must sell diesel, gasoline, and other products at government controlled prices within China.

China's largest refiner, Sinopec, has a small crude oil production of its own relative to its refining capacity and is thus particularly exposed to high international crude prices, causing it to lose an average of $1.09/bbl of crude refined in 2006. In contrast, US Gulf Coast refiners enjoyed margins of $10-16/bbl during that time (the long term global average is closer to $5/bbl).

Chinese refiners are torn between several critical demands, each of which is tough to address in isolation, much less as a whole. First, they face economic demands, as they need to make money and to some extent serve shareholder interests. Second, there are political demands since they are national providers of motor fuels. If Chinese refiners cannot meet the bulk of product demand, international oil companies will balk at selling refined products at a loss to China and Chinese product importers will have to bear the cost difference. Third, Chinese refiners are burdened by the social demand of keeping farmers, fisherman, car owners, truckers, shippers, and other constituencies satisfied. Indeed, one Chinese energy analyst characterizes the situation as: "If you wish to discuss economics, you must also discuss politics."

Finally, Chinese refiners must deal with an increasingly competitive market in which they face both domestic competition and foreign refiners as China opens its internal oil and products markets as stipulated by the World Trade Organization. China's oil wholesale market was opened to domestic and foreign investors in January 2007.

There are catches, however, as oil wholesale licenses are not useful unless accompanied by oil import and export licenses, which typically are controlled by CNPC, Sinopec, and affiliated operators and are tough to acquire. Companies wishing to engage in the oil wholesale business in China must also maintain at least 1.25 million bbl of storage capacity, posing another barrier to entry.[10]

Some Chinese analysts fear product market liberalization because they believe stronger foreign firms might displace Chinese companies and that foreign ownership might rise in the

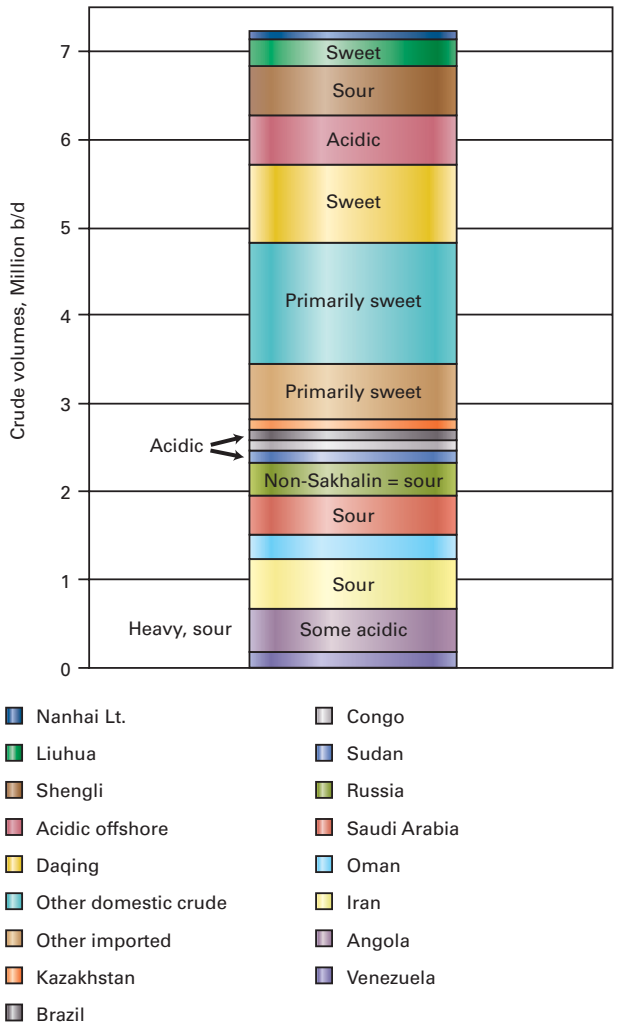
strategic refining sector. They also fear that it would lead to increased product imports and higher foreign exchange expenditures because products are often more expensive per barrel than crude oil. Chinese oil product markets are evolving despite continued price controls. Private firms are now getting licenses for product wholesaling—an area that was formerly the exclusive domain of CNPC and Sinopec. In the first 6 months of 2007, China's net refined product imports averaged roughly 450,000 b/d, largely from Singapore.[11]

That said, the Chinese government is gradually reforming its price controls in ways that are moving Chinese refined product prices closer to international price parity. Prior to 1998, NDRC simply capped prices. In June 1998, NDRC began using after-tax import prices plus domestic transport cost as the basis for fixing benchmark retail prices for oil products. Sinopec and CNPC then used this baseline price to reach a final retail price, which was allowed to fluctuate within a very narrow range. Beginning in October 2001, NDRC adopted a system whereby domestic refined product prices were based on a "price basket" of New York, Rotterdam, and Singapore product prices and allowed to fluctuate within a ± 8% price range.

NDRC's newest product pricing method, adopted in late January 2007 uses a "cost plus" system to determine refined product prices (Fig. 8). Under this scheme, Brent, Dubai, and Minas crude oil prices serve as benchmarks, upon which NDRC adds a fixed profit for refiners. The new method's key benefit is that it adjusts domestic product prices more quickly in response to international crude price fluctuations.

CHINESE CRUDE OIL CONSUMPTION* BREAKDOWN

Fig. 7



*Imports plus domestic production.
Sources: Energy Intelligence Group, Xinhua, EIA

The prior regimes all caused Chinese refined product prices to seriously lag international crude prices, so that during crude price spikes, Chinese refiners paid full international prices for crude but could then not recover their cost with domestic product sales. This was a serious disincentive to refining sector development and is likely a key reason that NDRC adopted the new "cost plus" system despite its short-term disadvantages from the consumer's perspective.

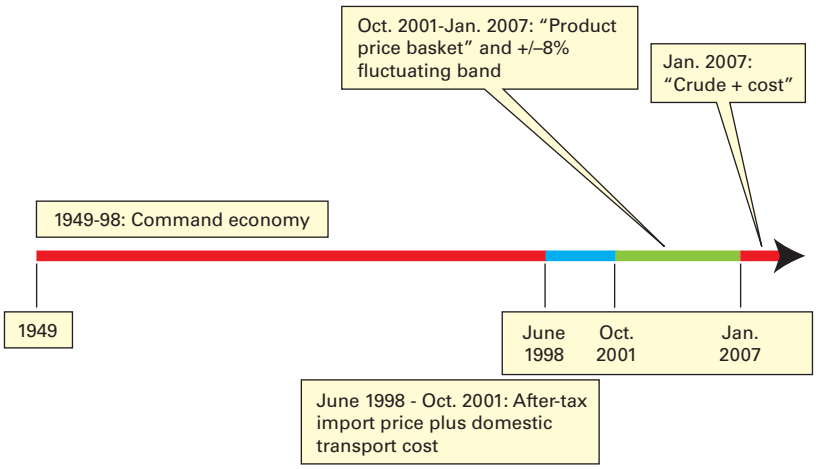
It is tough to say when Chinese oil product prices might near parity with international prices. One recent barrier to further price liberalization is that recent fears of inflation have driven NDRC to refuse any further fuel price increases for the time being.

That said, as Chinese oil demand grows, the government's insistence on subsidizing oil product prices could become increasingly unsustainable, causing powerful economic forces to drive Chinese product price liberalization, although perhaps not to full international parity in the near-term.

First, Chinese refiners may shift some operations overseas to escape price controls and enhance shareholder returns. This could take the form of joint investment in overseas projects, which would reduce capital available for projects desired by state regulators in China. Or, Chinese refiners could build wholly owned plants abroad, which would have an even more pronounced impact on refining project capital availability in China. Such moves have not yet occurred on a large scale, but it will be interesting to see how Beijing reacts if refiners look to shift operations outside of China. One possibility is that the government might force them to import product equal to that which they would have produced, which would erase most economic gains from investing in overseas refining projects.

Second, the Chinese government will face spiraling subsidy cost increases. In 2005, with oil prices lower than today's and Chinese refiners processing roughly 5.72 million b/d, the government had to reimburse refiners 104 yuan/bbl of oil processed, at a total cost of 30 billion yuan ($3.7 billion).[14] By 2012, China likely will be refining and consuming as much as 9 million b/d of oil. This means that conservatively assuming a need for 100 yuan/bbl in refining subsidies, the Chinese govern-

PRC OIL PRODUCT PRICING SYSTEM HISTORY Fig. 8



ment would be paying the equivalent of roughly 330 billion yuan in subsidies (about $43 billion at current exchange rates).

Foreigner squeeze

Will Chinese refining growth create commercial opportunities for foreigners? Chinese companies are learning fast and are willing to proceed alone if international partners don't bring enough to the table or move too slowly. Royal Dutch Shell was originally slated to partner with China National Offshore Oil Co. (CNOOC) on the 240,000 b/d Huizhou refinery but pulled out after 3 years of talks, leaving CNOOC to forge ahead by itself. Similarly, although Sinopec is keeping foreign partners ExxonMobil and Saudi Aramco for its 240,000 b/d Fujian project planned for 2009, plans for a follow-on JV in Guangzhou seem to be dead, and Sinopec looks ready to proceed alone.[12]

The trend of foreign firms being "squeezed out" of China's refining-petrochemical industry is being hastened by Chinese companies' rapidly growing construction and engineering expertise. Sinopec Engineering alone has completed more than 450 refining and petrochemical process units over the past 30 years.[13] While this figure lags the track record of foreign engineering and construction firms such as Foster-Wheeler and KBR, it shows the considerable refining experience and expertise rapidly becoming resident in China.

Western specialty firms still have niche markets for certain heavy lift capabilities, providing catalysts and supplying other advanced process technologies and equipment. Yet the big-ticket plant construction market is closing fast to outside firms. One Beijing-based refining and petrochemicals consultant notes that Chinese firms are building more than 80% of the ethylene steam cracker capacity currently under construction. By contrast, only 50% of the capacity that came online during 2004-06 was Chinese built, and projects included Western companies such as Shell, BASF, and BP as partners.[14]

This indicates that in the future, foreign firms' value added to potential Chinese refining and petchem partners will be determined primarily by their ability to provide either feedstock supply or access to downstream markets overseas. Since most Chinese projects for the next 5 years are aimed at the domestic market, supply-rich national oil companies will have a big advantage over private international oil companies in securing future refinery-petrochemical investment deals in China. Chinese refineries' moves to partner with Aramco and Kuwait Petroleum Corp. also help protect the national oil supply because a supplier is unlikely to cut supplies to refineries in which it holds investment stakes and which provide gateways to a huge oil products market.

A global powerhouse

The Chinese refining sector is unique because, while it is already the world's second largest after the US, it still has substantial upside growth potential. Even a conservative demand growth of 5%/year means that Chinese oil demand will expand by more than 300,000 b/d, or the equivalent of a large new refinery each year for some time to come. China also is the centerpiece of the refining and petrochemical industry's eastward shift, which is driven by strong demand, national desire for self-sufficiency, and more permissive industrial policies than those of Western countries.

China's refining industry growth will have several key commercial implications. First, as Chinese demand for sour crude rises as an overall proportion of crude consumption, growing Chinese pull on sour crude supplies may help reduce the current price differentials between sweet and sour oils. Higher Chinese sour crude processing capacity also will increase Chinese refiners' crude acquisition options and could shift trade patterns for Middle East and Venezuelan sour crudes.

Increased Chinese sour crude purchases of about 3 million b/d by 2012 could also provide major support for the new Dubai and Oman sour crude contracts. Finally, products surging onto the market after 2010 from new Chinese and Indian refineries could greatly lower regional refining margins. Depending on refiners' ability to export products, margins could be affected as far away as the US West Coast and Gulf of Mexico markets.

In short, China is positioned to lead the emergence of a new Eastern center of gravity in the world oil refining and petrochemical industries. Just as strong and sustained Chinese oil demand growth is reshaping the global upstream and oil shipping businesses, so too will it affect the refining and petrochemical businesses. ✦

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CERA: Aramco CEO calls for energy planning, cooperation

Sam Fletcher
Senior Writer

There are enough conventional and unconventional petroleum resources to satisfy global demand for liquid fuels "for many decades," but it will require better planning and cooperation between industry and governments to accomplish that task, the president and chief executive officer of Saudi Aramco said.

In the opening address at the annual energy conference sponsored by Cambridge Energy Research Associates in Houston, Abdallah S. Jum'ah said, "The world simply cannot afford to leave massive quantities of oil, gas, and coal in the ground and move precipitously to unproven alternatives, while still hoping to satisfy future growth in global energy demand."

Head of the world's largest oil corporation, Jum'ah said, "Even if we leave aside the potential of coal-to-liquids, gas-to-liquids, and biofuels, the world's total in-place endowment of conventional oil and nonconventional fuels ranges between 13-16 trillion bbl. To put that number in perspective, to date the world has consumed roughly 1.1 trillion bbl, or between 7-9% of the in-place endowment." Analysts estimate recoverable conventional and unconventional resources at 3-6 trillion bbl "depending on the economics of development, improvements in technology, recovery factors to be achieved, environmental considerations, government policies, and of course regional and global political trends," said Jum'ah. The 3 trillion bbl estimate is "ultra-conservative" and "will be exceeded in most scenarios," he said.

"At Saudi Aramco, we are starting to raise recoveries in some fields to the level of 70% of original oil-in-place. In fact, I have challenged our professionals to set that recovery level as the target for as many of our oil fields as possible."

—Aramco Pres. and CEO Abdallah S. Jum'ah

Improve recovery

There is potential to improve oil field recovery rates through new tools, techniques, and cutting–edge technologies "such as extended-reach wells, intelligent completions, and geosteering, combined with better reservoir description, improved monitoring, and reservoir management strategies emphasizing longer term field performance," Jum'ah said. "At Saudi Aramco, we are starting to raise recoveries in some fields to the level of 70% of original oil-in-place. In fact, I have challenged our professionals to set that recovery level as the target for as many of our oil fields as possible."

He sees "tremendous potential" to uncover yet-to-be-discovered oil resources by applying emerging technologies and extending exploration to new frontiers. "We should tap the vast potential of nonconventional resources, where the principal challenges are not finding these resources but overcoming a variety of technological, environmental, and economic hurdles associated with their production and processing," Jum'ah said. "The special challenges facing higher, economic recoveries from the unconventional heavy oil and oil shale resources include the need for cutting-edge R&D and development of groundbreaking technologies in addition to the allocation of necessary gas and water sources," he said.

'Confusing' policies

However, Jum'ah warned, "If conventional and nonconventional oil resources fall victim to well-intentioned but ultimately flawed or confusing energy policies, then the necessary investment of time, toil, and treasure may not materialize, and a significant proportion of these precious resources might not be recovered."

Jum'ah acknowledged the need to draw on alternative energy sources to help meet future demand. "Yet a number of well-intentioned strategies call for a much more aggressive displacement of fossil fuels, despite major technological, economic, infrastructure, and public acceptance hurdles remaining in the way of achieving such targets. That has led to considerable confusion over what is realistic when it comes to alternatives and what the future call on alternatives and conventional sources will actually be," he said.

Market confusion and uncertainty about the future energy mix make the oil and gas industry's investment decisions "more difficult than they should be, instead of reinforcing our ability to meet future energy demand in a responsible, responsive manner," said Jum'ah. Nonetheless, he noted that the US Department of Energy and the International Energy Agency in Paris predict fossil fuels will continue to meet 82-87% of total energy demand through 2030.

Aramco plans to invest $90 billion in upstream and downstream projects in Saudi Arabia and around the world over the next 5 years, Jum'ah said. "The oil production increments we currently have in progress total about 3 million b/d. Some of this capacity will be utilized to offset natural decline of oil

fields while the rest will be employed to expand our production capacity from about 11 million b/d presently to 12 million b/d next year," he said.

The company's worldwide refining capacity will almost double to 6 million b/d from the current 3 million b/d. Saudi Arabia's Motiva joint venture with Shell Oil Co. is expanding its Port Arthur, Tex., refinery by 325,000 b/d to 600,000 b/d to become the largest US refinery and one of the largest in the world.

Environmental issues

Environmental issues—"particularly reducing greenhouse gas emissions"—are important and pressing imperatives, "though the methods by which they can be achieved while minimizing damage to the world's economies and societies, particularly in developing countries, remain divisive," said Jum'ah. "Alternatives are simply not ready to shoulder the load [from fossil fuels], nor will they be in a position to do so anytime soon."

Therefore, he said, the world community must reach a consensus on protecting the environment while at the same time delivering the energy necessary to sustain the world's economic and social development.

"First, agree that we should continue to develop fossil energy resources while making their utilization cleaner and more efficient. Second, craft a consensus on energy strategies that devote sufficient attention to the rational development of alternative sources of energy and technologies, so that the level of their contributions can be increased at a realistic pace," Jum'ah recommended.

"Third, enhance the efficiency of energy use and conservation to the greatest extent possible; and finally, emphasize a range of both natural and technological solutions to carbon sequestration based on their economics and practicality," he said. "There is a vast unrealized potential when it comes to applying futuristic technological solutions to carbon sequestration, and the world may have just scratched the surface on this issue." ✦

WATCHING GOVERNMENT

Nick Snow, Washington Editor

Fresh questions about biofuels

Two separate scientific studies released on Feb. 7 asked if converting forests to farm land for ethanol crops will do more environmental harm than good. They emerged as a US Senate committee held a hearing on the new Renewable Fuels Standard's (RFS) impact on energy markets.

"Homegrown biofuels are good energy policy, good environmental policy, and good national security policy. However, there is some concern that the RFS, as enacted, risks taking the biofuels industry backward rather than pushing it ahead," Senate Energy and Natural Resources Committee Chairman Jeff Bingaman (D-NM) said as he opened the hearing.

He expressed particular concern that early-year biofuel requirements could be too aggressive, mandates for specific technologies and feedstock could be overly prescriptive, and environmental restrictions could be too narrow. Congress as well as the Bush administration continue to support biofuels. But the studies, which came out after the hearing, questioned the assumption that substituting biofuels for gasoline will reduce greenhouse gases.

Land conversion impacts

"Most prior studies...have failed to count the carbon emissions that occur as farmers worldwide respond to higher prices and convert forest and grassland to new cropland to replace the grain (or cropland) diverted to biofuels," said the first report in Science, the American Academy for the Advance of Science's weekly magazine.

"Using a worldwide agricultural model to estimate emissions from land use change, we found that corn-based ethanol, instead of producing a 20% savings, nearly doubles greenhouse emissions over 30 years and increases greenhouse gases for 167 years. Biofuels from switchgrass, if grown on US corn lands, increase emissions by 50%," the report said.

The second study, by the Nature Conservancy and the University of Minnesota, raised the issue of "carbon debts" that could result from clearing land to plant crops for biofuels. "Analysis suggests that biofuels produced on converted lands could, for long periods of time, be greater net emitters of greenhouse gases than the fossil fuels they typically displace," the study continued.

'Ignores key factors'

One leading biofuels advocate responded promptly. "Assigning the blame for rain forest deforestation and grassland conversion to agriculture production solely to the renewable fuels industry ignores key factors that play a greater role," Renewable Fuels Association Pres. Bob Dinneen said of the report in Science.

"The continued growth of the global population, surging global demand for food from expanding middle classes in China and India, and continued expansion of development and urban sprawl are all factors contributing to the demand for arable acres," he suggested.

Biofuels probably will remain a significant part of the US energy strategy. But questions about their benefits are growing louder. ✦

BP disappointed in downstream performance

Paula Dittrick
Senior Staff Writer

BP PLC is seeking to improve the financial performance of its refining and marketing assets, said BP Chief Executive Tony Hayward Feb. 5 while discussing companywide 2007 financial results.

"Although our fourth-quarter profits were very disappointing in refining and marketing in particular, we made good, step-by-step progress in bringing new oil and gas fields on stream and rebuilding refining capacity during the period," Hayward said.

Hayward also said that BP plans to cut 5,000 jobs companywide by mid-2009, and he believes the company can reduce corporate overhead by 15-20%. Speaking during a webcast from London, he called BP's downstream performance "unacceptable" and "very poor" compared with the downstream financial performance of BP's competitors.

"The principal reason is poor reliability in some of our US refineries, which is compounded by the complexity and overhead structure of the business segment," Hayward said.

BP's downstream business has been under scrutiny since 15 people died in a Mar. 23, 2005, blast at its 460,000 b/cd Texas City, Tex., refinery. About 180 people were injured.

Hayward said BP recommissioned the three units at Texas City necessary to allow restarting the remaining crude distillation capacity. The final sour crude unit is mechanically complete and expected to be fully operational during the first quarter.

"By mid-2008, we expect most of the economic capability at the Texas City refinery to have been restored," he said. "There is far more to do than merely restoring US refining reliability. We are absolutely determined to transform our downstream business as a whole. It will not happen overnight, but we believe that the performance gap with our competitors can be progressively narrowed in the next few years."

Downstream reports loss

Lower US refining margins, higher refining outages, and higher costs contributed to a fourth-quarter refining and marketing loss of $1.8 billion in the US, including nonoperating charges of $977 million, BP's financial results showed.

That compared with a loss of $421 million a year ago, including a nonoperating gain of $25 million.

US downstream costs for 2007 included repairs, recommissioning, and operating costs at the Texas City and Whiting, Ind., refineries.

BP executives believe the 2008 financial performance will be boosted from improved refining availability.

Following repairs, the 405,000 b/cd Whiting refinery is expected to return to its full crude capacity in the first half of this year. By yearend 2007, BP restored Whiting to its available distillation capacity of 300,000 b/d. ✦

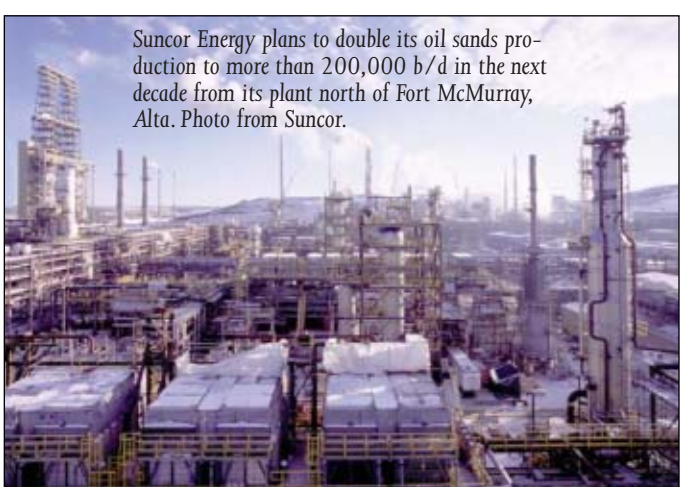
"Although our fourth-quarter profits were very disappointing in refining and marketing in particular, we made good, step-by-step progress in bringing new oil and gas fields on stream and rebuilding refining capacity during the period."
—BP Chief Executive Tony Hayward

Suncor plans $20.6 billion oil sands expansion

Suncor Energy Inc., Calgary, is planning to invest $20.6 billion (Can.) to expand the oil production capacity at its oil sands operation north of Fort McMurray, Alta., by 200,000 b/d, to 550,000 b/d in 2012.

The expansion includes constructing four additional stages of in situ bitumen production, a third upgrader to convert the bitumen into higher-value oil, and other facilities and utilities.

Of the total, Suncor has already invested $2.5 billion on detailed engineering, site work, and fabrication of major vessels for the expansion.



Suncor Energy plans to double its oil sands production to more than 200,000 b/d in the next decade from its plant north of Fort McMurray, Alta. Photo from Suncor.

The expansion will be completed in a phased manner, with mechanical completion of the new upgrader scheduled for 2011 and bitumen feed from the new stages of in situ production to begin operation in 2009-11. Crude oil produc-

tion is expected to begin ramping up in late 2011, with full production capacity slated for 2012 if all regulatory approvals are received promptly.

About $9 billion will be invested to construct four stages of in situ bitumen production. Each stage will produce about 68,000 b/d of bitumen. Depending on operational and market conditions, excess bitumen may be sold as a heavy crude blend, Suncor said.

About $11.6 billion will fund construction of the upgrader to process 245,000 b/d of bitumen into 200,000 b/d of crude oil. The product slate is expected to consist of 85% sweet crude and diesel and 15% sour crude. Oil products will be shipped via third-party and Suncor-owned pipelines.

Ancillary facilities include pipelines, camps, administration facilities, cogeneration, tank farms, and a highway interchange. Another $800 million is being spent to reduce sulfur dioxide emissions through the construction of a new sulfur plant. Commissioning and start-up are expected to cost another $820 million.

Suncor said the project is designed to mitigate many environmental impacts of oil sands development, particularly water management. The company said more than 90% of the water needed for the in situ process is recycled. Suncor has reduced water use per barrel by nearly 50% during the past 5 years and will spend $225 million to further improve water management.

The project also calls for emissions abatement equipment and sulfur handling systems to improve air quality and reduce odors, while new equipment and processes will improve energy efficiency. Suncor has reduced greenhouse gas emission intensity at its oil sands plant by about 50% from 1990 levels and is investigating carbon capture and storage to reduce absolute emissions in the longer term.

Improvements in emissions of nitrogen oxides are expected, and Suncor will investigate gasification options that could turn the byproduct petroleum coke into a clean energy source. ✦

ExxonMobil drills record extended-reach well at Sakhalin-1

Eric Watkins
Senior Correspondent

ExxonMobil Corp. has surpassed its own world record for reaching offshore deposits with land-based extended-reach technology, drilling from an onshore well at its Sakhalin-1 project in eastern Russian to a target area 7 miles offshore.

The project team at Sakhalin-1, which is operated by the company's Russian subsidiary Exxon Neftegas Ltd., used what ExxonMobil calls "leading-edge technologies" to drill the record Z-12 well in half the time needed by conventional technology.

The Z-12 well was drilled to Chayvo field, which contains 17 of the world's 30 longest extended-reach-drilling wells, and set a record by achieving a measured depth of 11,680 m.

The record exceeds by 398 m the prior world record set in 2007 by Exxon Neftegas's Z-11 well, also at the Sakhalin-1 project.

The process has been beneficial in terms of production and environmental safety, according to Morris Foster, president, ExxonMobil Production Co.

"This drilling success has contributed to other Sakhalin-1 project achievements, including the commencement of production 5 years after the project was declared commercial and 100 marine tanker shipments in the first year of export operations," said Foster.

"Employing extended-reach technology to drill onshore beneath the seafloor to offshore oil and gas deposits eliminates the need for additional offshore structures, pipelines, and associated activities."

ExxonMobil said its "Integrated Hole Quality" technology was used to manage a broad range of well variables, including rock strength and stresses and well-bore hydraulics. It also managed the Fast Drill optimization process that

The 22-story Yastreb drilling rig, which anchors the Chayvo well site on Sakhalin's northeast coast, was designed to drill extra-long extended-reach wells nearly 11 km offshore. Photo from ExxonMobil.

WATCHING THE WORLD

Eric Watkins, Senior Correspondent

The new oil diplomatist

Well, it seems the US Department of State has decided to start watching the world of oil and gas on an official basis. So says US Secretary of State Condoleeza Rice, who plans to appoint a special envoy for energy issues to deal with the use of oil and gas for political means.

"It is a really important part of diplomacy, in fact, I think I would go so far as to say that some of the politics of energy is warping diplomacy in certain parts of the world," Rice told the Senate Foreign Relations Committee on Feb. 12.

"I do intend to appoint, and we are looking for, a special energy coordinator who could especially spend time on the Central Asian and Caspian region," she said.

She was making her pitch on Capitol Hill in response to questions from Sen. Richard Lugar, R-Ind., who asked about progress made on establishing such a post as called for in legislation approved last year.

Russia's extortion

Lugar was especially vexed about Russia's use of oil and gas as a political weapon, saying among other things that, "Moscow continues to use energy to extort its neighbors."

In fact, Lugar went on to explain, "Russian foreign policy is now largely based on maximizing the political leverage and financial earnings of its energy supplies and dominating the transport of energy in Eurasia."

Lugar's interest in this issue follows his recent journey to Azerbaijan where he met with senior government officials and opposition leaders in Baku. There, Lugar reaffirmed his call for President Bush to appoint a special representative for energy in the greater Caspian region.

"Appointment of a special representative for energy would be a clear statement of high-level US priority for this strategically critical region. Failure to demonstrate US commitment will jeopardize progress on trans-Caspian energy cooperation, with potentially devastating impacts on long-term US security and economic interests in the region," Lugar said.

Big wide world

In a letter to Sec. Rice on Oct. 4, 2007, Lugar joined with Senate Foreign Relations Committee Chairman Joe Biden in calling for such a position, stating that, "further opening of the East-West energy corridor from Central Asia through the Caucuses and on to Western markets should have the full backing of US diplomacy."

Lugar praised the Baku-Tbilisi-Ceyhan pipeline effort, saying it is "a bold strategic initiative that today reaps tremendous benefits.... We must not lose sight of our long-term interest in preventing Russian domination of energy in the Southern Caucasus and Central Asia."

We applaud the desire of Sen. Lugar to keep watching the world, as well as Sec. Rice for finally getting on the bandwagon for oil and gas diplomacy. But let's not forget: The world needs diplomatic backing far beyond confrontation with Russia.

It's a big wide world out there, and wherever oil and gas is to be found, there is need for diplomacy. ✦

analyzes the amount of energy used to make the drilling process faster and more efficient.

The firm's announcement coincided with reports that OAO Gazprom plans to sign an agreement in April or May to buy all natural gas produced at the Sakhalin-1 project.

"We hope that in April-May we will be able to sign a binding agreement with Exxon to buy 11 billion cu m[/year] of gas," said Gazprom's Deputy CEO Alexander Ananenkov at a meeting on the development of the Far East chaired by Russia's First Deputy Prime Minister Dmitry Medvedev.

According to Ananenkov, gas reserves of Sakhalin-1 fields total 500 billion cu m, and annual production is expected to reach 11 billion cu m.

He said the gas would be supplied to consumers in the far eastern regions of Russia, as well as the Far East, where demand is expected to reach 25 billion cu m/year by 2020.

According to the consortium partners, Sakhalin-1 comprises the Chayvo, Odoptu, and Arkutun-Dagi field blocks, which contain potential reserves of about 2.3 billion bbl of oil and 485 billion cu m of gas.

Exxon Neftegas, holding 30% interest, is operator for the Sakhalin-1 group. Partners include Japan's Sakhalin Oil & Gas Development Co. Ltd. 30%; RN-Astra 8.5% and Sakhalinmorneftegas-Shelf 11.5%, both affiliates of Russia's Rosneft; and India's ONGC Videsh Ltd. 20%. ✦

Venezuela sounds off against ExxonMobil

Eric Watkins
Senior Correspondent

Oil futures have continued to rise due to traders' concerns over the war of words launched by Venezuelan President Hugo Chavez after ExxonMobil Corp. last week won a court injunction freezing as much as $12 billion in as-

sets owned by state firm Petroleos de Venezuela SA (PDVSA).

"If you end up freezing (Venezuelan assets) and it harms us, we're going to harm you," Chavez threatened, adding, "We aren't going to send oil to the United States." The Venezuelan leader also warned that US "aggression" could cause world oil prices to spike to $200/bbl.

While some traders dismissed Chavez words as inconsequential, others were said to be worried about the potential cutoff of Venezuelan oil. Light, sweet crude for March delivery jumped $1.64 to $93.41/bbl on the New York Mercantile Exchange after spiking to $94.72/bbl earlier, a 1-month high.

Chavez's comments followed what one commentator called "a blitz on state television" of programs and advertisements denouncing ExxonMobil as a predator seeking to plunder Venezuela.

The blitz came after the US firm launched a series of lawsuits in US, British, and Dutch courts, all aimed at challenging Chavez's nationalization of a multibillion-dollar oil project formerly owned by ExxonMobil in Venezuela's Orinoco belt.

Last week's court rulings in the US and UK mean that PDVSA, Venezuela's main source of income, cannot sell certain assets or move some funds while the compensation case is reviewed.

Rafael Ramirez, PDVSA president and Venezuela's oil minister, told a press conference at PDVSA headquarters in Caracas that appeals would be filed next week in British and US courts seeking to reverse the order.

Meanwhile, Ramirez launched into a tirade of his own against ExxonMobil, saying, "They are the typical North American transnational company. They want to take [Venezuela] hostage."

However, Bernie Picchi, an analyst with Wall Street Access, said in a note to clients: "Exxon is finally standing up to a regional bully, and has shown that it can inflict a punch at least as severe to Venezuela than the one Venezuela inflicted on [ExxonMobil]."

While ExxonMobil refused to participate any further in the Orinoco project, PDVSA recently agreed to pay qualified compensation to two of its partners, Total SA and Statoil AS, for their reduced stakes in the nationalized developments (OGJ Online, Feb. 1, 2008). ✦

US-India study discovers large gas hydrate presence

Sam Fletcher
Senior Writer

An international team led by the US Geological Survey (USGS) and India's Directorate General of Hydrocarbons released the results Feb. 7 of what they describe as the world's most comprehensive gas hydrate field venture to date.

In the Krishna-Godavari basin, India's National Gas Hydrate Program (NGHP) Expedition 01 in 2006 delineated and sampled one of the richest marine gas hydrate accumulations ever discovered. The report said one of the thickest and deepest gas hydrate occurrences yet known was discovered off the Andaman Islands, with gas hydrate-bearing volcanic ash layers as deep as 600 m below the seafloor. It also said, "For the first time, a fully developed gas hydrate system was established in the Mahanadi basin."

NGHP Expedition 01 was the first modern study of gas hydrates off the Indian peninsula and along the Andaman convergent margin with special emphasis on the geologic and geochemical controls on the occurrence of gas hydrate in these two diverse settings. It was planned to explore 10 sites in four areas: the Kerala-Konkan basin in the Arabian Sea on India's western continental shelf; the petroliferous Krishna-Godawari basin and Mahanadi basin in the Bay of Bengal; and the previously unexplored Andaman Islands. Scientists conducted ocean drilling, coring, logging, and analytical activities to assess the geologic occurrence, regional context, and characteristics of gas hydrate deposits along India.

The riserless drillship Resolution was operated by Overseas Drilling Ltd. in a 114-day expedition for hydrate deposits off India. Photo from US Geological Survey.

Gas hydrates are a naturally occurring, ice-like combination of natural gas and water formed by high pressure and low temperatures in the world's oceans and polar regions. In the 1990s, the USGS made the first systematic assessment of the volume of gas stored in gas hydrates. Estimates range from 2,800 to 8,000,000 trillion cu m of gas. Conventional natural gas accumulations (reserves and technically recoverable undiscovered resources) for the world are estimated at 440 trillion cu m, USGS reported.

Proponents speculate that this unconventional resource could be developed in conjunction with conventional gas fields. However, the technical challenges are substantial. Proposed methods of gas recovery from hydrates generally deal with dissociating gas hydrates in situ by heating the reservoir

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E&P ISSUES • CHALLENGES • SOLUTIONS

beyond the temperature of gas hydrate formation or decreasing the reservoir pressure below hydrate equilibrium.

"The combined wisdom of the scientific community from across the world could provide the answers and solutions to many of these challenges," said V. K. Sibal, NGHP program coordinator and director general of the hydrocarbons directorate under India's Ministry of Petroleum and Natural Gas.

During its 114-day voyage April-August 2006, the expedition cored or drilled 39 holes at 21 sites (one site in the Kerala-Konkan basin, 15 sites in the Krishna-Godavari basin, four sites in the Mahanadi basin, and one site in the Andaman deep offshore areas), penetrated more than 9,250 m of sedimentary section, and recovered 494 cores encompassing 2,850 m of sediment from 21 holes. Twelve holes were logged with logging-while-drilling tools at 10 sites, and an additional 13 holes were wireline-logged.

The expedition discovered gas hydrates in numerous complex geologic settings and collected an "unprecedented" number of gas hydrate cores and scientific data, USGS officials said. It collected vertical seismic profile data at six sites and detailed shallow geochemical profiles at 13 locations. It also established temperature gradients at 11 locations. It brought back an extensive sample collection to support a wide range of postcruise analyses, including:

- 6,800 whole round-core samples for examination of interstitial water geochemistry, microbiology, and other information.
- 12,500 core subsamples for paleomagnetic, mineralogical, paleontological, and other analyses.
- 140 gas-hydrate-bearing sediment samples for storage in liquid nitrogen.
- Five 1-m-long gas-hydrate-bearing pressure cores for analysis of the physical and mechanical properties of gas-hydrate-bearing sediment.
- 21 repressurized cores (9 representing subsamples from gas-hydrate-bearing pressure cores).

Workers conducted 97 deployments of advanced pressure coring devices, resulting in the collection of 49 cores that officials said "contain virtually undisturbed gas hydrate in host sediments at near in situ pressure conditions."

Gas hydrates are an ice-like combination of natural gas and water formed by high pressure and low temperatures. The expedition collected an "unprecedented" number of gas hydrate cores. Photo from USGS.

A technician measures the temperature of a core. The expedition recovered 494 cores with 2,850 m of sediment. Photo from USGS.

The NGHP expedition was "a monumental step forward in the realization of gas hydrates becoming a viable energy source," said USGS Director Mark Myers.

Global gas hydrate resources are estimated to be huge, presenting "unlimited" opportunities for exploration and exploitation, Sibal said. "The Indian gas hydrate program has been fortunate in having the benefits of a truly global collaboration in the form of the first gas hydrate expedition in Indian waters. The results of the studies are not only encouraging but also very exciting. I believe that the time to realize gas hydrate as a critical energy resource has come," he said.

Participants in the NGHP expedition presented the results of that study at the 3-day Indian National Gas Hydrate Program Gas Hydrate Conference in New Delhi.

NGHP Expedition 01 was planned and managed by the Directorate General, the USGS, and the Consortium for Scientific Methane Hydrate Investigations, led by Overseas Drilling Ltd. and Fugro McClelland Marine Geosciences. The science team was led by Dr. Timothy Collett of the USGS and consisted of more than 100 scientists.

Overseas Drilling was listed as operating the riserless drillship Resolution that was provided by the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES). Drilling and coring equipment was provided by the Integrated Ocean Drilling Program (IODP) at Texas A&M University through a loan agreement with the US National Science Foundation. Wireline pressure coring systems and supporting laboratories were provided by IODP, Fugro, the USGS, and the US Department of Energy. Downhole logging operational and technical support was provided by Lamont-Doherty Earth Observatory of Columbia University. ✦

DRILLING MARKET FOCUS

Operators announce capex budgets, drilling programs

Nina M. Rach
Drilling Editor

Operators have committed billions to exploratory and development drilling in 2008.

OAO Gazprom announced in late December that it will invest 710.13 billion rubles ($28.8 billion) in 2008, down about 10% from its total 2007 investment. But the press release said the allocation toward capital investment, 479.42 billion rubles, was a 43% increase from 2007.

In mid-December, Chevron Corp. announced it would spend $22.9 billion in 2008, up 15% from 2007. The company has 30 projects under development estimated at $1 billion or more.

In early December, ConocoPhillips, the third largest US operator, announced a $15.3 billion budget for 2008, up 13% from 2007.

StatoilHydro announced an estimated capital expenditure budget of 75 billion kroner ($13.8 billion) for 2008, up from 65 billion kroner in 2007. The company expects to drill 70 exploration wells this year.

Petro-Canada has budgeted $5.34 billion (Can.) for 2008, according to a mid-December company announcement, up 28% from 2007. The company focuses on eastern Canada, western Canada, oil sands development, and the North Sea.

Husky Energy Inc. announced a $3.7 billion 2008 budget in mid-December, about 28% above its 2007 expenditures.

Pioneer Natural Resources board approved a $1 billion capital budget for 2008, down about 33% from 2007. The company's Dec. 20 announcement said that 90% of the budget was focused on "low-risk development drilling and resource play extension in Pioneer's four core onshore areas" (350 oil wells in Spraberry field, West Texas; 175 gas wells in Raton basin, southeast Colorado; 35-40 gas wells in the Edwards trend, South Texas; 15-20 oil wells in Tunisia); and the other 10% would be spent drilling 15 wells at Oooguruk, off Alaska, and 15-20 development wells in the Barnett shale.

Hess Corp. announced a $4.4 billion capital and exploratory budget in late December up from $3.6 billion in 2007. About $4.3 billion targets E&P, including $1.6 billion for production, $1.5 billion for field developments, and $1.2 billion for exploration.

Gulf of Mexico

Hess will use part of its field expenditure budget to drill production wells at the deepwater Shenzi field throughout the year. A tension-leg platform and topsides will be installed in February, and production will begin in mid-2009. Hess has 28% working interest.

Hess will use the exploration and exploitation budget to drill appraisal wells at the Hess-operated Pony discovery (Green Canyon Block 468) and Tubular Bells discovery (Mississippi Canyon Block 725), both in the deepwater gulf. Hess holds a 20% working interest in Tubular Bells, with ChevronTexaco (30%) and BP PLC (50%, operator).

In early January, W&T Offshore Inc. released a 2008 budget of $800 million, up 77% from the revised 2007 budget of $453 million. The company plans to drill 50 wells, including 44 exploration and 6 development wells. Most (40) are on the conventional shelf and 10 are on the deep shelf or in deep water.

Tracy W. Krohn, W&T Offshore's chairman and chief executive officer, said that the company looks forward to "an exciting year with the drillbit."

Canada's Nexen Inc. announced a 2008 budget of $2.4 billion, down from $3.6 billion in 2007. The company will drill as many as 11 exploration wells in the Gulf of Mexico, the North Sea, and Yemen, it said in December. Nexen will drill three deepwater wells and one shelf well in the gulf. Two of the deepwater wells will test subsalt Miocene prospects.

Bois d'Arc Energy Inc. has $250 million budgeted for the Gulf of Mexico

Toreador Resources Corp. was drilling off Turkey in the western Black Sea with the Atwood Southern Cross, a second-generation semisubmersible, shown flaring gas from the Akcakoca-3 well. The well tested about 34 MMcfd from two of seven pay zones (Fig. 1, photo from Toreador Resources).

in 2008. In a Jan. 7 press release, the company said it will spend $139 million to drill 21 wells (18.5 net), and an additional $92 million for completion and facilities costs. The program includes 11 deep shelf, shallow water wells (8.75 net) that will be drilled deeper than 15,000 ft.

The company is drilling the first well, OCS-G 24977 No. 1, to 18,500 ft to test its Chinook prospect on South Pelto Block 21. It's expected to reach TD this month.

Bois d'Arc had a conference call scheduled for Feb. 12, to discuss fourth-quarter earnings and operations.

Eastern Canada

Calgary-based PetroWorth Resources Inc. announced a four-well drilling program on its Rosevale lease in New Brunswick. The company will drill two wells near the West Stoney Creek E-08 (Feenan No. 2) natural gas discovery well (OGJ, Nov. 26, 2007, p. 38), and "two previously postponed exploration wells on the southwestern part of the lease." PetroWorth wants to drill all four wells in the first half of 2008, and is currently looking for a land drilling rig in eastern Canada.[1]

PetroWorth has 100% working interests in nine exploration permits in New Brunswick, Nova Scotia (Cape Breton), and Prince Edward Island, totalling nearly 1 million acres.

On Prince Edward Island, PetroWorth singed a multiwell farm-in agreement with Corridor Resources Inc. PetroWorth drilled the New Harmony No. 1 well in fourth-quarter 2007 on their exploration license 03-02, according to the company's Dec. 12, 2007, press release.

Calgary's Contact Exploration Inc. is also focused on eastern Canada. It will spud an the Pound Hill C-67-2328 exploration well at its South Stoney Creek prospect this month, and is completing four wells in a 10-well workover program. In a Jan. 15 press release, Contact said it was "examining the future feasibility of a low-cost, high-density drilling program" for Stoney Creek field.

Husky Energy Inc. announced Jan. 21 that it has a 3-year, $380 million contract to use Transocean's GSF Grand Banks semisubmersible, with two, 1-year optional extensions.

Husky will use the rig to complete subsea tiebacks at White Rose and to drill at North Amethyst off Newfoundland in mid-2008. The rig has already drilled 18 development wells for the White Rose project.

Western Canada

Calgary's Vero Energy Inc. announced its $50 million (Can.) initial 2008 capital budget on Jan. 8. The company will drill 10-12 wells in the first-quarter, including four horizontal wells. Over the year, Vero expects to drill 30-32 wells, and has more than 3 years of drilling inventory ahead.

ARC Energy Trust has committed $85 million (Can.) in 2008 to acquire 3D seismic and drill several vertical wells in the Montney resource play, greater Dawson area, BC, the company announced in early January.

Husky Energy will spend about $50 million (Can.) to drill two exploration wells in the central Mackenzie Valley, NWT.[2]

Europe

Contact Exploration also plans to drill two wells in Hungary during the first-half of 2008. According to a news release from Dec. 19, 2007,

CAPITAL BUDGETS, OPERATING COMPANIES*

	2008	2007
	Billion $	
OAO Gazprom	28.8	31.6
Chevron Corp.	22.9	19.9
Royal Dutch Shell PLC	24-25	23.8
ConocoPhillips	15.3	13.5
StatoilHydro	13.7	12.0
EnCana Corp.	6.9	6.1
Petro-Canada	5.34	4.17
Hess Corp.	4.4	3.6
Husky Energy Inc.	3.7	2.89
Nexen	2.4	3.6
Pioneer Natural Resources	1.0	1.5
W&T Offshore	0.8	0.45

*From company announcements.

Contact signed a joint-venture agreement with Toreador Hungary Ltd. to drill the exploration wells and acquire 170 sq. km of 3D seismic in the 262,000-hectacre Szolnok exploration licence area in east-central Hungary. The total cost of the two wells and seismic is €6.7 million ($9.67 million), of which Contact will pay €1.4 million. Toreador Hungary, a subsidiary of Dallas-based Toreador Resources Corp. (formerly Toreador Royalty Corp.), will operate the two drillsites.

Toreador also has operations in Turkey, Romania, and France, with a total of 4.3 million net acres in Europe. The company holds nearly 3.5 million acres under license in Turkey, and discovered gas in its Ayazli-1 exploratory well in the western Black Sea, September 2004. It then drilled 15 wells in the area, dubbed the South Akcakoca subbasin project (SASB), during 2005-07; 13 encountered natural gas (Fig. 1). First gas sales were in May 2007, and three shallow-water platforms (Dogu Ayazli, Ayazli, and Akkaya) began production in 2007, according to the company. However, a vessel damaged the pipeline spur running to the Akkaya platform in late November, causing a temporary shutdown.

TPAO (the Turkish national oil company) has a 51% interest in the permit area, Toreador has 36.75%, and Calgary's Stratic Energy Corp. has 12.25%.

In August 2007, Toreador sold all its US properties (interest in about 700 wells in five states) to RTF Realty Inc. for $19.1 million (OGJ, Aug. 27, 2007, p. 33) in order to concentrate on the Black Sea.

According to a presentation at the NYSSA Conf. in November, Toreador's first priority is continued development of the SASB project off Turkey. It will provide $44 million of the $120 development costs, including $2 million already spent in 2007, $27 million budgeted for 2008, and $15 million budgeted for 2009. This will include drilling as many as four additional development wells by 2009. Toreador wants to develop the deeper water, Thrace portion of the SASB, with its 50:50 Turkish industrial partner, Hema Endustri AS. ✦

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2. "Husky Energy Announces 2008 Capital Expenditure and Production Guidance, " news release, Dec. 13, 2007.

Method estimates solubility of petrochemicals in water

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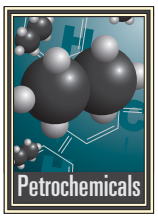


New data for an existing equation allow accurate estimates of the solubilities of many petrochemicals in water.

Correlation results for estimating water solubility are presented for a wide variety of petrochemicals: acetates, acids, alcohols, aldehydes, amines, butanoates, ethers, formates, ketones, monobromo alkanes, monochloro alkanes, and propanoates.

The new correlation provides reliable solubility values down to very low concentrations—in the parts-per-million range—of petrochemicals in water. Correlation values and experimental data are in favorable agreement.

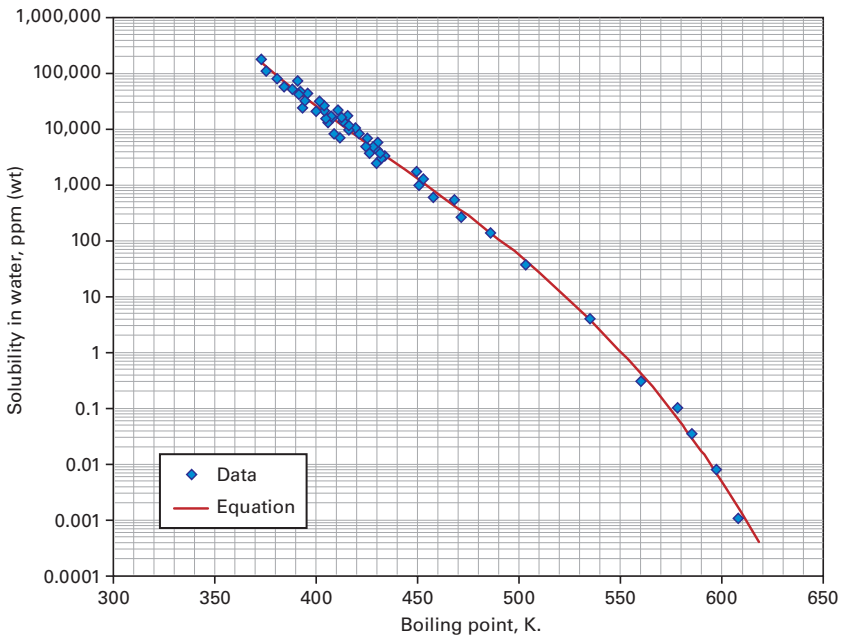
The results are useful in process engineering for waste water minimization.

Importance of water solubility

It is important to understand the solubility of compounds in water. This importance will increase in the future due to heath, safety, and environmental considerations. The importance of water solubility even applies at very low concentrations.

ALCOHOLS IN WATER

Fig. 1



PETROCHEMICALS IN WATER

Chemical family	Equation 1 coefficients A	B	C	D	Minimum Boiling temp., K.	Maximum Boiling temp., K.	Formula
Acetates	13.0000	–2.3382E-02	0	0	330	600	$C_nH_{2n}O_2$
Acids	14.3000	–2.2000E-02	0	0	440	560	$C_nH_{2n}O_2$
Alcohols	45.6398	–2.3859E-01	4.8739E-04	–3.7160E-07	370	620	$C_nH_{2n+2}O$
Aldehydes	12.4200	–2.2000E-02	0	0	320	560	$C_nH_{2n}O$
Amines, primary	11.4300	-1.8000E-02	0	0	400	560	$C_nH_{2n+3}N$
Amines, secondary	11.3600	-1.8000E-02	0	0	360	560	$C_nH_{2n+3}N$
Amines, tertiary	11.8200	-2.0000E-02	0	0	360	560	$C_nH_{2n+3}N$
Butanoates	13.0000	–2.3382E-02	0	0	330	600	$C_nH_{2n}O_2$
Ethers	11.4000	–2.2000E-02	0	0	300	560	$C_nH_{2n+2}O$
Formates	12.5750	–2.3382E-02	0	0	330	600	$C_nH_{2n}O_2$
Ketones	45.2000	–2.3859E-01	4.8739E-04	–3.7160E-07	350	590	$C_nH_{2n}O$
Monobromo alkanes	–7.1700	1.0050E-01	–2.7288E-04	1.9987E-07	300	590	$C_nH_{2n+1}Br$
Monochloro alkanes	–7.4500	1.0050E-01	–2.7288E-04	1.9987E-07	300	590	$C_nH_{2n+1}Cl$
Propanoates	13.0000	–2.3382E-02	0	0	330	600	$C_nH_{2n}O_2$

For health involving human exposure to substances in air, the threshold limit value (TLV) for sec-butanol in air is 100 ppm (vol), according to the Occupational Safety and Health Act.[1] A concentration of only 0.0005 mole fraction of sec-butanol in water will provide about 236 ppm of sec-butanol in air at the air-water interface. This concentration of 236 ppm in air exceeds the TLV of 100 ppm.

For safety reasons, the lower explosive limit (LEL) for sec-butanol in air is 1.7%, according to Yaws.[2] A concentration of only 0.04 mole fraction of sec-butanol in water will provide about 1.9% of sec-butanol in air at the air-water interface. This concentration of 1.9 % in air exceeds the LEL of 1.7%.

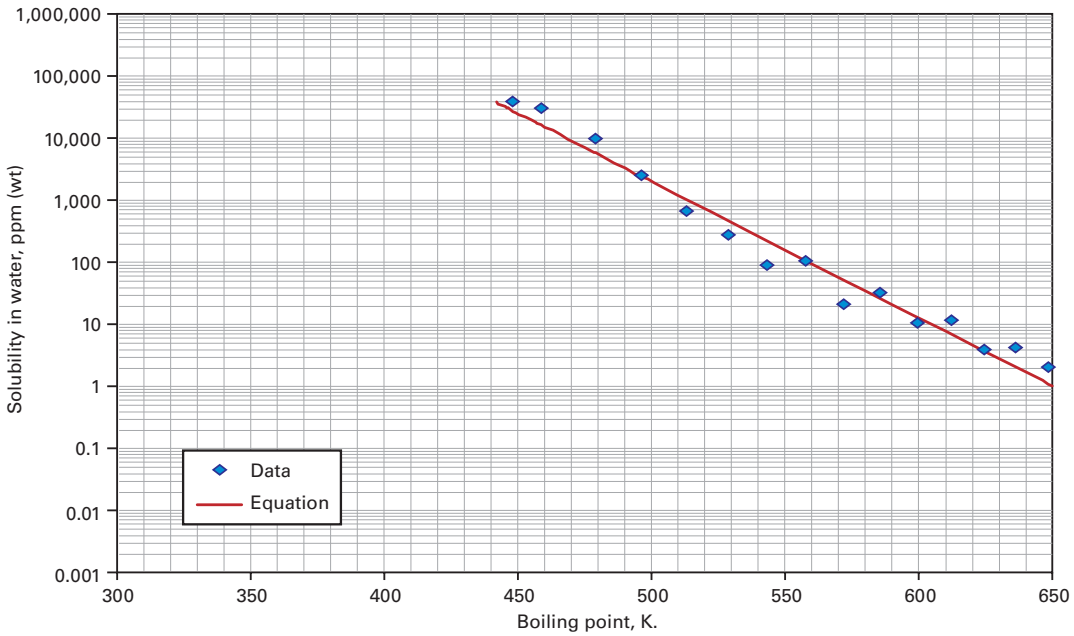
For environmental considerations, consider a spill of sec-butanol in contact with water. The water will become saturated with sec-butanol. At saturation, the solubility of sec-butanol in water is about 0.181 weight fraction or 0.0508 mole fraction, according to Yalkwosky.[3]

This concentration of only 0.0508 mole fraction at saturation will provide about 24,000 ppm or 2.4% of sec-butanol in air at the air-water interface. This concentration greatly exceeds both the TLV of 100 ppm and the LEL of 1.7%.

These brief examples using sec-butanol indicate that very low concentrations of a chemical in water can provide concentrations in air at the air-water interface that exceed the TLV for human exposure and the LEL for flammability.

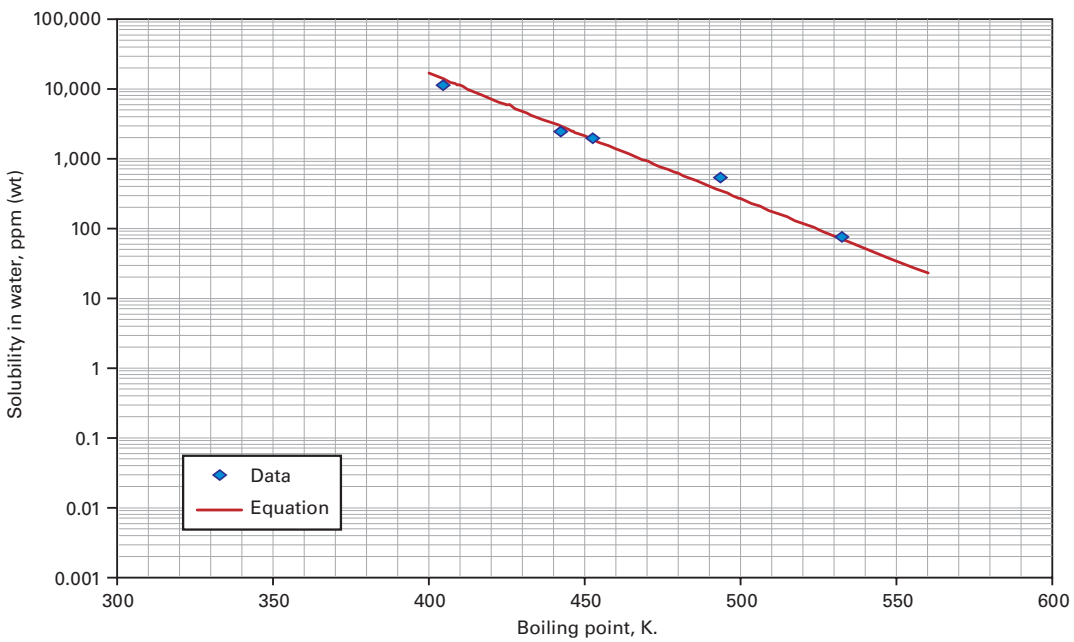
Acids in water

Fig. 2



Primary amines in water

Fig. 3



Solubility correlation

In earlier work by Yaws and cowork-

ers,[2] water solubility for hydrocarbons was correlated as a function of the compound's boiling point. In this article, we determined that the boiling point method was also applicable for correlating the water solubility of petrochemicals.

Equation 1 (see attached equation box) shows the correlation.

The range for boiling point temperature depends on the petrochemical family.

The accompanying table shows the coefficients (A, B, C, and D) for a wide variety of petrochemicals: acetates, acids, alcohols, aldehydes, amines, butanoates, ethers, formates, ketones, monobromo alkanes, monochloro alkanes, and propanoates.

The table also provides the boiling point range for each chemical family. The correlation is applicable for compounds having boiling points in this range. The correlation should not be used for compounds with boiling points outside the boiling point range.

We determined the coefficients from regressions of available data. In preparing the correlation, we conducted a literature search to identify data source publications.[2-15]

The excellent compilations by Horvath;[4 5] Howard and Meylan;[6] Mackay, Shiu, and Ma;[7] Verschueren;[8] Yalkowsky;[3] and Yaws[2] were used extensively for water solubility. Boiling point temperature data are from compilations of Yaws.[9 10]

The publications were screened and copies of appropriate data were made. These data were then keyed in to the computer to provide a database for which experimental data are available. The database also served as a basis to check the accuracy of the correlation.

Figs. 1-3 show graphs of water solubility vs. boiling point temperature for representative chemical families. The graphs indicate favorable agreement of correlation values and experimental data.

Example

A chemical spill of dodecanol occurs into a body of water at ambient conditions. Estimate the concentration in the water at saturation.

The correlation for alcohols may be used to determine the solubility in water. Substitution of the coefficients and boiling point temperature of dodecanol into the correlation equation yields:

$\log_{10}(S) = 45.6398 - 2.3859E\text{-}01\ (535) + 4.8739E\text{-}04\ (535)^2 - 3.7160E\text{-}07\ (535)^3$

S = 3.93 ppm (wt).

The calculated value and data compare favorably (3.93 vs. 4.00, deviation = 0.07/5 = 1.8%). ✦

EQUATION

$$\text{Log}_{10}(S) = A + BT_B + CT_B^2 + DT_B^3 \quad (1)$$

Nomenclature

A, B, C, and D	=	Regression coefficients
S	=	Solubility in water at 25° C., ppm (wt)
T_B	=	Boiling point temperature, K.

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Global pipeline plans expand

Christopher E. Smith
Pipeline Editor

Leena Koottungal
Survey Editor

Planned pipeline construction to be completed in 2008 rose by more than one-third from the previous year, driven by large crude oil transportation projects in both the US and Asia-Pacific. Plans for 2008 construction of both natural gas and products pipelines also expanded from those for 2007.

Operators plan to install nearly 13,500 miles in 2008 alone (Table 1), with natural gas construction making up 56% (more than 7,500 miles) of the plans, based on reports from the world's pipeline operating companies and data collected by Oil & Gas Journal.

Looking forward to 2008 and beyond, greater mileage is planned for both natural gas and products pipelines than had been the case a year ago, with a slight downturn in crude lines stemming from the large quantity of mileage expected to be completed this year.

US demand for natural gas continued to drive large infrastructure projects such as pipelines in 2008, with a growth of planned construction for the year in the US helping balance a temporary downturn in Asia-Pacific activity. Long-term natural gas pipeline plans (2008 and beyond) in Asia-Pacific more than doubled year-on-year, however, driving much of the future increase seen in planned miles.

Large expansions in crude systems in both the US and Asia-Pacific keyed a nearly four-fold 2008 increase in miles expected to be completed in that sector from global totals the previous year.

Plans for construction of product pipelines in 2008 were nearly flat globally, with a large increase in US construction expected to be completed this year making up for steep declines in both the Asia-Pacific and Europe.

As 2008 began, operators had announced plans to build more than 85,500 miles of crude oil, product, and natural gas pipelines beginning this year and extending into the next decade (Fig. 1), a substantial increase over data reported last year (OGJ, Feb. 19, 2007, p. 48) in this report. Most (nearly 72%) of these plans are for natural gas pipelines, an increase from the previous year.

Outlook

The continued up-tick in worldwide pipeline construction trends follows US Energy Information Administration energy consumption forecasts, which show continued growth, even if at a slower rate than predictions from a year ago.

EIA forecast world marketed energy consumption to increase by 57% through 2030 (using a 2004 baseline), a period that encompasses the long-term pipeline construction projections stated here.

Energy demand growth will be strongest, according to the midyear 2007 analysis, among non-OECD countries. This non-OECD growth will be

led by non-OECD Asia, which includes China and India, where demand will grow more than 3.2%/year.

Fueling this energy demand growth is an acceleration of projected gross domestic product growth in non-OECD Asia to 5.8%/year through 2030—led by China at 6.5%/year, the highest projected growth rate in the world—compared with 4.1% worldwide. EIA ascribed the stronger global growth projection (up from 3.0/year projected in 2006) to more optimistic assumptions of growth in China and India.

Structural issues that have implications for medium to long-term growth in China include the pace of reform affecting inefficient state-owned companies and a banking system that is carrying a large number of nonperforming loans, according to the EIA. The development of domestic capital markets to help macroeconomic stability and ensure China's large savings are used efficiently supports the medium-term growth projections, according to the EIA.

In December 2007, the EIA reduced projected US energy consumption in 2030 to 123.8 quadrillion btu, 7.4 quadrillion btu lower than the previous year's projection. Even with this nearly 6% drop, however, energy consumption is still likely to increase more rapidly than energy production. Projections for imports' share of consumption in 2030 slipped to 29% from 30%, with rising fuel prices expected to both spur domestic production and moderate demand growth.

EIA projects domestic natural gas production in 2030 of 19.9 tcf/year, compared with the 21.15 tcf/year projected for 2030 in the prior year's report. After a 2019 peak at 4.5 tcf/year, EIA sees Lower 48 offshore production declining to 3.5 tcf/year in 2030, as investment is inadequate to maintain production levels. This is both a later peak and larger 2030 production level than the EIA projected the previous year.

EIA, however, made a large downward revision in its projections of natural gas consumption in 2030, now pegged at 23.4 tcf/year vs. the 26.9 tcf/year projected a year earlier. Expected consumption is lower in all sectors, particularly industrial and electric power, which will be slowed by higher natural gas prices and slower growth in electricity demand.

Net pipeline imports of natural gas from Canada and Mexico will fall from 2.9 tcf in 2006 to 0.5 tcf in 2030, according to the EIA, which last year pegged 2030 net pipeline imports at 0.9 tcf. EIA ascribed the difference to both increased exports to Mexico as the growth rate of Mexican production sinks and decreased imports from Canada due to resource depletion in Alberta and Canada's growing domestic demand.

EIA also sharply reduced the amount of LNG it expects the US to be importing annually in 2030, from 4.5 tcf in its 2007 annual outlook to 2.9 tcf in this year's publication, ascribing the lower projection to higher costs, especially of liquefaction capacity, and decreased US consumption due to higher natural gas prices, slower economic growth, and expected global competition for available LNG supplies.

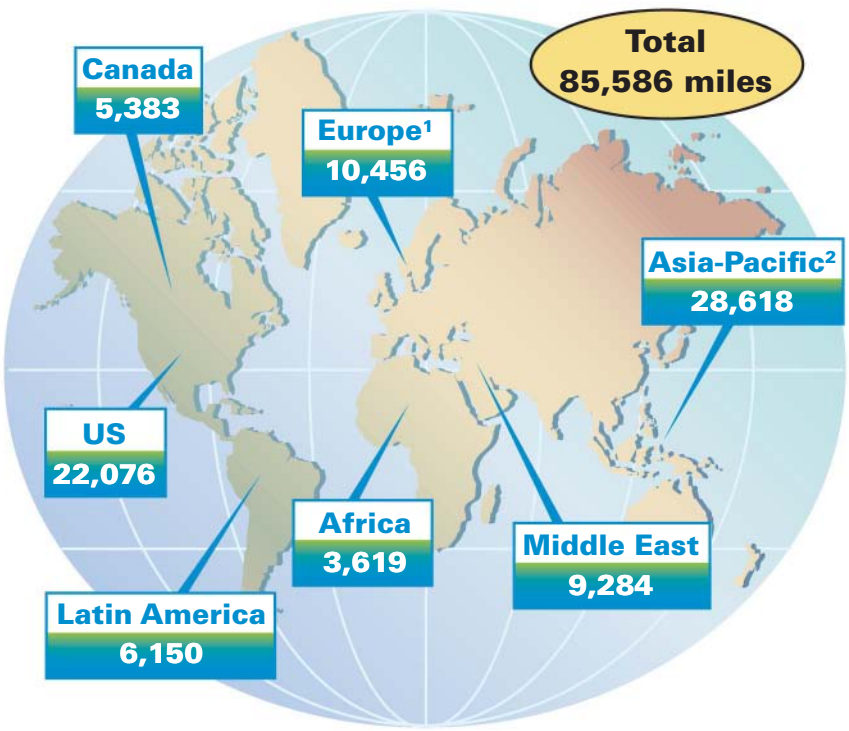
Even these smaller projected volumes, however, will have to be brought to the end-user market via pipeline, as will future unconventional domestic production and any new supplies from Alaska.

OGJ has for more than 50 years tracked applications for gas pipeline construction to what is now called the Federal Energy Regulatory Commission. Applications filed in the 12 months ending June 30, 2007 (the most recent 1-year period surveyed), suggest continued strength in US interstate pipeline construction.

- Some 2,032 miles of pipeline were proposed for land construction, but only 18 miles were proposed for offshore work. For the earlier 12-month period ending June 30, 2006, more than 1,450 miles were proposed for land construction.

Forecast pipeline construction

Fig. 1



[1]Including Russia and former Soviet republics west of the Ural Mountains. [2]Including Russia and former Soviet republics east of the Ural Mountains.

PIPELINE CONSTRUCTION IN 2008[1]

Table 1

Area	4-10 in.	12-20 in.	22-30 in.	32+ in.	Total
			Miles		
Gas pipelines					
US	—	86	1,183	1,513	2,782
Canada	31	120	90	—	241
Latin America	308	730	—	327	1,365
Asia-Pacific[2]	29	288	25	1,509	1,851
Europe[3]	—	58	—	66	124
Middle East	—	—	—	817	817
Africa	—	—	—	364	364
Total gas	**368**	**1,282**	**1,298**	**4,596**	**7,544**
Crude pipelines					
US	65	748	355	321	1,489
Canada	—	—	143	273	416
Latin America	10	—	—	—	10
Asia-Pacific[2]	29	29	—	1,500	1,558
Europe[3]	—	—	—	—	—
Middle East	—	—	15	160	175
Africa	—	—	445	—	445
Total crude	**104**	**777**	**958**	**2,254**	**4,093**
Product pipelines					
US	—	1,380	—	—	1,380
Canada	—	—	—	—	—
Latin America	—	175	—	—	175
Asia-Pacific[2]	172	—	—	—	172
Europe[3]	—	—	—	—	—
Middle East	—	106	—	—	106
Africa	—	—	—	—	—
Total product	**172**	**1,661**	**—**	**—**	**1,833**
World totals					
Gas	368	1,282	1,298	4,596	7,544
Crude	104	777	958	2,254	4,093
Product	172	1,661	—	—	1,833
Total	**644**	**3,720**	**2,256**	**6,850**	**13,470**

[1]Projects planned to be completed in 2008. [2]Regions east of the Ural Mountains and south of the Caucasus Mountains, excluding the Middle East. [3]Regions west of the Ural Mountains and north of the Caucasus Mountains.

• FERC applications for new or additional horsepower at the end of June 2007 also continued their recent surge, reaching more than 713,000 hp, all onshore, compared with 583,000 hp of new or additional compression applied for a year earlier and 175,000 hp the year before that.

In line with the upswing in FERC applications, prospects for oil, natural gas, and products pipeline construction appear healthy (Tables 1 and 2), led by a surge in expected work in the US and Asia-Pacific.

US energy demand in 2008, however, will be nearly unchanged from last year. Weakness in the US economy, in addition to a global economic slowdown, could hold growth in check. Federal Reserve Chairman Ben Bernanke told the US House Budget Committee last month that downside risks to US economic growth in 2008 are now more pronounced.

As tight fundamentals, difficult geopolitics, and fears that an economic recession will reduce demand continue to worry energy markets, it is important to bear in mind that large infrastructure projects such as pipelines can slip in their schedules or be canceled outright as the perceived ability to construct and operate them at a profit erodes.

Bases, costs

For 2008 only (Table 1), operators plan to build nearly 13,500 miles of oil and gas pipelines worldwide at a cost of about $37 billion. For 2007 only, companies had planned more than 10,000 miles at a cost of more than $18 billion.

For projects completed after 2008 (Table 2), companies plan to lay more than 72,000 miles of line and spend nearly $201 billion. When these companies looked beyond 2007 last year, they anticipated spending more than $107 billion to lay nearly 57,000 miles of line.

• Projections for 2008 pipeline mileage reflect only projects likely to be completed by yearend 2008, including construction in progress at the start of the year or set to begin during it.

• Projections for mileage in 2008 and beyond include construction that might begin in 2008 and be completed in 2009 or later.

Also included are some long-term projects judged as probable (such as at least two pipelines competing to bring Arctic gas to the continental US), even if they will not break ground until after 2008.

US average costs-per-mile for onshore and offshore pipeline construction (Table 4, OGJ, Sept. 3, 2007, p. 51) on FERC applications submitted by June 30, 2007, were $2.8 million and $3.2 million, respectively.

Based on historical analysis and a few exceptions and variations notwithstanding, these projections assume that 90% of all construction will be onshore and 10% offshore and that pipelines 32 in. OD or larger are onshore projects.

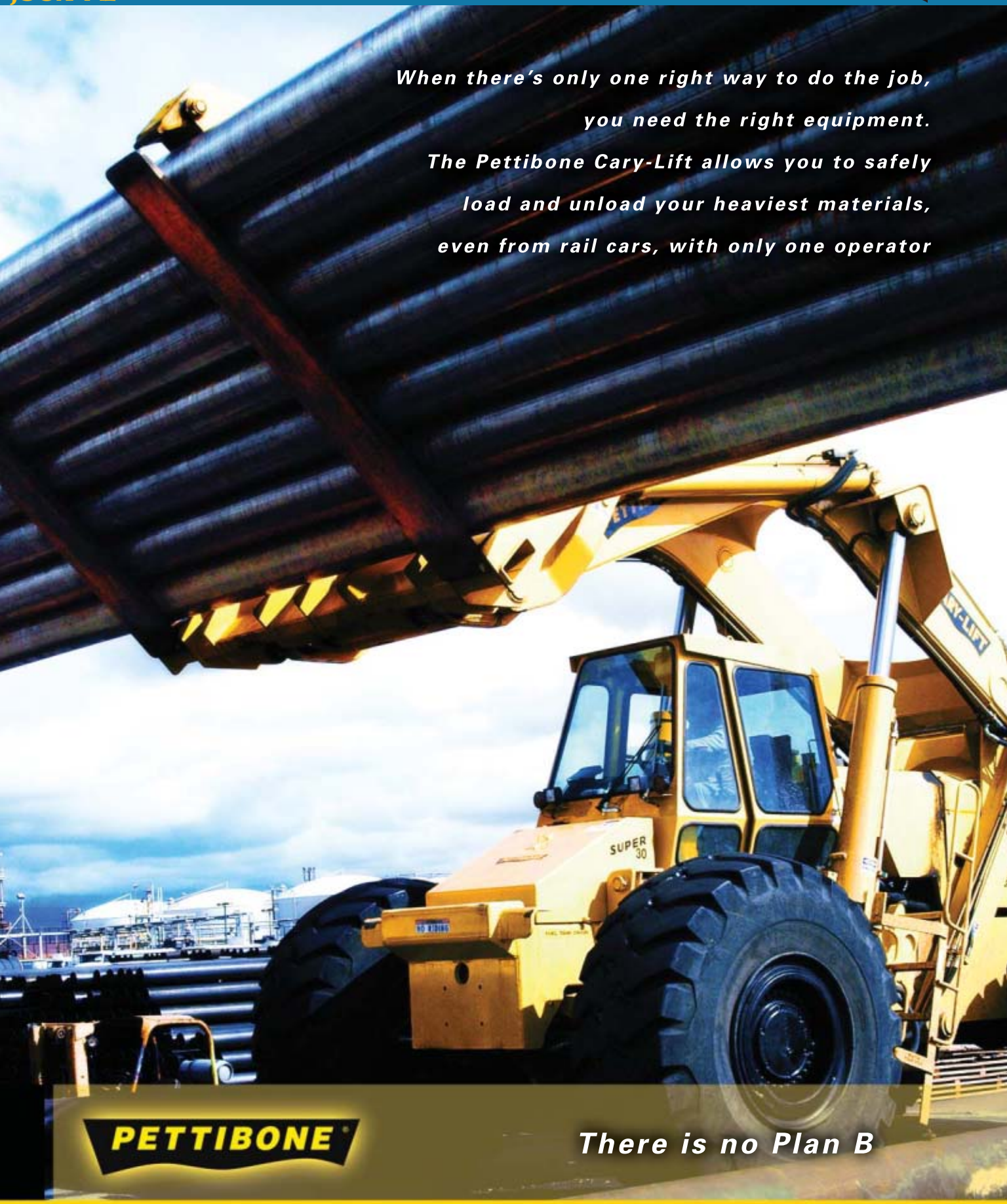
Following is a breakdown of projected costs, under these assumptions and OGJ pipeline-cost data:

• Total onshore construction (12,808 miles) for 2008 only will cost more than $35.5 billion:
—$1.6 billion for 4-10 in.
—$9.3 billion for 12-20 in.
—$5.6 billion for 22-30 in.
—$19 billion for 32 in. and larger.

• Total offshore construction (662 miles) for 2008 only will cost nearly $2.1 billion:
—$204 million for 4-10 in.
—$1.2 billion for 12-20 in.
—$715 million for 22-30 in.

• Total onshore construction (70,217 miles) for beyond 2008 will cost nearly $195 billion:
—$2.2 billion for 4-10 in.
—$19.5 billion for 12-20 in.
—$25.7 billion for 22-30 in.
—$147 billion for 32 in. and larger.

• Total offshore construction (1,899 miles) for beyond 2008 will cost more than $6 billion:
—$279 million for 4-10 in.
—$2.5 billion for 12-20 in.
—$3.3 billion for 22-30 in.



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PIPELINE CONSTRUCTION IN 2008 AND BEYOND[1]

Table 2

Area	4-10 in.	12-20 in	22-30 in.	30+ in.	Total
			Miles		
Gas pipelines					
US	—	236	920	8,191	9,347
Canada	—	—	1,145	331	1,476
Latin America	458	374	2,035	1,403	4,270
Asia-Pacific[2]	—	936	108	20,289	21,333
Europe[3]	—	411	898	7,566	8,875
Middle East	—	—	56	5,877	5,933
Africa	—	—	—	2,810	2,810
Total gas	**458**	**1,957**	**5,162**	**46,467**	**54,044**
Crude pipelines					
US	—	165	2,125	1,590	3,880
Canada	—	—	1,033	1,064	2,097
Latin America	—	—	—	—	—
Asia-Pacific[2]	25	—	1,655	1,911	3,591
Europe[3]	—	83	—	1,374	1,457
Middle East	—	676	—	225	901
Africa	—	—	—	—	—
Total crude	**25**	**924**	**4,813**	**6,164**	**11,926**
Product pipelines					
US	—	2,384	314	500	3,198
Canada	281	872	—	—	1,153
Latin America	—	330	—	—	330
Asia-Pacific[2]	113	—	—	—	113
Europe[3]	—	—	—	—	—
Middle East	—	1,352	—	—	1,352
Africa	—	—	—	—	—
Total product	**394**	**4,938**	**314**	**500**	**6,146**
World totals					
Gas	458	1,957	5,162	46,467	54,044
Crude	25	924	4,813	6,164	11,926
Product	394	4,938	314	500	6,146
Total	**877**	**7,819**	**10,289**	**53,131**	**72,116**

[1]Projects under way at the start of or set to begin in 2008 and be completed in 2009 or later. Includes some probable major projects whose installation will begin in 2009 or later. [2]Regions east of the Ural Mountains and south of the Caucasus Mountains, excluding the Middle East. [3]Regions west of the Ural Mountains and north of the Caucasus Mountains.

Action

What follows is a rundown of major projects in each of the world's regions.

North America

Pipeline construction projects mirror end users' energy demands, and much of that demand, both in the US and globally, continues to center on natural gas, with the industry remaining focused on how to get that gas to market as quickly and efficiently as possible. The following sections look at both natural gas and liquids pipelines, starting with North America.

Gas, NGL

The Calypso pipeline, proposed by Calypso US Pipeline LLC, a subsidiary of SUEZ Energy North America Inc., once premised on the construction of an LNG terminal at Freeport Harbor on Grand Bahama Island, will now run to shore from an anchor-and-buoy deepwater port 8-10 miles off Port Everglades, Fla.

The 1-bcfd Calypso Deepwater Port project received its draft environmental impact statement in November 2007. The facility mirrors the design of a SUEZ port planned for offshore Massachusetts and will move gas to shore through a truncated version of the already FERC-approved pipeline. Calypso expects to start construction this year.

The 842-MMcfd Ocean Express pipeline, proposed by AES Corp., is premised on construction of an LNG terminal at Ocean Cay, an industrial site in the Bahamas. It would entail installation of 54.3 miles of 26-in. mostly subsea pipeline from the EEZ boundary to Broward County, Fla.

AES is currently pursuing final permits for the project and will have a construction schedule in place once these are secured.

Elsewhere in North America, the race continued to bring Arctic gas south to major US consuming centers.

Alaska Gov. Sarah Palin notified ConocoPhillips in January that she rejected the company's proposal to build an Alaska gas pipeline to transport North Slope gas to the Lower 48 states. Meanwhile, a 60-day public comment period began Jan. 5 regarding TransCanada's gas pipeline proposal under the Alaskan Gasline Inducement Act. ConocoPhillips's application was outside the AGIA solicitation.

TransCanada's application was the only one of five formal AGIA applications to meet all the state's requirements. Other applications were submitted by Sinopec of China, AEnergia of California, and two Alaska groups: the Alaska Gasline Port Authority and the Alaska Natural Gas Development Authority.

Following the allotted period for comment, Palin can submit the proposal to the state legislature.

TransCanada proposed a 48-in. pipeline extending from Prudhoe Bay to Alberta, where it would tie into existing pipelines that transport gas to US markets. The project's estimated cost is $26-35 billion, and—if authorized by lawmakers—the proposed pipeline could start operation in 2017.

The proposed pipeline would follow the route of the existing trans-Alaska oil pipeline and the Alaska Highway, and continue through northern British Columbia to link with the pipeline grid in northwestern Alberta.

In Canada, the proposed Mackenzie Valley pipeline would stretch more than 750 miles to transport Mackenzie River Delta gas to Alberta and beyond. Plans call for initial capacity of 1.2 bcfd, expandable to 1.9 bcfd. The project is currently in regulatory reviews. Participants expect permits to be awarded by spring or late summer 2008 and gas to begin flowing in 2014, although major unanticipated expenses could create setbacks.

Questions remain, for instance, concerning who will pay for the proposed gathering system in the Mackenzie Delta. The Northwest Territories government has suggested that Canada's federal government build it because it could be a facilities investment extend-

ing beyond oil and gas.

In addition to the Aboriginal Pipeline Group, other pipeline partners are Imperial Oil Ltd. 34.4%, ConocoPhillips Canada 15.7%, Shell Canada 11.4%, and ExxonMobil Canada 5.2%

The partners updated cost estimates in March 2007 to $16.2 billion (Can.) from the $7 billion (Can.) filed by Imperial just 3 years ago. Costs include $7.8 billion for the Mackenzie Valley mainline, $3.5 billion for the gas gathering system, and $4.9 billion for anchor-field development.

Large domestic west-to-east natural gas expansions also continued to be planned in the US. The Rockies Express pipeline, running 1,323 miles of 42 in. pipe from Cheyenne, Wyo., and Colorado to Clarington, Ohio, is the largest new US pipeline project undertaken in 20 years (Fig. 2). The 1.8 bcfd, $3 billion line has firm commitments in place for 900 MMcfd, including a binding 500 MMcfd by EnCana Corp. and a conditional 400 MMcfd from the Wyoming Natural Gas Pipeline Authority.

Kinder Morgan Energy Partners LP will operate the pipeline and owns two thirds of the project. Sempra Pipelines & Storage holds one third of it. In exchange for capacity commitments, some shippers may exercise options for equity in the project, which could give KMP a minimum of 50% and Sempra 25% after construction.

The pipeline, which KMP expects to be completed by June 2009, will be brought on line in three segments.

REX-Entrega, running from Greasewood, Kanda, and Wamsutter to the Cheyenne Hub in Colorado is already in service. REX-West, covering the next 710 miles from the Cheyenne Hub in Colorado to Audrain County, Mo., and interconnecting with five other interstate pipelines, is scheduled to be in service this month.

The 639-mile REX-East segment from Missouri to Ohio received its draft environmental impact statement in November 2007. In addition to the 42-in pipeline, FERC's REX-East draft EIS covered the possible environmental impacts of 20 metering stations and 7 new compressor stations, including 2 to be built along the REX-West in Wyoming and Nebraska.

FERC noted that the REX-East project would follow existing rights-of-way for more than 59% of its route and would be consistent with or conform to federal resource management plans.

Construction is scheduled to begin in summer 2008, with targeted partial service of the pipeline, meter stations, and most compressor stations by the following December. Full service is expected by June 2009.

Kinder Morgan and Energy Transfer Partners LP will jointly develop the Midcontinent Express Pipeline. The 1.4-bcfd pipeline will be about 500 miles long, originating near Bennington, Okla. It will run through Perryville, La., and terminate at an interconnect with Transco in Butler, Ala.

Pending regulatory approvals, the $1.25 billion project will be in service by February 2009. MEP has prearranged binding commitments for 800 MMcfd, including a commitment from Chesapeake Energy Marketing Inc. for 500 MMcfd.

MEP filed with FERC requesting a certificate of public convenience and necessity in October 2007 that would authorize construction and operation of the system. Construction on the pipeline is to begin this August.

Spectra Energy Transmission plans another capacity expansion of its 9,040-mile Texas Eastern pipeline system connecting Texas and the Gulf Coast to the US Northeast. The project, designated Time 3, involves expanding the pipeline system from Oakford, Pa., through addition of compression and pipeline looping. Existing rights of way will be used where possible. At an estimated $300 million, the Time 3 project is to enter service in late 2010.

ONEOK Partners LP and a subsidiary of Williams Cos. Inc. have formed a joint venture to construct and operate the 760-mile Overland Pass NGL pipeline from Wyoming to Kansas. The 110,000-b/d pipeline, consisting of 14 and 16-in. pipe will enter service by the middle of this year, with a 150 mile, 14-in. lateral from the Piceance basin entering service in 2009. When combined with its 440 mile, 160,000-b/d Arbuckle pipeline, from southern Oklahoma through the Barnett Shale to Mont Belvieu, Tex., and also set for 2009 completion, ONEOK will have more than 1,300 miles of NGL line in service by then.

Crude

Canadian oil sands will surpass deepwater wells as the single largest global source of new oil exports by the end of this decade, according to Jeff Rubin, chief market strategist and economist at CIBC World Markets, the wholesale and corporate banking arm of Canadian Imperial Bank of Commerce. Rubin also stated that Canada's oil sands represent 50-70% of the world's oil reserves open to private investment, depending on the investment climate in Nigeria and Kazakhstan (OGJ Online, Oct. 8, 2007).

This supply's proximity to US demand has helped make export lines for Canadian crude a large portion of the work to be completed in the US for 2008. TransCanada Corp. is preparing to begin construction this spring on the 1,379-mile US portion of its Keystone oil pipeline project, which will transport oil from Canada to the US Midwest.

Keystone will total 3,456 km, including additions to existing Canadian pipelines and mainline flow reversals. It is to start up in late 2009 with capacity to deliver 435,000 b/d of crude oil from Hardisty, Alta., to the US at Wood River and Patoka, Ill.

The company has entered into contracts or conditionally awarded about $3 billion for major materials and pipeline construction.

TransCanada applied to Canada's National Energy Board in November for additional pumping facilities to expand Keystone's capacity to 590,000 b/d and extend the line to Cushing, Okla., starting in 2010. Based on the increased size and scope of the project and the

ROCKIES EXPRESS PIPELINE

Fig. 2

Source: Bentek Energy LLC.

executed material and service construction contracts, the Keystone project cost is now estimated at $5.2 billion.

The plans to expand Keystone follow successful completion of an open season that secured an additional 155,000 b/d of firm contracts for oil delivery from Hardisty to Cushing (OGJ, July 16, 2007, p. 10).

The project has secured firm long-term contracts totaling 495,000 b/d for an average of 18 years.

Keystone received NEB approval this year for two major applications to construct and operate the Canadian portion of the project. Keystone received its final EIS from FERC in January.

The Keystone project is one of two currently progressing systems planned to deliver crude oil from Hardisty to the US Midwest. Enbridge Energy Partners LP, also of Calgary, plans its own pipeline expansion to deliver 400,000 b/d of crude oil to the US.

The Southern Access system expansion will use 42-in. pipe to allow for future expansions of as much as 800,000 b/d on its Canadian mainline from Hardisty to the international border near Neche, ND, and new pipeline construction in the US. The new pipeline will be added between Superior, Wis., and Flanagan, Ill., just west of Chicago, on Enbridge's Lakehead system.

The US portion of the expansion will cost about $1 billion and will take place in the three stages. The first stage added 44,000 b/d of capacity in 2007 and is to begin operations this year. An additional 146,000 b/d will be constructed this year and enter service in spring 2009, with the final 210,000 b/d also to be built in 2008 and enter service in 2009, bringing the system up to its 400,000 b/d capacity.

The final stage will run 286 miles of 36-in. pipe from Flanagan south to Patoka and can be expanded to 800,000 b/d by adding pumps.

At Flanagan, the new line will also have access to Chicago and will interconnect with Enbridge Inc.'s Spearhead pipeline, which began deliveries to Cushing Mar. 1, 2006.

Accompanying the Southern Access expansion is Enbridge's Southern Lights 180,000-b/d Chicago-to-Edmonton diluent pipeline. Shippers have committed to 162,000 b/d, with the balance retained for spot suppliers. Enbridge will build 674 miles of 16 or 20-in. pipe from the Chicago area to Clearbrook, Minn. About 442 miles of this construction uses the same right of way as the Southern Access expansion. Enbridge will reverse the flow of its existing Line 13 to carry the diluent from Clearbrook to Edmonton, replacing this volume with a new 20-in 185,000 b/d pipeline from Cromer, Man., to Clearbrook and an expansion of its existing Line 2.

Beyond these two projects, Enbridge intends to build the Alberta Clipper crude pipeline between Hardisty and Superior, Wis. This 1,000-mile segment is designed to resolve expected capacity constraints and to be in service by mid-2010, after the Southern Access program is completed and as crude oil supplies from Western Canada continue to increase. Initial capacity will be 450,000 b/d, with ultimate capacity of up to 800,000 b/d available.

Enbridge expects supply from Western Canada oil sands developments to grow by as much as 1.8 million b/d by 2015.

Enbridge and ExxonMobil Pipeline Co. also announced in December that they will conduct commitment solicitation for a proposed new pipeline system to transport crude from Patoka to the Texas Gulf Coast. The new Texas Access Pipeline would transport crude oil sourced from the Canadian oil sands region in Alberta and from the upper US Midwest to refiners in Nederland and Houston.

The proposed project consists of construction of a 768 mile, 30-in. pipeline to Nederland and an 88 mile, 24-in. pipeline from Nederland to a delivery point in east Houston.

The commitment solicitation is to secure shipper interest in executing binding commitments to transport specified volumes of crude oil on the new pipeline, expected to be completed in 2011. Its results will guide and determine further development.

Minnesota Pipe Line Co. is expanding its pipeline system to transport additional Canadian crude to Minneapolis-St. Paul-area refiners. The company's MinnCan Project will add a new 300 mile, 24-in. pipeline to its existing

system. Minnesota Pipe Line expects 100,000 b/d to move on the pipeline once completed in late 2008, though it will actually have 165,000 b/d of initial capacity and the potential to expand to 350,000 b/d. Work began on the pipeline in August 2007.

Enterprise Products Partners LP will construct, own, and operate an oil export pipeline to provide firm gathering services from the BHP Billiton-operated Shenzi field located in South Green Canyon, Gulf of Mexico. The Shenzi pipeline will start in 4,300 ft of water at Green Canyon Block 653, about 120 miles off the coast of Louisiana. The 83 mile, 20-in. pipeline will have the capacity to transport 230,000 b/d and will connect the field to the Cameron Highway Oil Pipeline and Poseidon Oil Pipeline systems at Enterprise's Ship Shoal 332B junction platform.

BHP Billiton expects Shenzi production to begin in mid-2009. Saipem America began installation of precrossing concrete mattresses for the pipeline in September 2007.

Products

Colonial Pipeline Co. received assurances from FERC encouraging it to invest $1 billion in an expansion of its mainline petroleum products pipeline. To ease constraints on its system, Colonial plans to construct and operate 500 miles of 36-in. pipeline between Louisiana and Georgia to transport at least 800,000 b/d, a 30% increase in capacity.

In July 2007, Colonial filed an application with the Georgia Department of Transportation requesting permission to build between the Alabama state line and suburban Atlanta, using the same right-of-way of its two existing mainlines.

Colonial estimates the expansion will enter service in 2010.

Kinder Morgan is continuing the development of its $400 million CALNEV pipeline expansion following July 2007 FERC approval of its rate structure. Expansion of the 550-mile pipeline involves construction of a 16-in. pipeline from Colton, Calif., to Las Vegas, Nev., and will increase the system's capacity to 200,000 b/d, transporting products for the military at Nellis Air Force Base. The company said a further capacity increase to more than 300,000 b/d is possible with the addition of pump stations.

The new pipeline will parallel existing utility corridors between Colton and Las Vegas. Following its completion, the existing 14-in. line will be transferred to commercial jet fuel service for McCarran International Airport and any future airports planned in Las Vegas, with the 8-in. pipeline that currently serves the airport purged and held for future service.

Start-up of the new line is scheduled for late 2009 or early 2010.

Holly Corp. and Sinclair Transportation Co. plan to build a products pipeline extending from Salt Lake City to Las Vegas. The UNEV Pipeline project includes construction of associated terminal facilities in Cedar City, Utah, and northern Las Vegas.

The 430 mile, 12-in. line will cost about $300 million and have an initial capacity of 62,000 b/d, expandable to 120,000 b/d. It will serve refineries and shippers along its route and interconnect to the Pioneer Pipeline.

The system is slated for completion by the end of this year.

Latin America

Intergovernmental meetings held in 2006 regarding construction of a 7,776-mile pipeline to transport natural gas from Venezuela to Argentina through Brazil, Uruguay, and Paraguay have yielded little concrete progress on the project since. The line, if constructed, would cost $25 billion and could take 5 years to construct. It has a projected capacity of 150 million cu m/day.

Talks culminated in the January 2007 signing of a declaration between Brazil and Venezuela authorizing construction of the pipeline's first leg, to begin in 2009.

Venezuelan President Hugo Chavez ascribes the subsequent slowing of progress to dissent between potential participating nations and attempts at subversion by the US government.

Petrobras signed an accord with the Goias state government to build the country's first ethanol pipeline, a $226 million, 975-km line to transport 1.056 billion gal/year. The pipeline will run from Goias to a refinery in Paulinia, near Sao Paulo. Japan's Mitsui and Brazil's Camargo Correa are also participating in the project, with plans for a feasibility study announced in March 2007. Petrobras plans to have the line in service by 2010.

Three other Brazilian ethanol pipeline proposals have also emerged; a second from Petrobras and two non-Petrobras projects

Ethanol producers in Parana state proposed a $315 million, 528-km pipeline to Paranaqua, to be completed in 2011. The other non-Petrobras line would run 300 km across Sao Paulo state from Paulinia to the port of Sao Sebastiao, carrying 1.32 billion gal/year.

Tidelands Oil & Gas Corp. subsidiary Sonora Pipeline LLC received permitting in March 2007 from FERC for construction of the US portion of the Burgos Hub Export-Import project. Tidelands subsidiary Terranova Energia had previously received approval from the Mexican government for both the Occidente and Oriente sections of the project.

The Occidente section will use 323 km of 30-in. pipe, running from the Brasil storage field to Nuevo Progresso, Mexico, with a proposed international pipeline crossing into South Texas from Mexico at the Donna Station. This crossing will allow interconnections with TETCO, TGPL, and Texas Gas Services. The pipeline will also include a stretch from Brasil to Arguelles, where another proposed crossing into South Texas would facilitate interconnection with Houston Pipeline, Calpine, and Kinder Morgan.

The Oriente section will use 36-in. line spanning 149 km. It will run from a proposed offshore LNG regasification terminal to Norte Puerto Mezquital and

NABUCCO PIPELINE

Fig. 3

Source: Nabucco Gas Pipeline International GMBH

from there to the Brasil storage field.

Proposed US construction totals 29 miles of 30-in. pipeline.

The system is designed to flow natural gas bidirectionally between Texas and Mexico at a rate of 1.2 bcfd, but is being built to address an expected sharp increase in Mexican demand for imported gas starting in 2010.

Asia-Pacific

Industrial growth in Western Australia prompted an increase in the size of the proposed Stage 5 expansion of the Dampier-Bunbury natural gas trunkline to handle an additional 140 terajoule/day of natural gas expected to come online in 2008-10.

Stage 5A will duplicate about half the current mainline length, comprising 10 loops that will connect to previously constructed Stage 4 loops. The new loops will total 570 km, adding around 100 TJ/day of capacity. Stage 5A is expected to cost $660 million (Aus.). Work began in late February 2007, with commissioning expected next month.

Stage 5A(2) will add another 40 TJ/day and has been approved by Dampier Bunbury Pipeline. It will involve an additional 140 km of looping, some compressor station modifications, and is expected to be commissioned by 2010.

The Indonesian government tendered in January 2006 for the construction of a 1,219-km natural gas pipeline between Bontang in East Kalimantan and Semarang in Central Java. The pipeline, estimated to cost $1.7 billion, would carry 700-1,000 MMcfd of natural gas.

PT Bakrie & Bros. won the tender to build and operate the pipeline and in December 2006 said it plans to proceed with the project despite doubt voiced by officials about its feasibility. In May 2007 the Indonesian government said it would revoke PT Bakrie & Bros. building rights unless construction started by July of that year, but reversed course in June, stating that Bakrie's progress reports had been sufficiently detailed to justify their continued participation.

PT Perusahaan Gas Negara was in the early stages of building the South Sumatra to West Java Transmission Pipeline Project Stage 1 in November 2007. Stage 1 will use 375 km of 32-in. pipe to move gas from Pagardewa (South Sumatra) to Cilegon (Banten). Stage 2 will transport natural gas from Pagardewa to Labuhan Maringgai (South Sumatra) and from Muara Bekasi (West Java) to Rawa Maju (West Java) using a combined 100 km of 28 and 32-in pipe.

Indonesia has also offered construction of both the Gresik to Semarang and Semarang to Cirebon pipelines to private contractors.

In December 2007 Russia and Turkmenistan agreed to accelerate development of the proposed Caspian Gas Pipeline. The decision followed agreement the prior month on amendments to the gas supply contract governing the export of Turkmen gas to Russia. On completion in 2012, the pipeline will extend 510 km along the coast of the Caspian Sea—360 km through Turkmenistan and another 150 km through Kazakhstan—before connecting with the existing Central Asia-Center gas pipeline network at the Russian-Kazakh border.

Turkmen gas will also be moving east to China. Kazakhstan and China agreed in August 2005 to build a 40 to 48-in. natural gas pipeline running from western Kazakhstan to China. Now extended into Turkmenistan, the 4,350-mile pipeline is scheduled to deliver 30 billion cu m/year by 2012. Construction began on the Turkmen section in August 2007. About 117 miles will be laid in Turkmenistan, 329 miles through Uzbekistan, 803 miles through Kazakhstan, and 2,796 miles in China as that country's second West-East Gas Pipeline, terminating in Guangzhou.

China plans more that 20,000 km of domestic pipeline construction, more than 15,000 km of which will be built by the end of 2010, a large portion consisting of this system.

The first West-East Gas Pipeline, running 4,000 km from the Xinjiang Uygar Autonomous region to Shanghai and other eastern provinces, entered service in 2004. It is being expanded to 17 billion cu m/year from 12 billion cu m/year. Construction on the second line is scheduled to start next year. It will parallel the first line until Gansu before separating to reach Guangzhou.

The project will comprise more than 8,500 km of line when eight branch lines are included, at an estimated cost of nearly $20 billion. Construction is expected to begin this year.

The Caspian nations are not the only countries actively pursuing export projects to China, with much of the crude mileage planned in the Asia

Pacific region for 2008 consisting of the Eastern Siberia-Pacific Ocean crude line running to China from Russia.

The first stage of the 4,700-km project includes construction of a 2,400-km oil pipeline from Taishet to Skovorodino near the Chinese border and of a rail oil terminal at the Perevoznaya Bay at a combined cost of $7.9 billion. The second stage, depending on development of Eastern Siberian oil fields, involves construction of a pipeline link between Skovorodino and Perevoznaya on Russia's Pacific Coast.

China looks to import as much as 30 million tonnes/year of crude if a pipeline spur is built from Skovorodino to Daquing. In November 2007 the premiers of both countries agreed that the spur would be built and the entire line placed in service by the end of this year, but progress has slowed since, Transneft cautioning that completion of the first stage could be delayed by several months.

Supplies along the Skovorodino-Perevoznaya route would total 50 million tonnes/year, the bulk of which would be exported to Japan, but hinge entirely on a combination of continued development of the Siberian fields, other fields, and Russia's continued desire to export to Japan.

Urals Energy in October 2007 received approval from Transneft to build a pipeline tie-in from its Dulisminskoye field to ESPO. First oil from the field is expected to flow into ESPO during the first half of 2009.

In December 2006, OAO Gazprom agreed to acquire, for $7.45 billion, a 50%-plus-one share stake from Sakhalin-2 project operator Sakhalin Energy Investment Co. Ltd.—Royal Dutch Shell PLC, Mitsui & Co., and Mitsubishi Corp. Construction of one onshore pipeline section halted in July 2007 due to safety and environmental concerns, even as the rest of construction activity continued pace.

The total pipeline project comprises two 800-km systems (one gas, one oil) running from production at the northeastern edge of Sakhalin Island to terminals at the southern tip.

Beyond the export projects to Russia and China described earlier in this section, Turkmenistan has also agreed to supply natural gas to Pakistan over 30 years via the proposed $2 billion Turkmenistan-Afghanistan-Pakistan pipeline. India has also expressed its willingness to participate in the 1,680-km pipeline.

A 735 km Afghani segment lies between a 145 km Turkmen length and the final 800 km through Pakistan.

Turkmenistan and Afghanistan reached an agreement to revive the line in July 2007, with Turkmen President Gurbanguly Berdymukhammedov saying that Turkmenistan would send 30 billion cu m/year through the line. Outside analysts, however, have voiced skepticism regarding Turkmenistan's ability to meet these supply commitments at the same time it has agreed to ship large volumes of gas to both Russia and China.

Europe

Work started in early December 2005 on the Russian onshore section of the Nord Stream pipeline in Babayevo. This 56-in. segment will stretch 917 km to the Baltic Sea coast near Vyborg, linking existing gas pipelines from Siberia to the NEGP project. Seven compressor stations will provide the necessary pressure. The pipeline will cross the Baltic, making landfall near Greifswald, Germany. This section will be 1,200 km in length with a 48-in. OD. Environmental studies regarding offshore pipelay activities and pressure testing began last month.

The full system is scheduled to start operations in 2011 at a capacity of 27.5 billion cu m/year. The project includes building a second, parallel pipeline, doubling capacity to about 55 billion cu m/year. This second pipeline is planned to come on stream in 2012.

A joint venture consisting of Gazprom (51%), Wintershall AG (20%), E.ON Ruhrgas AG (20%), and NV Nederlandse Gasunie (9%) is building the pipeline. The total cost for the offshore project will amount to more than €5 billion, with Gazprom investing an additional €1.3 billion in the onshore section.

Gaz de France, and Finland have also voiced interest in participating in the project.

Russia began production at the 825.2 billion cu m Yuzhno Russkoye oil and gas condensate field in December 2007. Gas from this field will be shipped through Nord Stream once it is completed.

Gazprom and Eni SPA agreed in December 2007 to build the 560-mile South Stream gas pipeline under the Black Sea and through Bulgaria. Bulgaria and Russia reached agreement last month. On completion, the $10 billion line could distribute gas to northern and southern Europe, with an estimated capacity of 30 billion cu m/year. A feasibility study is set to be completed by the end of this year. Participants plan to deliver first gas through South Stream by 2013.

Medgaz began onshore trenching for the 8 billion cu m/year Algerian-European gas pipeline bearing the same name in July 2007, having received all regulatory approvals within the scheduled timeframes. The first shipment of offshore pipe (35,000 tons of 12-m lengths with a 24-in OD) arrived in Spain in October 2007. The project is expected to cost €900 million, with start-up slated for 2009. This figure includes past costs of the project, construction, start-up, and preinstallation of future extension points in the coastal section.

Medgaz's offshore length is 210 km, and it will reach a maximum water depth of 2,160 m. Supplies will come from the Hassi R'Mel-Beni Saf gas pipeline operated in Algeria by Sonatrach. Upon landfall in Spain, the pipeline will link with the Almería-Albacete gas pipeline operated by Enagas, facilitating its connection to the Spanish and European gas grid. Gaz de France, which owns a 12% stake in the project, contracted for 1 billion cu m/year of gas through Medgaz starting in 2009 with a 20-year term.

WEST ETHYLENE PIPELINE

Fig. 4

Source: NIC

Other interests in Medgez are: Sonatrach (36%), Cepsa and Ibedrolla (20% each), and Endesa (12%).

Plans to export Algerian gas via Italy have also progressed, Galsi SPA and Snam Rete Gas SPA having signed a memorandum of understanding in November 2007 to construct the Italian section of the planned 8 billion cu m/year Galsi natural gas pipeline, which will deliver Algerian gas to Italy via Sardinia.

Gasli shareholders are Sonatrach, Edison SPA, Enel SPA, Hera Trading, Regione Sardegna, and Wintershall AG.

The project envisions four pipeline segments: 640 km onshore between Hassi R'mel gas field in Algeria and El Kala on the Algerian coast; 310 km between El Kala and Cagliari on Sardinia in water as deep as 2,850 m; 300 km between Cagliari and Olbia on the northern Sardinian coast; and 220 km between Olbia and Pescaia, southeast of Florence, in water as deep as 900 m.

Sardinia is set to receive gas supplies starting in 2012 from the new line.

Sonatrach will deliver 3 billion cu m/year into the system, Enel, 2 billion cu m/year, and Hera Trading, 1 billion cu m/year.

Austria's OMV AG continues to advance the 56-in. Nabucco pipeline, which will bring some combination of Central Asian, Caspian, and Middle Eastern gas to the Baumgarten hub in Austria near the Slovakian border at a rate of 31 billion cu m/year, before moving it on to Western Europe. The $6.5 billion pipeline, spanning 3,300 km, is to be completed by 2013.

Feasibility studies have led to a two-stage construction plan. The first phase, starting construction next year, calls for 2,000 km of pipe between Ankara, Turkey, and Baumgarten, allowing 8 billion cu m/year of gas from the existing Turkish pipeline network to be transported by 2012. Second-stage construction would begin in 2012 and build eastward from Ankara to the Iranian and Georgian borders (Fig. 3).

The European Union has given its backing to the proposal, appointing a coordinator who seeks to make the line the core of European Union energy policy and asking the five-company consortium (OMV, MOL Rt., Botas, Bulgargaz, and Transgaz SA) developing the project to allow RWE AG and Gaz de France to participate. The lack of firm gas-supply commitments, however, continues to weigh on project financing.

Middle East

Iran, Pakistan, and India continued discussions toward building the long-contemplated gas export line from Iran to India during 2007. Gazprom has also expressed interest in participating in the $7 billion project, which would transport as much as 120 million cu m/day of natural gas from the South Pars field in the Persian Gulf through 2,100 km of 56-in. OD line (Iran, 1,100 km; Pakistan, 750 km; India, 250 km).

Natural gas pricing agreements have been reached between Iran and Pakistan, but India's status remains uncertain. In addition to difficulties reaching economic terms, India is under US pressure to not participate in the project and has security concerns regarding having such a major energy artery running through Pakistan.

Pakistan has said that it will build its portion of the pipeline between 2009 and 2011, while Iran stated in July 2007 the construction of its section was 18% complete.

Iran is also building a 2,163-km ethylene pipeline from Assaluyeh in southern Iran to the country's northwestern provinces (Fig. 4). The pipeline will transport ethylene to meet the feed requirements of new petrochemical complexes in Gachsaran, Kermanshah, and Mahabad.

Construction of the pipeline began in 2003 and is targeted for completion in 2009-10. The West Ethylene Pipeline was initially to transport 1.5 million tonnes across 1,500 km to feed five planned petrochemical complexes. The Iranian Parliament, however, instructed the Petroleum Ministry to build five more complexes in the cities of Andimeshk, Dehdasht, Hamedan, Kermanshah, and Miyandoab as a means to boost production in the less-developed parts of the country. The pipeline's length, therefore, was extended to 2,163 km and capacity increased to 2.8 million tonnes.

Olefin plants in Assaluyeh and the Bandar Imam special economic petrochemical zone in Mahshahr City will supply the ethylene.

Bakhtar Petrochemical Co., which is constructing the pipeline, is a private joint stock holding company.

Calvalley Petroleum Inc. will build and operate 250 km of 16-in. crude oil pipeline in Yemen between Blocks 9 and 18, crossing a number of development areas before reaching a tie-in to an export pipeline already in place running from Block 18 to the Ras Isa terminal on the Red Sea.

Last month the company awarded and received Yemeni approval of an engineering, procurement, and construction management contract for the pipeline.

Africa

Nigeria, Algeria, and Niger hope to start gas exports via the proposed 18-25 billion cu m/year Trans-Sahara gas pipeline in 2015. Once built, the 4,300-km line would transport gas from the Niger Delta in southern Nigeria through Niger and into Algeria and Europe. Cost estimates for the project are $10-13 billion.

A senior energy delegation from Algeria, Nigeria, and Niger visited Brussels in August 2007 to promote TSGP to potential investors and European gas consumers seeking to diversify gas supply sources.

According to the feasibility report published by engineering company Penspen Consulting, TSGP would comprise a 48-56-in. pipeline from Nigeria to Algeria's Mediterranean coast at Beni Saf and subsea pipelines of 20-in. between Beni Saf and Spain.

Europe expects to import 500 billion cu m of gas in 2020. Europe's Energy Commissioner Andris Pielbags cautiously welcomed the pipeline, stressing the need for Europe to diversify gas suppliers and enhance security of supply. Pielbags, however, said it was important to determine the availability of proved gas reserves, the feasibility of the project, its economic viability, and geopolitical developments in the region.

Tony Chukwuku, Director of Nigeria's Petroleum Resources, admitted that Nigeria's export plans were ambitious, particularly as it is trying to boost the use of domestic gas for electric power generation.

India has also voiced interest in participating in the project.

Sonatrach has secured cathodic protection for the 665 km NK-1 Haoud el Hamra-to-Skikda oil pipeline. Construction of the line is to be completed this year. ✦

Equipment/Software/Literature

New girth weld pipeline inspection system

Newly released Weldstar is a complete, automated ultrasonic girth weld inspection system for transmission pipelines.

The company says the system promises gains in productivity and probability of detection—without the hazards associated with ionizing radiation—when compared with traditional film-based radiographic nondestructive testing.

The system incorporates automated tools to set up, conduct, and report a weld inspection. With Weldstar's ability to size and locate a weld defect, pipeline contractors can implement engineering methods to assess the strength of a weld.

The product uses ultrasonic technology, as opposed to radiography, making inspection possible immediately following the welding process. This provides the operator with near real-time process control, the firm points out.

Source: **GE Sensing & Inspection Technologies,** 1100 Technology Park Drive, Billerica, MA 01821.

New 3D laser designed to help offshore operations

This new 3D laser measurement system is designed for use in shipbuilding and offshore platform environments.

The FX scanner is specifically designed to capture data to create as-built digital drawings for existing structures. With a 360° by 270° field of view and data capture rates that can exceed 175,000 points/sec, accurate data can be quickly captured on a project, the firm notes.

The scanner allows users to measure existing conditions quickly and accurately, creating a high-resolution 3D image. Each pixel in the image represents a 3D point in space that can be used for virtual surveying, locating interferences, and connection points or to create 2D and 3D computer-aided drawing shapes for use with AVEVA, Intergraph, Autodesk, Bentley, and other design software systems.

Used in conjunction with this firm's FX controller software, the scanner offers users a flexible 3D imaging solution by providing the ability to create a low or high-resolution data set. The scanner can be mounted on tripods, brackets, columns, decking, or ceiling joists.

Weighing about 22 lb, the unit allows for easy movement on a project. Using the company's SceneManager software, users are able to locate and transform the setup locations of the scanner to known positions. The scanner supports flat targets and spheres, depending on the needs of the project.

Source: **Trimble Navigation Ltd.,** 935 Stewart Drive, Sunnyvale, CA 94085.

Services/Suppliers

Aker Kvaerner ASA,

Oslo, has appointed Simen Lieungh president and CEO, effective in March. He succeeds Martinus Brandal, who has been named executive vice-president, energy technologies, for Aker ASA, and who will be nominated as Aker Kvaerner ASA chairman. Lieungh, 47, most recently was managing director at Arne Blystad AS. Prior to that, he held several positions at Aker Kvaerner, including executive vice-president of field development. Lieungh is a graduate of the Norwegian University of Science and Technology.

In a related development, Aker Kvaerner ASA will propose to its annual general meeting on April 3 to change its name to Aker Solutions ASA.

Aker Kvaerner ASA is a leading global provider of engineering and construction services, technology products, and integrated solutions serving the oil and gas, refining, chemicals, power generation, and mining and metals industries.

John Wood Group PLC,

Aberdeen, has appointed Jim Renfroe group executive director for its well support division. In addition, he will join the Wood Group board Feb. 25. Previously, Renfroe worked for Halliburton for 30 years, most recently as senior vice-president, strategy. Renfroe also led the production optimization and fluids divisions at Halliburton as well as serving in a number of roles at Otis Engineering.

Renfroe

Wood Group is an international energy services company focused on engineering, production, support, maintenance management, and industrial gas turbine overhaul and repair to the oil and gas and power generation industries worldwide.

EMER International Group Ltd.,

Hong Kong, shareholders approved at an extraordinary general meeting a resolution to change its name to TSC Offshore Group Ltd. The goal is strengthen the company's corporate identity in the onshore and offshore oil and gas drilling sectors in international markets, in particular in North America. The name change is subject to the consent of the Registrar of Companies in the Cayman Islands.

EMER provides onshore and offshore drilling equipment, offshore rig turnkey solutions, and oil field supplies through its subsidiaries in the US and China.

Honeywell International,

Morris Township, NJ, has opened a new project services office in Anchorage for its Honeywell Process Solutions business. The office enables Honeywell to provide automation and control solutions to oil, gas, refining, and other industrial customers in Alaska.

Honeywell Process Solutions, based in Phoenix, is part of the company's Automation & Control Solutions business group, a global leader in providing product and service solutions that improve efficiency and profitability, support regulatory compliance, and maintain safe, comfortable environments in homes, buildings, and industry.

Imports of crude and products

	Districts 1-4 2-1 2008	Districts 1-4 1-25 2008	District 5 2-1 2008	District 5 1-25 2008	Total US 2-1 2008	Total US 1-25 2008	Total US [1]2-2 2007
	1,000 b/d						
Total motor gasoline	1,114	1,119	30	37	1,144	1,156	984
Mo. gas. blending comp.	611	651	30	22	641	673	621
Distillate	371	277	—	—	371	277	339
Residual	245	193	50	13	295	206	349
Jet fuel-kerosine	156	129	53	53	209	182	203
Propane-propylene[2]	261	182	24	39	285	221	209
Other	967	587	304	31	1,271	618	528
Total products	**3,725**	**3,138**	**491**	**195**	**4,216**	**3,333**	**3,233**
Total crude	**9,278**	**8,494**	**1,236**	**1,562**	**10,514**	**10,056**	**9,547**
Total imports	**13,003**	**11,632**	**1,727**	**1,757**	**14,730**	**13,389**	**12,780**

[1]Revised. [2]Data available only for PADDs 1-3.
Source: US Energy Information Administration
Data available in OGJ Online Research Center.

Purvin & Gertz LNG netbacks—Feb. 8, 2008

Receiving terminal	Liquefaction plant: Algeria	Malaysia	Nigeria	Austr. NW Shelf	Qatar	Trinidad
	$/MMbtu					
Barcelona	7.18	5.60	6.90	5.48	6.22	6.82
Everett	7.63	5.38	7.24	5.45	6.00	7.95
Isle of Grain	7.91	5.64	7.26	5.53	6.26	7.25
Lake Charles	5.47	3.42	5.23	3.60	3.91	6.13
Sodegaura	6.37	8.42	6.63	8.43	7.68	5.64
Zeebrugge	7.70	5.46	7.06	5.35	6.08	7.06

Definitions, see OGJ Apr. 9, 2007, p. 57.
Source: Purvin & Gertz Inc.
Data available in OGJ Online Research Center.

Crude and product stocks

District	Crude oil	Motor gasoline: Total	Motor gasoline: Blending comp.[1]	Jet fuel, kerosine	Fuel oils: Distillate	Fuel oils: Residual	Propane-propylene
	1,000 bbl						
PADD 1	14,457	64,096	33,115	9,006	48,475	15,299	4,038
PADD 2	60,883	54,383	18,675	8,095	31,030	1,295	13,476
PADD 3	156,963	67,612	31,536	12,601	29,993	14,003	19,875
PADD 4	13,201	7,112	2,205	569	2,972	447	[1]1,433
PADD 5	54,500	34,284	27,273	10,895	14,729	5,415	—
Feb. 1, 2008	**300,004**	**227,487**	**112,804**	**41,166**	**127,139**	**36,459**	**38,822**
Jan. 25, 2008	**292,952**	**223,899**	**110,662**	**40,609**	**127,004**	**35,531**	**42,374**
Feb. 2, 2007[2]	**324,478**	**227,214**	**102,335**	**40,300**	**136,345**	**42,338**	**45,296**

[1]Includes PADD 5. [2]Revised.
Source: US Energy Information Administration
Data available in OGJ Online Research Center.

Refinery report—Feb. 1, 2008

District	Refinery operations: Gross inputs	Refinery operations: Crude oil inputs	Refinery output: Total motor gasoline	Refinery output: Jet fuel, kerosine	Refinery output: Fuel oils: Distillate	Refinery output: Fuel oils: Residual	Refinery output: Propane-propylene
	1,000 b/d		1,000 b/d				
PADD 1	1,389	1,439	1,670	89	534	136	59
PADD 2	3,186	3,149	2,181	196	962	66	158
PADD 3	6,932	6,794	3,157	712	1,832	317	736
PADD 4	553	548	309	26	158	14	[1]138
PADD 5	2,645	2,562	1,422	472	551	130	—
Feb. 1, 2008	**14,705**	**14,492**	**8,739**	**1,495**	**4,037**	**663**	**1,091**
Jan. 25, 2008	**14,814**	**14,618**	**8,887**	**1,494**	**3,894**	**565**	**1,079**
Feb. 2, 2007[2]	**15,195**	**14,837**	**9,013**	**1,381**	**3,963**	**641**	**1,055**
	17,436 operable capacity		**84.3% utilization rate**				

[1]Includes PADD 5. [2]Revised.
Source: US Energy Information Administration
Data available in OGJ Online Research Center.

Additional analysis of market trends is available through **OGJ Online**, *Oil & Gas Journal's* electronic information source, at http://www.ogjonline.com.

OIL&GAS JOURNAL online research center

OGJ crack spread

	*2-8-08	*2-9-07 $/bbl	Change	Change, %
SPOT PRICES				
Product value	97.52	67.48	30.04	44.5
Brent crude	91.48	57.63	33.85	58.7
Crack spread	6.04	9.85	–3.81	–38.7
FUTURES MARKET PRICES				
One month				
Product value	99.20	68.23	30.97	45.4
Light sweet crude	89.09	58.99	30.10	51.0
Crack spread	10.11	9.24	0.87	9.4
Six month				
Product value	102.19	73.97	28.23	38.2
Light sweet crude	88.60	61.94	26.66	43.0
Crack spread	13.59	12.03	1.56	13.0

*Average for week ending
Source: Oil & Gas Journal.
Data available in OGJ Online Research Center.

Statistics

OGJ GASOLINE PRICES

	Price ex tax 2-6-08	Pump price* 2-6-08	Pump price 2-7-07
	¢/gal		
(Approx. prices for self-service unleaded gasoline)			
Atlanta	268.6	308.3	217.3
Baltimore	253.7	295.6	219.9
Boston	263.0	304.9	219.3
Buffalo	268.0	328.1	240.3
Miami	272.2	322.5	234.7
Newark	258.2	291.1	212.3
New York	244.7	304.8	227.4
Norfolk	251.6	289.2	210.6
Philadelphia	259.1	309.8	242.6
Pittsburgh	255.8	306.5	223.9
Wash., DC	267.9	306.3	228.9
PAD I avg.	260.3	306.1	225.2
Chicago	287.8	338.7	241.9
Cleveland	251.3	297.7	221.9
Des Moines	255.1	295.5	212.3
Detroit	253.7	302.9	219.0
Indianapolis	255.3	300.3	222.7
Kansas City	251.4	287.4	206.9
Louisville	264.9	301.8	223.0
Memphis	248.7	288.5	208.6
Milwaukee	247.2	298.5	227.6
Minn.-St. Paul	254.2	294.6	218.3
Oklahoma City	247.8	283.2	205.6
Omaha	252.2	298.6	219.3
St. Louis	242.6	278.6	212.3
Tulsa	248.8	284.2	205.3
Wichita	238.4	281.8	211.3
PAD II avg.	253.3	295.5	217.1
Albuquerque	154.5	290.9	213.9
Birmingham	256.7	295.4	212.9
Dallas-Fort Worth	249.4	287.8	215.6
Houston	253.9	291.4	209.5
Little Rock	247.9	288.1	213.6
New Orleans	254.5	292.9	213.3
San Antonio	248.8	287.2	206.9
PAD III avg.	252.1	290.5	212.3
Cheyenne	244.5	276.0	204.9
Denver	248.4	288.8	212.2
Salt Lake City	254.4	297.3	215.2
PAD IV avg.	249.1	287.6	210.8
Los Angeles	251.1	309.6	260.5
Phoenix	249.1	286.5	229.2
Portland	256.2	299.5	252.6
San Diego	257.9	316.4	268.9
San Francisco	282.7	341.2	284.1
Seattle	257.6	310.0	260.7
PAD V avg.	259.1	310.5	259.4
Week's avg.	**255.4**	**299.0**	**224.0**
Jan. avg.	**260.9**	**304.5**	**225.3**
Dec. avg.	**257.0**	**300.6**	—
2008 to date	**260.0**	**303.6**	—
2007 to date	**181.5**	**225.1**	—

*Includes state and federal motor fuel taxes and state sales tax. Local governments may impose additional taxes.
Source: Oil & Gas Journal.
Data available in OGJ Online Research Center.

REFINED PRODUCT PRICES

	2-1-08 ¢/gal		2-1-08 ¢/gal
Spot market product prices			
Motor gasoline (Conventional-regular)		Heating oil No. 2	
New York Harbor	222.31	New York Harbor	245.21
Gulf Coast	224.56	Gulf Coast	241.16
Los Angeles	236.65	Gas oil	
Amsterdam-Rotterdam-Antwerp (ARA)	215.57	ARA	253.22
Singapore	238.57	Singapore	248.62
Motor gasoline (Reformulated-regular)		Residual fuel oil	
New York Harbor	220.76	New York Harbor	166.07
Gulf Coast	225.65	Gulf Coast	164.29
Los Angeles	241.65	Los Angeles	175.26
		ARA	177.54
		Singapore	169.33

Source: DOE Weekly Petroleum Status Report.
Data available in OGJ Online Research Center.

BAKER HUGHES RIG COUNT

	2-8-08	2-9-07
Alabama	3	3
Alaska	7	9
Arkansas	41	38
California	33	32
Land	32	29
Offshore	1	3
Colorado	114	93
Florida	0	0
Illinois	0	0
Indiana	1	1
Kansas	10	11
Kentucky	8	9
Louisiana	140	188
N. Land	45	52
S. Inland waters	18	24
S. Land	29	43
Offshore	48	69
Maryland	0	0
Michigan	0	0
Mississippi	11	19
Montana	11	20
Nebraska	0	0
New Mexico	69	85
New York	6	9
North Dakota	53	32
Ohio	11	13
Oklahoma	190	183
Pennsylvania	18	13
South Dakota	1	0
Texas	872	822
Offshore	7	11
Inland waters	4	2
Dist. 1	21	24
Dist. 2	32	31
Dist. 3	68	53
Dist. 4	93	93
Dist. 5	182	153
Dist. 6	124	135
Dist. 7B	33	36
Dist. 7C	45	47
Dist. 8	126	107
Dist. 8A	16	25
Dist. 9	45	40
Dist. 10	76	65
Utah	43	44
West Virginia	28	27
Wyoming	72	71
Others—NV-4; TN-6; VA-3	13	9
Total US	**1,755**	**1,731**
Total Canada	**598**	**641**
Grand total	**2,353**	**2,372**
Oil rigs	324	254
Gas rigs	1,424	1,473
Total offshore	56	83
Total cum. avg. YTD	**1,753**	**1,717**

Rotary rigs from spudding in to total depth.
Definitions, see OGJ Sept. 18, 2006, p. 42.

Source: Baker Hughes Inc.
Data available in OGJ Online Research Center.

SMITH RIG COUNT

Proposed depth, ft	2-8-08 Rig count	2-8-08 Percent footage*	2-9-07 Rig count	2-9-07 Percent footage*
0-2,500	68	5.8	47	—
2,501-5,000	102	50.9	96	55.2
5,001-7,500	223	23.7	219	22.8
7,501-10,000	439	3.8	421	3.5
10,001-12,500	443	3.8	406	2.2
12,501-15,000	299	0.3	272	0.3
15,001-17,500	93	—	123	1.6
17,501-20,000	76	—	77	—
20,001-over	34	—	39	—
Total	**1,777**	**8.1**	**1,700**	**7.6**
INLAND	36		37	
LAND	1,687		1,599	
OFFSHORE	54		64	

*Rigs employed under footage contracts.
Definitions, see OGJ, Sept. 18, 2006, p. 42.

Source: Smith International Inc.
Data available in OGJ Online Research Center.

OGJ PRODUCTION REPORT

	[1]2-8-08 1,000 b/d	[2]2-9-07
(Crude oil and lease condensate)		
Alabama	15	19
Alaska	687	766
California	652	671
Colorado	49	48
Florida	6	6
Illinois	26	24
Kansas	93	95
Louisiana	1,310	1,328
Michigan	15	16
Mississippi	50	52
Montana	91	96
New Mexico	166	162
North Dakota	115	116
Oklahoma	171	172
Texas	1,333	1,328
Utah	45	52
Wyoming	143	146
All others	59	68
Total	**5,026**	**5,165**

[1]OGJ estimate. [2]Revised.

Source: Oil & Gas Journal.
Data available in OGJ Online Research Center.

US CRUDE PRICES

$/bbl*	2-8-08
Alaska-North Slope 27°	80.63
South Louisiana Sweet	94.50
California-Kern River 13°	79.05
Lost Hills 30°	87.10
Wyoming Sweet	83.27
East Texas Sweet	87.75
West Texas Sour 34°	80.75
West Texas Intermediate	88.25
Oklahoma Sweet	88.25
Texas Upper Gulf Coast	84.75
Michigan Sour	81.25
Kansas Common	87.25
North Dakota Sweet	80.00

*Current major refiner's posted prices except North Slope lags 2 months. 40° gravity crude unless differing gravity is shown.

Source: Oil & Gas Journal.
Data available in OGJ Online Research Center.

WORLD CRUDE PRICES

$/bbl[1]	2-1-08
United Kingdom-Brent 38°	93.15
Russia-Urals 32°	89.55
Saudi Light 34°	88.33
Dubai Fateh 32°	86.73
Algeria Saharan 44°	93.10
Nigeria-Bonny Light 37°	94.04
Indonesia-Minas 34°	94.54
Venezuela-Tia Juana Light 31°	86.97
Mexico-Isthmus 33°	86.86
OPEC basket	90.08
Total OPEC[2]	88.64
Total non-OPEC[2]	88.78
Total world[2]	88.71
US imports[3]	85.36

[1]Estimated contract prices. [2]Average price (FOB) weighted by estimated export volume. [3]Average price (FOB) weighted by estimated import volume.

Source: DOE Weekly Petroleum Status Report.
Data available in OGJ Online Research Center.

US NATURAL GAS STORAGE[1]

	2-1-08	1-25-07	2-1-07	Change, %
	bcf			
Producing region	670	720	753	–11.0
Consuming region east	1,138	1,257	1,346	–15.5
Consuming region west	254	285	280	–9.3
Total US	**2,062**	**2,262**	**2,379**	**–13.3**
	Nov. 07	**Nov. 06**	**Change, %**	
Total US[2]	**3,456**	**3,407**	**1.4**	

[1]Working gas. [2]At end of period.
Source: Energy Information Administration.
Data available in OGJ Online Research Center.

INTERNATIONAL RIG COUNT

Region	Jan. 2008 Land	Jan. 2008 Off.	Jan. 2008 Total	Jan. 07 Total
WESTERN HEMISPHERE				
Argentina	82	0	82	85
Bolivia	0	0	0	2
Brazil	20	25	45	36
Canada	492	2	494	568
Chile	1	0	1	1
Colombia	37	0	37	24
Ecuador	7	0	7	12
Mexico	69	28	97	84
Peru	7	1	8	9
Trinidad	1	4	5	7
United States	1,690	60	1,749	1,714
Venezuela	65	16	81	73
Other	2	0	2	2
Subtotal	**2,473**	**136**	**2,608**	**2,617**
ASIA-PACIFIC				
Australia	13	12	25	21
Brunei	2	2	4	4
China-offshore	0	21	21	18
India	55	30	84	86
Indonesia	42	22	64	49
Japan	0	2	2	1
Malaysia	0	12	12	14
Myanmar	7	1	8	11
New Zealand	4	2	6	4
Papua New Guinea	3	0	3	2
Philippines	0	1	1	1
Taiwan	0	0	0	0
Thailand	3	9	12	12
Vietnam	0	6	6	4
Other	1	2	3	4
Subtotal	**130**	**122**	**252**	**231**
AFRICA				
Algeria	27	0	27	24
Angola	1	4	5	5
Congo	2	1	3	3
Gabon	0	1	1	4
Kenya	0	0	0	0
Libya	14	0	14	13
Nigeria	3	8	11	9
South Africa	0	0	0	0
Tunisia	3	1	4	5
Other	2	1	3	6
Subtotal	**52**	**16**	**68**	**69**
MIDDLE EAST				
Abu Dhabi	9	3	12	14
Dubai	1	0	1	1
Egypt	40	12	52	44
Iran	0	0	0	0
Iraq	0	0	0	0
Jordan	0	0	0	1
Kuwait	12	0	12	16
Oman	55	0	55	40
Pakistan	20	0	20	20
Qatar	3	8	11	9
Saudi Arabia	66	11	77	78
Sudan	0	0	0	0
Syria	19	0	19	24
Yemen	15	0	15	15
Other	1	0	1	1
Subtotal	**241**	**34**	**275**	**263**
EUROPE				
Croatia	1	0	1	1
Denmark	0	2	2	5
France	1	0	1	1
Germany	6	1	7	5
Hungary	2	0	2	3
Italy	5	1	6	3
Netherlands	0	2	2	5
Norway	0	17	17	16
Poland	2	0	2	2
Romania	17	3	20	2
Turkey	5	0	5	4
UK	1	19	20	24
Other	8	0	8	3
Subtotal	**48**	**45**	**93**	**74**
Total	**2,944**	**353**	**3,296**	**3,254**

Definitions, see OGJ Sept. 18, 2006, p. 42.
Source: Baker Hughes Inc.
Data available in OGJ Online Research Center.

OIL IMPORT FREIGHT COSTS*

Source	Discharge	Cargo	Cargo size, 1,000 bbl	Freight (Spot rate) worldscale	$/bbl
Caribbean	New York	Dist.	200	202	1.72
Caribbean	Houston	Resid.	380	174	1.65
Caribbean	Houston	Resid.	500	190	1.81
N. Europe	New York	Dist.	200	311	4.25
N. Europe	Houston	Crude	400	204	4.13
W. Africa	Houston	Crude	910	140	3.11
Persian Gulf	Houston	Crude	1,900	91	3.74
W. Africa	N. Europe	Crude	910	155	2.55
Persian Gulf	N. Europe	Crude	1,900	143	4.29
Persian Gulf	Japan	Crude	1,750	133	3.22

*Jan. 2008 average.
Source: Drewry Shipping Consultants Ltd. Data available in OGJ Online Research Center.

WATERBORNE ENERGY INC. US LNG IMPORTS

Country	Jan. 2008	Dec. 2007	Jan. 2007	Change from a year ago, %
	MMcf			
Algeria	0	0	2,520	—
Brunei	0	0	8,790	—
Malaysia	0	0	0	—
Nigeria	0	0	5,310	—
Qatar	0	0	0	—
Trinidad and Tobago	22,500	18,820	36,630	–38.6
Total	**22,500**	**18,820**	**53,250**	**–57.7**

Source: Waterborne Energy Inc.
Data available in OGJ Online Research Center.

PROPANE PRICES

	Dec. 2007	Jan. 2008	Dec. 2006	Jan. 2006
	¢/gal			
Mont Belvieu	152.95	150.58	96.63	89.35
Conway	151.69	146.37	94.42	86.96
Northwest Europe	175.08	171.81	98.81	92.58

Source: EIA Weekly Petroleum Status Report
Data available in OGJ Online Research Center.

MUSE, STANCIL & CO. REFINING MARGINS

	US Gulf Coast	US East Coast	US Mid-west	US West Coast	North-west Europe	South-east Asia
	$/bbl					
Jan. 2008						
Product revenues	103.74	99.69	99.32	102.81	100.34	98.44
Feedstock costs	–93.47	–94.97	–86.55	–86.54	–92.57	92.96
Gross margin	10.27	4.72	12.77	16.27	7.77	5.48
Fixed costs	–2.07	–2.40	–2.23	–2.72	–2.33	–1.82
Variable costs	–2.33	–1.50	–2.05	–3.51	–3.35	–1.02
Cash operating margin	**5.87**	**0.82**	**8.39**	**10.04**	**2.09**	**2.64**
Dec. 2007	6.28	1.46	12.71	15.05	3.66	1.42
YTD avg.	5.87	0.82	8.39	10.04	2.09	2.64
2007 avg.	12.36	6.36	18.60	20.89	5.75	2.26
2006 avg.	12.39	6.13	14.91	23.69	5.88	1.06
2005 avg.	12.53	6.98	12.31	20.55	5.51	1.52

Source: Muse, Stancil & Co. See OGJ, Jan. 15, 2001, p. 46
Data available in OGJ Online Research Center.

MUSE, STANCIL & CO. GASOLINE MARKETING MARGINS

Dec. 2007	Chicago*	Houston	Los Angeles	New York
	¢/gal			
Retail price	307.66	291.75	327.60	320.32
Taxes	57.32	38.40	61.55	52.27
Wholesale price	234.50	233.92	254.49	245.46
Spot price	220.96	222.38	240.47	227.32
Retail margin	15.76	19.43	11.56	22.59
Wholesale margin	13.54	11.54	14.02	18.14
Gross marketing margin	**29.30**	**30.97**	**25.58**	**40.73**
Oct. 2007	21.97	24.54	21.65	28.52
YTD avg.	26.96	23.12	19.05	31.10
2006 avg.	19.74	20.34	18.03	27.90
2005 avg.	19.77	16.26	20.39	27.13
2004 avg.	22.49	17.50	23.61	30.39

*The wholesale price shown for Chicago is the RFG price utilized for the wholesale margin. The Chicago retail margin includes a weighted average of RFG and conventional wholesale purchases.
Source: Muse, Stancil & Co. See OGJ, Oct. 15, 2001, p. 46.
Data available in OGJ Online Research Center.

MUSE, STANCIL & CO. ETHYLENE MARGINS

	Ethane	Propane	Naphtha
	¢/lb ethylene		
Jan. 2008			
Product revenues	70.59	113.10	134.41
Feedstock costs	–45.75	–85.82	–125.41
Gross margin	24.84	27.28	9.07
Fixed costs	–5.38	–6.36	–7.19
Variable costs	–5.14	–6.06	–8.15
Cash operating margin	**14.32**	**14.86**	**–6.27**
Dec. 2007	15.82	12.96	–3.43
YTD avg.	14.32	14.86	–6.27
2007 avg.	14.41	14.14	–7.42
2006 avg.	19.53	22.44	1.34
2005 avg.	14.43	20.68	1.28

Source: Muse, Stancil & Co. See OGJ, Sept. 16, 2002, p. 46.
Data available in OGJ Online Research Center.

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Jan. 2007	Gulf Coast	Mid-continent
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Gross revenue		
Gas	7.56	6.70
Liquids	1.63	4.50
Gas purchase cost	8.42	9.00
Operating costs	0.07	0.15
Cash operating margin	**0.71**	**2.05**
Dec. 2007	0.78	2.36
YTD avg.	0.71	2.05
2006 avg.	0.44	1.48
2005 avg.	0.26	0.97
2004 avg.	–0.06	0.25
Breakeven producer payment, % of liquids	55%	53%

Source: Muse, Stancil & Co. See OGJ, May 21, 2001, p. 54.
Data available in OGJ Online Research Center.

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Energy in need of politically popular change

A political campaign with "change" as a rallying call should be good for energy policy in the US. But don't count on anything.

Because "change" can mean whatever anyone wants it to mean that suggests departure from some perceived norm, it's a marvelously useful political word.

Early in the presidential primary season, incantation of change galvanized the campaign of Sen. Barack Obama (D-Ill.). Now all candidates of both political parties promise to be first-order changers.

So far, particulars don't seem to matter much. Change in general will do for now.

That this is so testifies to widespread American discontent.

Protracted war in Iraq no doubt explains much about the dour US mood. And abysmal approval ratings for not only a wartime president but also congressional leaders from the opposition political party hint at general disdain for Washington, DC.

There can be little doubt, too, that the US is politically polarized. A large part of the population craves change in the liberal direction. Another part clamors for a conservative turn.

Now, after withdrawal of former Massachusetts Gov. Mitt Romney from the Republican race, staunch conservatives will be seeking change from the now-likely nominee, Sen. John McCain of Arizona, whom they see as too liberal.

Or maybe McCain's success means that the Republican Party already has changed and that orthodox conservatives haven't yet gotten the message.

Whatever, McCain, unless something now unseen derails his candidacy, will effuse "change" through November. In this wild political year, he'll have to.

The Arizona senator might strengthen his standing with conservatives by taking change to where the US needs it: an energy policy needing a strong dose of realism.

Chasing impossible dreams like energy independence and a carbon-free energy economy, the US is undermining its prosperity with one costly mistake after another.

Change is surely in order. A candidate willing to resist popular but self-sacrificial energy fantasies, as McCain stood up to the party faithful on key issues in the Senate, would be impressive.

Alas, the senator's voting record indicates that when he trumpets "change," constructive action on energy won't be what he has in mind.

(Online Feb. 8, 2008; author's e-mail: bobt@ogjonline.com)

The Editor's Perspective

by Bob Tippee, Editor

Market Journal

by Sam Fletcher, Senior Writer

Crude market lacks direction

Crude futures prices fluctuated sharply within a $5/bbl range in a directionless market in early February, with traders torn between fears of an economic recession and potential threats to oil supplies.

Energy prices fell heavily Feb. 1, with the front-month crude contract dropping $2.79 to $88.96/bbl on the New York Mercantile Exchange after the US Department of Labor reported nonfarm payrolls fell by 17,000 in January, marking the first monthly decline since August 2003. However, the market was unaffected by an earlier decision that day by ministers of the Organization of Petroleum Exporting Countries to make no production changes. The general assumption that OPEC would take no action had already been priced into the market, analysts said (OGJ Online, Feb. 1, 2008). The front-month crude contract rebounded above $90/bbl Feb. 4 as reports of weekend battles in Nigeria and Iraq reminded traders of the vulnerability of oil supplies from those regions. Analysts also said the market had gone too far with a 3% drop in the contract price Feb. 1, resulting in readjustments (OGJ Online, Feb.4, 2008). Soleil-Back Bay Research analyst Jacques H. Rousseau said US petroleum inventories should be starting a seasonal decline after rising 7% since mid-November. "We upgraded the refining sector due to our view that seasonally rising demand and falling supply should result in a 10% decrease to refined product inventories (gasoline, distillate, and jet fuel) by the end of the first quarter. We believe that falling inventory levels are the key leading indicator for improvements in refining margins and stock prices," he said.

The crude contract dipped below $89/bbl Feb. 5, wiping out the previous day's gains in the New York futures market, when the Institute for Supply Management's nonmanufacturing index fell to a reading of 41.9% for January, down from 54.4% in December and well below the 53% reading that many economists had expected. That was both the largest single-month drop and the second-lowest reading ever in the index's history. It also was the first reading since March 2003 that dipped below 50%, indicating that most services sector firms are contracting.

Inventories increase

Crude prices continued to fall, closing at $87.14/bbl Feb. 6 on NYMEX after the US Energy Information Administration reported the largest 1-week gain in commercial US inventories since March 2004 as refiners slowed operations in the face of weak margins and oil imports climbed. Commercial US crude inventories rose by 7 million bbl to 300 million bbl in the week ended Feb. 1 (OGJ Online, Feb. 6, 2008). Gasoline stocks increased by 3.6 million bbl to 227.5 million bbl—the highest level since February 1999—while distillate fuel inventories gained 100,000 bbl to 127.1 million bbl. "Both heating oil and diesel inventories should be drawing fast at this point, but they have instead risen," said Paul Horsnell at Barclays Capital Inc., London.

Imports of crude into the US increased by 458,000 b/d to 10.5 million b/d in the week ended Feb. 1. However, the input of crude into US refineries declined by 126,000 b/d to 14.5 million b/d with refineries operating at 84.3% of capacity. Gasoline production decreased to 8.7 million b/d as distillate fuel production increased to 4 million b/d. Analysts in the Houston office of Raymond James & Associates Inc. reported, "Refinery utilization continues to decrease and has now reached levels not seen since March of 2006. Rousseau said, "Refined product inventories increased more than expected… due to lower demand and higher imports. However, the average refinery utilization rate continued to fall, suggesting lower production in the coming weeks."

Price rises

On Feb. 7, however, crude futures prices increased modestly $88.11/bbl, ending a sharp 2-day decline on NYMEX. The turnaround came after Royal Dutch Shell PLC curtailed 130,000 b/d of crude exports from Nigeria, pending repair of a pipeline damaged by rebel forces. A day earlier, Total SA was reported to have shut in production of 280,000 boe/d from the North Sea.

Crude traded at $88-91.98/bbl Feb. 8 on NYMEX before settling at $91.77/bbl, the highest closing in more than a week, as Venezuelan President Hugo Chavez threatened to cut off exports to the US over a legal battle with ExxonMobil Corp. Courts in the US and the UK granted ExxonMobil's requests to freeze more than $12 billion in assets of Petroleos de Venezuela SA (PDVSA) to ensure payment for the nationalization of two Venezuelan oil projects in which the US company was involved. ExxonMobil said it also obtained attachment orders against PDVSA assets in the Netherlands and Netherlands Antilles.

(Online Feb. 12, 2008; author's e-mail: samf@ogjonline.com)

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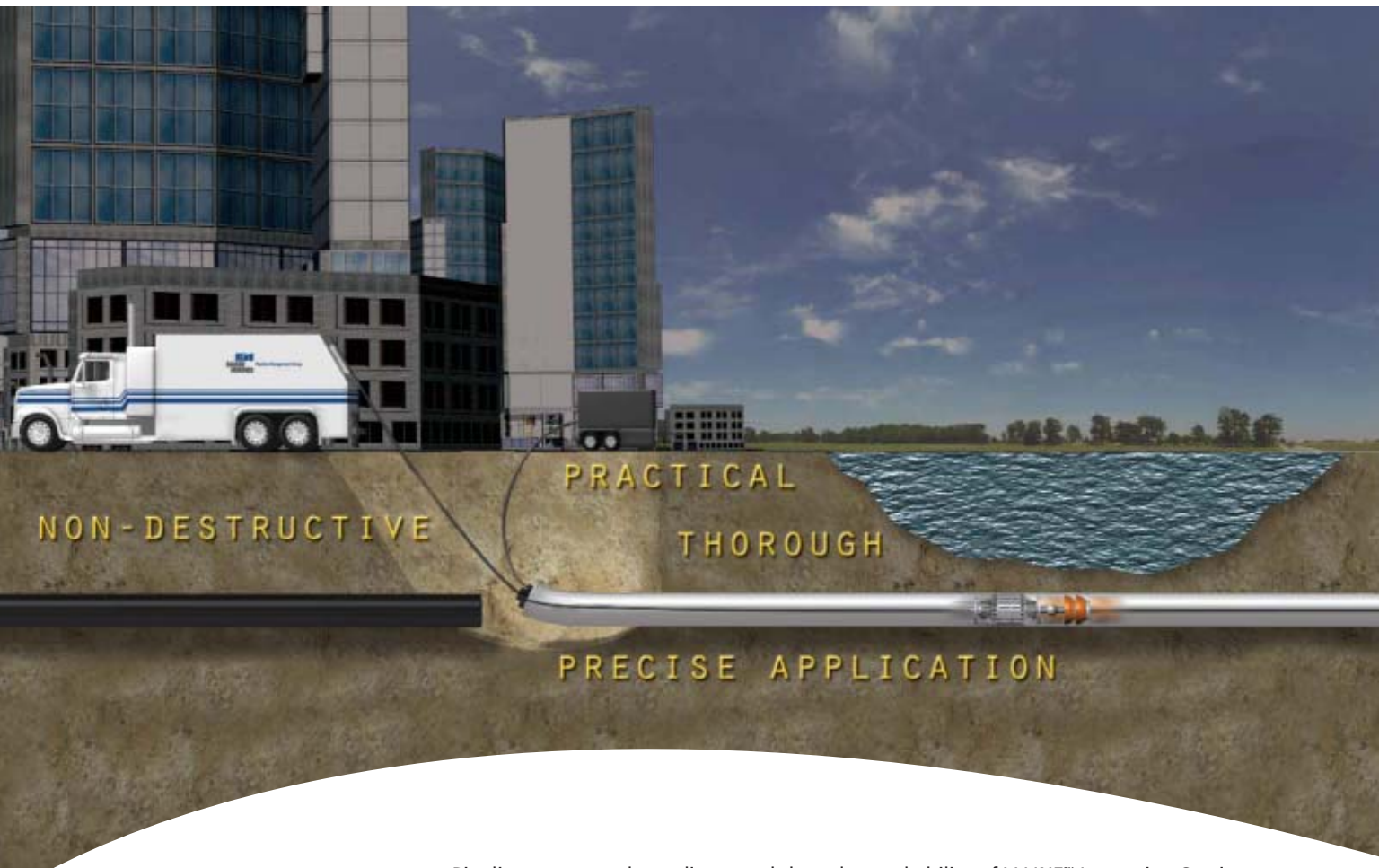

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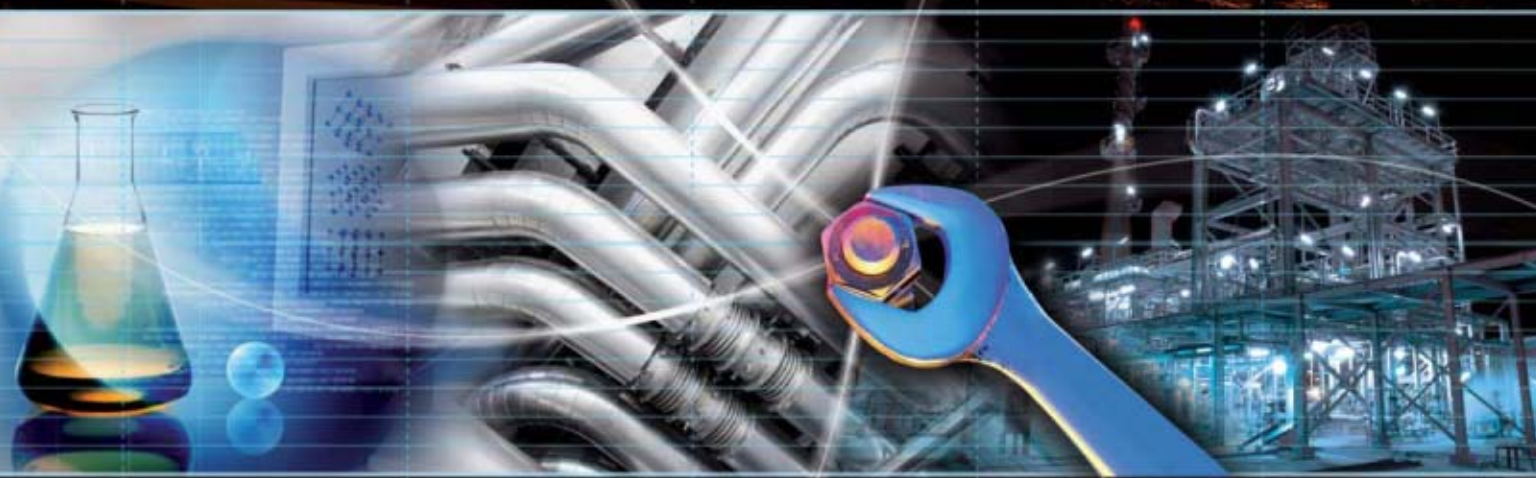

EGYPTIAN ENERGY STRIDES AHEAD

An in-depth overview of Egypt's Petroleum Sector

This special report has been produced by Star Communications for distribution with OIL&GAS JOURNAL

contents

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An Exclusive One-on-one Interview with

H.E. Eng. Sameh Fahmy, Minister of Petroleum

Q: *How has re-structuring of the oil sector streamlined operations and enhanced the industry's future potential?*

A: Restructuring the petroleum sector took place by establishing three new powerful and specialized holding companies to develop and manage the petroleum sector in addition to the Egyptian General Petroleum Corporation (EGPC). These three companies are The Egyptian Natural Gas Holding Company (EGAS), The Egyptian Petrochemicals Holding Company (ECHEM), and Ganoub El Wadi Petroleum Holding Company (GANOPE).

The restructuring has speeded up the decision-making process and enabled focus on both gas and petrochemicals sectors. Furthermore, it will boost the oil and gas activities in Upper Egypt.

The holding companies work under the umbrella of the Ministry of Petroleum in complete coordination. They manage operations including collaboration with foreign oil companies and through their subsidiaries; joint ventures and other companies formed under the Investment Law and public sector companies.

H.E. Minister Sameh Fahmy

Q: Have there been any unforeseen challenges executing the petrochemical's development plan and is the plan on schedule?

A: On the contrary, the Egyptian petrochemical industry has succeeded in keeping pace with the fast and ever changing scenarios within the domestic and international markets. Egypt possesses all the required assets to rank among the most important major global petrochemicals producers, with its availability of gas reserves, political stability, unique geographic location and appropriate fiscal incentives.

We designed The Petrochemical Master Plan consisting of 14 complexes (24 projects, 50 production units). It requires over 10 Billion USD (as of today) to be realized in 20 years. Total production amount up to 15 million tons/year, worth 7 billion USD. It will create over 100 thousand jobs, both directly and indirectly.

In this context, the Ministry of Petroleum established The Egyptian Petrochemicals Holding Company (ECHEM) in 2002 with the main objective to promote and develop the Petrochemical industry in Egypt and assume the responsibility of implementing and continuously updating the Petrochemical Master Plan.

The implementation of the first phase of the project, with a total investment of $6.6 billion is already underway and consists of: linear alkyl benzene, propylene & poly propylene, acrylic fibers (already started in February 2006), styrene & poly-styrene, ammonia, ethylene and poly-ethylene, poly vinyl chloride and methanol. In this context, five new companies have been recently established to produce and market petrochemical products.

We are doing our utmost to attract international investors here to reap the benefits of these exciting projects.

Q: How is the focus of the foreign direct investment changing in the energy sector, for example, is there an increase for downstream vs. upstream or visa versa?

A: We are encouraging investments from all over the world. It is important to emphasize that investment opportunities exist in various sectors throughout the Egyptian economy, with emphasis on export oriented projects among many others.

Egypt's record in attracting Foreign Direct Investment (FDI) has been very positive over the past decades. FDI is the major source of capital flow to developing countries and Egypt is well placed to attract additional foreign investment given the success of its stabilization program and the strength of its economic recovery.

In this regard, we stand on solid ground boosted by the continuous support of the government policy and enhanced by the political and economic stability and credibility enjoyed by our country.

As for the investment and financing strategy, the petroleum sector shifted policies from financing projects to rely more on the local and international private sector, as well as local, Arab and international financing institutes. This policy has proved to be very effective in providing more flexibility and developing more projects.

One successful example is Idku LNG train 1 and 2.

It is the largest project to be financed and implemented in Egypt with a value of 1.95 billion US$ (including the financing arrangements cost and loan interest), $1 billion of which are loans without governmental guarantees. Idku LNG first train was awarded the "2003 Gas Deal of the Year" by Project Finance Magazine EUROMONEY. This reflects the confidence that international finance institutions have in Egypt showing it to be a credible country for direct foreign investments. This also paves the way for a successful future

cooperation in the oil and gas industry as a whole.

There are presently more than 50 international companies working in the field of exploration for oil and gas in Egypt, with investments estimated at about $2 billion annually. While Egypt for its part, has committed about $3 billion of its own money to upgrade infrastructure within the sector.

Q: Are any significant changes anticipated in the short-term in concession agreements, or in Egypt's legal and tax framework as it affects the petroleum sector?

A: To answer this question it should be noticed that most of the existing production sharing agreement models were implemented in the 60's and 70's, and although there were no serious problems experienced in applying these agreements, there has been a major evolution in oil and gas technology and consequent industry advancements, along with higher exploration and development costs, especially in deep waters and frontier areas, and with the recent changes in world market prices. We found that it is time to find areas for improvement that could lead to a better utilization of the assets and economical environment that would encourage more investments and lead to further discoveries and increased production.

Development of the concession agreements is always required to cope with changes and challenges facing the exploration for the oil and gas business. We are keen to introduce the necessary changes in the model and the whole process to reduce the cycle time and to achieve a balance in benefit for the contractors and on the national side.

Expert committees with highly qualified staff from different disciplines have been formed in order to accomplish these tasks and several models and scenarios are being evaluated currently to modify and recommend the best models and processes to attract more FDI and to extend the exploration activities in new frontier areas.

Q: How do you see energy consumption patterns changing in Egypt over the longer term?

A: I believe that for the foreseeable future, oil and natural gas will continue to play their vital role as main sources of energy in Egypt. Today the petroleum energy represents 96% of the country's primary energy supply. The total petroleum products and natural gas consumption increased from 27 million tones in 1990/1991 to 54.7 million tones in 2006/2007. The electricity sector had the largest rate of natural gas consumption and its share represented 58%, followed by industrial sector with share of about 26%.

Q: With the increasing concern about CO2 emissions, is the Ministry considering measures to address this issue?

A: Of course, we are concerned with the global warming phenomenon, we are part of that world and we are doing our best in cooperation with other countries to reduce the effect of green house gases (GHG). Two of our technical staff at the ministry participated in the former UN climate change conference held in Nairobi in November 2006.

The Egyptian ministry of petroleum has exerted several efforts in order to reduce the CO2 emissions such as:

- Continuing the expansion and use of natural gas in the commercial and residential sector, for example, during the period 1981/1982 – 2006/2007 we supplied natural gas connections to about 2.553 million residential consumers, and our plan is to extend natural gas to another 6 million residential consumers during the next five years.
- Encouraging the use of natural gas instead of liquid fuels in the transportation sector, currently 81 thousand cars have been converted to work with natural gas; also 114 natural gas supply stations have been established.
- Utilizing natural gas in new applications, such as using it in air conditioning equipment, and so we have established a specialized company in that field.
- Applying energy conservation programs in our refineries.

Q: In view of the capital requirements for deepwater development and downstream expansion, what special financial challenges do these plans pose?

A: As you know deep water development requires a large amount of capital as the initial investment, and that this is directly related to the over all economic value of the discovered reserves. We always cooperate with the contractors and investors to reach "a win-win" agreement especially with gas pricing and open areas for export.

Our plan is to continue attracting international companies to explore for oil and gas to maximize reserves and production. Special attention will be given to exploring resources in deeper horizons and new areas such as Upper Egypt, the Red Sea, and the western part of the Mediterranean.

Q: Does the Ministry contemplate new indicatives in training and safety, or to increase the Egyptian content in the sector's work force?

A: Recognizing the importance of human resources, the Ministry of Petroleum has already begun a remarkable initiative by establishing a new specialized company "Oil & Gas Skills", to deliver and organize the training and HR development according to the international industry standard for the petroleum sector in Egypt.

Another effort being exerted by the Ministry of Petroleum is to establish a mining college with the cooperation of a number of internationally recognized universities, to upgrade the capabilities of fresh graduates and new generations of the oil industry.

As for the health and safety domain, we strictly monitor the adoption of new codes and ensure the compliance of our operations to international standards. The procedures for industrial safety are applied in all oil, gas, petrochemical and transport of oil goods. This is due to the involvement of international partners and companies working in Egypt through updating safety procedures, training courses and strict implementations of safety regulations in different work locations.

Q: What is the most daunting single challenge facing Egypt's oil sector – technical, financial, social – in the next decade and what will the Ministry's role be in meeting that challenge?

A: The major challenges facing the Egyptian petroleum sectors are:

- The huge and continuous increase in the local consumption of petroleum products and natural gas.
- Most current petroleum agreements are approaching their end.
- Emergence of new regions for foreign investments such as Libya, Iraq, Sudan and Western Africa.
- The lack of oil rigs on the world level.
- The fast development of the specifications of fuel petroleum products.
- The rapid increase of prices for raw materials and equipment worldwide, which cause the increase in the investment and operating costs leading to an increase in the final products prices.
- Scarcity of qualified contractors for oil and gas projects.

To confront these challenges, the Ministry of Petroleum is applying a flexible strategy to assure the rational use of our petroleum wealth and to guarantee the continuation of assuring its role to achieve the goals of the Egyptian economic development plans.

This strategy includes the following:

- Increasing and developing the crude oil and natural gas reserves;
- Satisfying the local demand for the petroleum products, natural gas and petrochemicals;
- Increasing the petroleum exports, and consequently increasing Egypt's revenues from foreign currency;
- Attraction from FDI to the petroleum sector projects;
- Environment preservation;
- Increasing job opportunities, and improving the performance of the petroleum employees;
- International cooperation with different technological institutes and adopting the most up to date international technology.

Egypt's Petroleum Future:

Adding value to natural gas, developing deepwater prospects are key goals

Egypt began the ascent to its position as a leading global energy player by leveraging its strategic location. Building the Suez Mediterranean (Sumed) pipeline to augment the Suez Canal, the country put together a critical transportation infrastructure that linked large oil reserves to world markets.

It was an auspicious beginning. But it was only the first step towards optimizing the value of Egypt's own petroleum resources. Next, a long-term strategy was developed to accelerate reserves and production growth, and to expand the capabilities of Egyptian companies to drive that growth well into the future.

An important goal of that strategy is to realize the full potential of Egypt's natural gas resource, much of which lies in the deep water of the Mediterranean. In addition, a master plan will help wring the most value from that resource by expanding petrochemical, liquefied petroleum gas (LPG) and liquefied natural gas (LNG) capacity to serve domestic demand and capitalize on export markets.

Together, its history and its energy strategy promise a bright future for Egypt's petroleum industry. To help reach that future, the country offers:

- Tempting oil and gas prospects;
- Political, financial and legal stability;
- Established international relationships;
- A skilled, educated, enthusiastic workforce;
- Keen environmental responsibility.

Deep water and gas

Along with its other natural and human resources and its physical assets, natural gas—especially that which lies in deep water—is critical to Egypt's energy future.

As of June 30, 2007, Egyptian Natural Gas Holding Co. (EGAS) estimated Egypt's gas reserves at 72.3 trillion cubic feet (tcf). An estimated 78% of this resource is in the Mediterranean, 4% in the Nile Delta onshore, 10% in the Western Desert area and 8% in the Gulf of Suez.

Labouring in the oil and gas sector.

Rashpetco's P1 unmanned platform, Rosetta.

Yet-to-find reserves may total as much as 120 tcf, according to EGAS.

Other reports are even more optimistic. One estimate puts ultimate reserves in the ultra-deep water alone at 70 tcf. Another report puts total reserves at 128 tcf, including 80 tcf in the Mediterranean deep water and 28 tcf in shallow water; 9 tcf in the Nile Delta onshore; and 11 tcf in the Western Desert.

Badr El-Din

Formed to develop and explore for oil and associated gas in Egypt's Western Desert, Badr El-Din Petroleum Co. (Bapetco)—a 50-50 joint venture between Shell Egypt N.V. and Egyptian General Petroleum Corp. (EGPC)—has played a significant role in the launch of Egypt's growing gas industry. Currently one of the country's largest gas producers, Bapetco was established in 1983 after the Badr El-Din (BED) field in the Western Desert about 130 km (81 miles) southwest of Alexandria was declared commercial. Now the company operates in other areas of the Western Desert on behalf of EGPC and Shell Egypt.

Bapetco's in-place gas reserves were 2,935 billion cu ft (bcf) at the beginning of fiscal 2007; ultimate recoverable reserves were estimated at 1,882 bcf. Bulk of the company's 220 bcf of remaining reserve is in three fields in the Badr El-Din concession—BED-2 (88 bcf), BED-3 (72 bcf) and BED-15 (43 bcf).

Its first gas sales, from the BED-3 field, were in 1990; in 1999, it delivered first gas from the Obaiyed field to the Obaiyed gas plant. Bapetco gas production during fiscal 2005-2006 averaged 223 MMcfd.

Bapetco also held about 121 million bbl of recoverable oil reserves and 40 million bbl of recoverable condensate at the end of last fiscal year.

With a focus on exploration, spending during 2005/2006 fiscal year was US$171 million, including exploration cost of about US$28 million and development expense of US$89 million. Operating cost was US$25 million.

HSE performance

The record tells the story of Bapetco's intense, continuous focus on improving health, safety, and environmental (HSE) performance. After its formation in 1983, the company achieved 3 million man hours without a lost time incident (LTI) in 1993; 5 million man hours without LTI for staff and contractors in 1998; and 12 million LTI-free man hours for Bapetco and contractors in 2000.

There were no fatalities during last fiscal year, and staff achieved 2.6 million hours free of a lost time incident on 31st of January 2006.

View of Geisum offshore platform, Gulf of Suez. Most of Egypt's natural gas reserves lie in the deep and ultra-deep water.

Other metrics also highlight Bapetco's HSE performance:

- The BED area project team reached six years without an LTI in August 2005;
- In April 2006, Al Hamra area completed 19 years free of LTIs, and;
- In December 2005, Al Amereya achieved 15 LTI-free years.

The corporate HSE plan issued in February 2006 achieved more than 40% of its objectives by June, meeting its target.

Bapetco's HSE policy includes a biodiversity standard and road transport safety guidelines; it also covers issues of smoking and alcohol/drug abuse. Training sessions are continuous, evacuation drills are conducted, health and medical audits are performed and radiation surveys are conducted.

In 2006 the company passed the inspection for IS014001 for the eighth year in a row, and OHSAS 18001 was renewed for the second time.

WDDM development

Burullus Gas Co., responsible for developing the West Delta Deep Marine (WDDM) concession, has completed Phase I of the development, the Scarab/Saffron project.

And Rashid Petroleum Co., formed following the signature of the gas sales agreement and sanction of the Rosetta Phase I project to develop the concession, is in the process of implementing the next phases of the field's development. Partners in Rashpetco are EGPC, BG Egypt S.A., Shell Egypt and Edison Gas International.

The Scarab/Saffron concession, about 90 km (56 miles) from the Nile Delta shoreline in the Eastern Mediterranean is in water depths ranging from 250 m to 850 m (about 800-2,800 ft). The Scarab/Saffron development area is located in the Western half of the concession about 100 km (62 miles) offshore Idku, near Alexandria.

The two main structures in the Phase I area—Scarab and Saffron—hold natural gas that contains a very small amount of condensate, no hydrogen sulfide (H2S) and little carbon dioxide (CO2). The Simian, Sienna and Sapphire fields, in water depths of 900-1,100 m (about 2,950-3,610 ft), comprise Phases II and III of the concession development. Simian/Sienna and Sapphire were commissioned in 2005.

The next development phase will involve a new field, Sequoia, scheduled to be on stream by 2009. It will produce dry gas through subsea completions. Since it extends into both the WDDM and Rosetta concessions, North Sequoia will be tied to WDDM facilities and south Sequoia to the Rosetta facilities.

Commercial oil in the south

Established in 2003, Ganoub El Wadi Petroleum Holding Co. (Ganope) made its first oil discovery in the southern part of Egypt. Proving the presence of oil source rocks system in the Upper Egypt, the discovery will play a major role in changing the geological theories applied to the southern part of the country, according to Ganope.

The Al-Baraka-1 well was drilled by Dana Petroleum (E&P) Ltd. to a total depth of 2,655 m (8,712 ft), penetrating several oil bearing zones. Testing of the early Cretaceous Abu Ballas sandstone indicated proven reserves of about 8 million bbl of oil and produced approximately 150 b/d of oil from a 12-m (39-ft) perforated interval. The oil has a specific gravity of 37.3° API and wax content similar to the oil being produced in Sudan.

Oil shows while drilling also came from three additional zones in the upper and lower Cretaceous and Jurassic formations.

The development plan called for putting Al-Baraka discovery in production by the end of 2007, making it the first commercial oil well in southern Egypt.

The Komombo concession, 700 km (435 miles) from Cairo and 320 km (199 miles) from the nearest refinery at Assiut, is one of ten concession areas Ganope has been awarded in Upper Egypt, the western desert and the Red Sea. Agreements for seven are signed; three are pending.

Total area of the ten concessions is 219,000 sq km (84,556 sq miles). The agreements call for the company to spend a total of US$282 million and drill 46 exploratory wells.

Egypt's Deepwater Oil and Gas Development:

Technology will aid recovery from complex structures, find new fields

At its most fundamental, deepwater exploration and development is about cost and risk. In the past two decades, advancing technology has made it possible to dramatically reduce both. The result is increased exploration success and a lower commercial threshold that makes more discoveries—in ever deeper water—commercially viable.

Petroleum demand will continue to grow and deep water fields will be increasingly important in meeting that demand.

In late 2007, Douglas-Westwood updated its World Deepwater Market Report to cover 2008-2012. The report, for water depths of 500 m (1,640 ft) and more, forecasts annual worldwide capital spending will reach nearly $25 billion over the period. "The deepwater oil and gas industry is set for continued growth through to 2012, with over 30% growth forecast for 2008-2012, compared with the previous five years," said John Westwood, Managing Director, at PennWell's Deep Offshore Technology International Conference and Exhibition in Stavanger.

Deepwater oil production currently accounts for almost 15% of total offshore production, but deep water will represent about 20% of offshore production by 2011, he said. Together, Africa, the Gulf of Mexico and Brazil will account for 84% of global deepwater spending over the period, said Westwood.

Advancing technology continues to bring new discoveries in Egypt's existing concessions. And it enhances interest in prospects in even deeper water, as evidenced by the results of a recent bidding round.

But executing Egypt's deepwater projects pose a wide variety of technical challenges, including a difficult geo-technical environment, a variety of reservoir pressures and fluid compositions, and high temperature/high pressure conditions. Besides meeting these immediate challenges in each development project, the high cost of deepwater operations makes it important to provide for future growth and expansion.

Geologic setting

In Egypt's prospective deepwater areas, the spectrum of technology available today to understand and optimize the life cycle value of a discovery is especially important because of the complexity of many of the productive zones.

The main producing reservoirs in the western part of the Nile Delta deep water are mostly submarine channel features, with extended submarine fans farther north. Sealing rocks are provided by the intra-formational Pliocene-Pleistocene mud stone.

Gas comes from both thermogenic and biogenic sources and includes some condensate. Only shallow reservoirs in one or two fields contain gas entirely from a biogenic origin; the majority of discoveries suggests a predominantly thermogenic origin.

Migration of hydrocarbons from Oligocene-Miocene source rocks probably occurred along the active faults. Currently, evidence of the pre-Tertiary sources is proven by carbon isotopes.

The major structural elements are the southwest/northeast trending Rosetta fault and the east-northeast/west-southwest trending Nile Delta offshore anticline (NDOA) high. Both of these were active at various periods during the Pliocene-Pleistocene periods. But they have not had a major impact on the depositional geometries of the Upper Pliocene channels, which when traced in map and seismic sections, show no significant thickening or change in style across the features.

The crestal part of the east-northeast trending NDOA is collapsed by a tectonic listric fan developed in response to a cycle of negative tectonic inversion where the extensional regime dominated in the Upper Early Pliocene. This indicates that the time of the tectonic inversion along the east-northeast trend is younger than that on the northeast-trending Rosetta belt.

Applying technology

Using up-to-date techniques enhances reservoir understanding, leading to a more accurate

Gupco offshore platform, Al Morgan Field, Gulf of Suez.

estimate of reserves, and better well and reservoir optimization. Rashpetco uses the latest technology to maximize hydrocarbon productivity and reduce development risk in the offshore deltaic area.

Seismic inversion is used to calculate the relative and absolute acoustic impedance to discriminate between the hydrocarbon bearing sands and non-reservoir zones. However, this technology may fail to discriminate between shale and water-bearing sand, according to the company, and pre-stack amplitude variation with offset (AVO) inversion was used successfully as a lithology and fluid indicator.

The technique reduces drilling risk and improves static and dynamic reservoir models. The rock physics model is also essential in offshore deltaic sequences, according to Rashpetco.

In addition to defining lithology and fluid content, parallel multiple 3D seismic attributes are used to define the stratigraphic and structural setting of the area. Long offset seismic re-processing trials reduce risk by enhancing the horizontal and vertical resolutions of reservoir sequences.

Thin bedded intervals containing significant amounts of net pay identified in the Mediterranean are considered by Rashpetco as potential development targets. These thin bed successions are often less than 10 cm thick, sandstone and siltstone sheets deposited from sediment gravity flows and inter-bedded with shale.

Lateral continuity, connectivity and bed lengths are important influences on reservoir performance and recovery that cannot be deduced from seismic and conventional well log data. Rashpetco used combinations of tools in different fields to image these unconventional pays and quantify hydrocarbon pore volume.

Reservoir modeling was used to test the impact of these unconventional pays on gas-in-place calculations.

Hardware upgrades are also necessary to be able to use the latest modeling and analysis software. Rashpetco's 54 new Linux workstations are allocated for exploration staff. Soon, the four terabyte storage will be upgraded to six terabytes.

Still deeper water

Late last year, Statoil ASA was awarded two deepwater blocks in Egypt's most recent bidding round in water depths between 1,000 and 3,000 m (3,280-9,840 ft).

Statoil is operator and an 80% working interest owner in Block 10, the second award of exploration acreage secured by the group late last year. Sonatrach International Petroleum Exploration & Production (Sipex), a wholly-owned subsidiary of Algerian state oil and gas company Sonatrach, owns a 20% working interest. The block will be operated under a production sharing agreement.

Earlier, Statoil was awarded an 80% working interest in block 9 in the area and will be the operator of the block. Blocks 9 and 10 are west of the Nile Delta, and cover areas of 8,368 sq km (3,231 sq miles) and 9,802 sq km (3,785 sq miles) respectively.

Shell Egypt, too, has a long history of investment in oil and gas exploration in Egypt. In recent years, the company has increasingly targeted gas exploration, in line with Egypt's drive to develop its gas resources. Shell Egypt won the Northeast Mediterranean Deepwater Concession in 1998, a large concession north of the Nile Delta in water depths between 800 and 2,800 m (2,625-9,185 ft). The company committed $150 million to a preliminary five-year exploration period, and two of these exploration wells were completed in 2000/2001.

Shell Egypt's reservoir modeling expertise has been useful in the complex geology of the Western Desert, as well as in the North East Mediterranean deepwater concession.

Shell Egypt is a 40% equity owner in the Rosetta field, which came on stream in January 2001.

Operated by Rashpetco, Phases I and II of the concession development is complete. Rosetta Phase II includes four development wells on an unmanned offshore platform producing about 230 MMcfd for the domestic market. Rosetta Phase III was under way at mid 2007.

Labouring on an offshore platform.

Egypt's Deepwater Oil and Gas Development:

Work continues in existing fields, new discoveries await plans

With the bulk of its natural gas resource in the Mediterranean—some studies estimate ultimate recovery from deepwater gas reserves at up to 70 tcf—and a strategic focus on optimizing the value of its natural gas supply, meeting deepwater challenges will be vital to Egypt's energy future.

As development continues in the West Delta Deep Marine and Rosetta concessions, new deepwater discoveries also continue to be made. Recent discoveries in the Rosetta concession area, for example, include Mina, Silva, Saurus and Sienna. Development plans for those fields are in progress.

The Mina-1 well indicated a reservoir pressure of about 6,100 psia and a reservoir temperature of 201 °F (94 °C). Silva reservoir pressure is about 4,900 psia and temperature is 162 °F (72 °C). And the Sienna UP-2 well measured reservoir pressure of more than 3,300 psia and a temperature of 129 °F (53 °C).

Scarab/Saffron details

Burullus Gas Co., responsible for developing the West Delta Deep Marine concession, has completed the Scarab/Saffron project, Phase I in the development of the area.

In water depths ranging from 250 m to 850 m (820-2789 ft), the two main structures in the area—Scarab and Saffron—hold natural gas that contains a very small volume of condensate, and a negligible amount of carbon dioxide (CO_2). Reservoir pressure in the zones is about 3,500 psia and reservoir temperature is about 150 °F (66 °C).

In mid 2003, eight wells were capable of producing up to 150 MMcfd of dry gas from the project for Egypt's domestic market. Those eight subsea wells in the initial development are tied back to two manifolds. The manifolds are connected to shore via two export pipelines that terminate at new onshore facilities adjacent to the Rosetta onshore processing plant in Idku, east of Alexandria.

The export pipelines were initially sized as 20 in. and 22 in., but were subsequently increased to 24 in. and 36 in. to accommodate additional wells.

Wells are controlled from shore using a multiplexed electro-hydraulic control system and umbilical control lines. A 4-in. pipeline from shore to the field delivers monoethylene glycol (MEG) for hydrate inhibition and remediation in the wells and flow lines.

The onshore processing plant was designed for a maximum capacity of up to 600 MMcfd of gas and 3,000 b/d of condensate. But since startup in early 2003, debottlenecking has boosted deliverability to 800 MMcfd.

Export pipeline, Train 2, Idku.

The plant separates the well stream into gas, condensate and water. Following treatment, the gas is exported via a new pipeline and metered at the tie-in to the Egyptian National Transmission System. Condensate is stabilized and stored on site prior to export through the existing Rosetta condensate pipeline to the Wepco Gas Treatment and LPG facilities at Abu Qir, east of Alexandria.

Produced water is cleaned to recover the MEG for re-use and to extract a salt sludge prior to discharge to the sea. The salt sludge is disposed in a landfill.

Phases II and III

Simian, Sienna and Sapphire fields, in water depths of 900-1,100 m (2,953-3,609 ft), comprise Phases II and III of the WDDM concession development. Simian/Sienna and Sapphire were commissioned in 2005.

The three fields are produced via a subsea tie-back to the existing Scarab/Saffron export pipeline. Offshore elements of the project included the design, installation and commissioning of flow lines, manifolds, pipelines, subsea distribution assembly, umbilicals, a control system and the control platform.

Also during the expansion, the existing Scarab/Saffron terminal was expanded to provide a separate gas feed to the liquefaction plant at Damietta. Modifications included a new slug catcher, high pressure separation, condensate treatment, vent lines, and the pipeline to the LNG plant's Train 2.

In Sapphire, a field in 400-550 m (1,312-1,804 ft) of water, eight new development wells will be drilled and completed using multi-zone smart completion technology. The producing zone, the pre-Pliocene Kafer El-Sheikh, consists of five stacked reservoirs of very loose sand with a shale cap rock.

Reservoir pressure is about 4,500 psia and reservoir temperature is 180 °F (82 °C). In mid 2007, eight wells were producing up to 120 MMcfd/well of wet gas containing about 25 bbl of condensate/MMcf.

Two exploration/appraisal wells in both Simian and Sienna were re-entered and

Workers on a platform in the Red Sea

completed, and two new development wells drilled and completed in Simian. Reservoir pressure in the two fields is about 3,600 psia and reservoir temperature is 130 °F (54 °C). The producing formation is the Pliocene El-Westani, a channel sand with some inter-bedded shale and a shale cap rock.

Several advanced technologies and design innovations played a key role in completing the Simian wells, including:

- Wells are completed with an open-hole gravel pack to maximize production, although there is very active shale between the reservoir sands;
- A smart completion technology with down-hole control valves makes it possible to produce the five stacked reservoir sands through the same well bore without the zones interfering with each other;
- All the wells are completed with 7-in. tubing and permanent down-hole gauges to monitor reservoir pressure, temperature and flow rate;
- The wells are designed to avoid the high cost of subsea intervention;
- A regeneration unit saves the high cost of replacing the MEG and is more environmentally friendly.

A small Burullus project management team executed the work in cooperation with other Rashpetco departments. Major contracts included a tendered lump sum deepwater Engineering Procurement Installation and Commissioning (EPIC) contract for the total offshore facilities, and a negotiated lump sum Engineering Procurement and Construction (EPC) contract for the onshore terminal expansion. A lump sum EPC contract was also negotiated for the condensate export pipeline.

WDDM Phase IV

The West Delta Deep Marine Phase IV comprises eight additional wells in the existing Scarab/Saffron and Simian developments. Five of these wells are in the Scarab/Saffron area, two wells develop the Serpent field and one well develops the Sinbad field. The Scarab/Saffron and Serpent wells tie into the Scarab/Saffron manifolds and the Sinbad well ties into the southern Simian manifold.

This phase is essentially an infill of the existing Scarab/Saffron and Simian deepwater gas and condensate subsea production complex. Existing offshore pipelines move the product from the subsea system to the onshore gas plant at Idku.

Burullus is responsible for all drilling operations, the completion of the offshore wells and the management of the drilling contracts. A key to achieving the fast-track development schedule is to order long-delivery-time items such as subsea trees, connectors and control systems well in advance.

Key drivers for implementing WDDM Phase IV include:

- Meet the aggressive first gas date requirements;
- Fulfill the safety and environmental objectives;
- Provide infill gas capacity to enhance security of supply for the Idku hub;
- Optimize economics, in particular by incorporating the experience of Scarab/Saffron and the Simian/Sienna and Sapphire developments;
- Leverage opportunities for synergy between Phase IV and the Scarab/Saffron development and the Simian/Sienna and Sapphire development, optimizing the overall controls configuration.

Rosetta details

In Rashpetco's Rosetta concession, the Phase I area is located about 65 km (40 miles) from the Nile Delta shoreline in the Eastern Mediterranean. One main structure contains relatively dry gas with a very small amount of condensate, no hydrogen sulfide, and little carbon dioxide. The reservoir pressure is about 2,000 psia and reservoir temperature is about 150 °F (66 °C). The initial phase includes six producing wells drilled and completed from an unmanned platform.

Rosetta Phase II includes four development wells on another small unmanned offshore platform producing about 230 MMcfd for the domestic market. The wells were completed with a 7-in. tubing string using "smart well" completion technology.

Rosetta Phase III consists of five development wells and all the wells in this phase will be subsea completions tied to the existing Rosetta facilities. Three will be completed using a jack up drilling rig; the other two wells are in significantly deeper water and will be completed using a semisubmersible rig.

The tanker "Queen Zenobia" carried the first export shipment of propane to Europe.

Egypt's Natural Gas Operations and Plans:

New discoveries, more liquids recovery both serve natural gas strategy

The world's energy future—at least a big part of it—belongs to natural gas. Globally, the resource is very large, and countries and consumers increasingly choose clean burning natural gas when possible.

Egypt is fortunate to have two key benefits as this future unfolds: A significant gas resource and a well-defined strategy to optimize the value of that resource, both at home and via exports. That strategy includes finding and producing more, and processing to recover liquids with high value as fuel and petrochemical feedstock.

Successes achieved by the Egyptian Natural Gas Holding Company (EGAS) in recent years attest to the wisdom of an expansion strategy for natural gas adopted by the Ministry of Petroleum, said Minister of Petroleum Eng. Sameh Fahmy recently.

During the General Assembly meeting of EGAS in September, the Minister called the expansion of the natural gas sector a corner stone in Egypt's energy strategy.

Total natural gas reserve by end of fiscal year 2006-2007 stood at 72.3 tcf. And new finds continue to add to that reserve. For example, in mid 2007, Dana Gas (PSJC) announced a new gas and condensate discovery in its Dabayaa-1 exploration well in the West Manzala exploration concession. The well penetrated a gas-bearing interval in the Lower Abu Madi sandstone where an extensive drill stem test produced at a rate of 16.5 MMcfd and 330 b/d of condensate through a 32/64-in. choke.

Centurion Petroleum Corp., the upstream division of Dana Gas, drilled the well to a total depth of 3,001 m (9,846 ft) and encountered a hydrocarbon-bearing interval that extends over a 10 sq km (3.9 sq mile) area, according to the company.

"We are very excited about this gas discovery which confirms our high expectations for the hydrocarbon potential of the Abu Madi Formation in our concession," said Mr. Rashid Saif Al-Jarwan, General Manager of Dana Gas.

Focus on processing

A variety of companies explore for and develop Egypt's natural gas reserves, and Egyptian Natural Gas Co. (Gasco) is responsible for gathering, processing and transporting natural gas and gas products to a wide range of consumers.

Gasco received natural gas from production companies during 2005 totaling 38.1 billion cu m (bcm) of gas, distributed 31.6 bcm for local consumption, and exported 6.5 bcm.

UGDC gas storage tanks.

UGDC plant, Port Said.

Gas treatment station at Rashid Area.

New natural gas discoveries have been made in the Western Desert area. And demand for propane and ethane/propane mix to supply feedstock for expansions and future projects in the ethylene and polyethylene industry is expected to grow rapidly. With the prospect of both new supply and increased demand for high-value natural gas products, Gasco began in 2006 to implement a project to maximize production of ethane/propane mix in the Western Desert Gas Complex and the Amereya LPG recovery plant.

Mechanical works are expected to be complete by late 2008, with commissioning and start up scheduled for February 2009. Estimated total cost of the project is about US$218 million.

UGDC: A world class plant

Established in October 2001, United Gas Derivatives Co. (UGDC) is a response to the increasing international demand for natural gas. It is a result of the policy and economic model implemented by the Ministry of Petroleum for attracting foreign investments to increase production and exports. The program also will return foreign currency, helping to fund projects without burdening Egypt's economy.

UGDC receives the gas produced from North Port Said, Temsah and Ras El-Bar concessions through the gas treatment plants of El-Gamil and Ha'py, and produces propane, LPG and condensate.

Company owners are Gasco, BP Global Investments Ltd. (BP) and ENI International B.V. (ENI), each with a one-third share.

"The relationship between the shareholders is very healthy," said Ibrahim Ahmed, UGDC Chairman and Managing Director. "All are working towards the success of the company as most of the gas fed to the plants comes from the shareholders' concessions."

The goal is to meet the needs of these multinationals investors while still achieving UGDC's corporate objectives.

A big part of world's energy future belongs to natural gas. View of LNG plant in Mubarak Complex for Natural Gas and Petrochemicals, Damietta .

"I do not see a conflict of interest between the multinational investors and our own corporate objectives," said Mr. Ahmed. "The company works on behalf of all the shareholders to maximize revenue through safe and reliable operations."

And safety is top priority. Since its inception in 2005, the company as accumulated 2.5 million man hours without accidents while handling about 1.1 bcfd of natural gas. "This is a world class NGL plant," said Mr. Ahmed.

To achieve such a safety record requires keeping track of all activities, major and minor, said Mr. Ahmed, with well established and monitored procedures. For example, a tracking system monitors every car 24 hour/day to ensure compliance with speed limits.

Within the plant, there are different levels of approval both for cold and hot work. Every procedure is closely scrutinized and monitored by staff from the foremen to the plant manager.

Exports important

One of UGDC's objectives is to produce propane for export at the international market price, as well as satisfying the national demand for LPG and condensate, which is used in gasoline production. Domestic sales are at a price agreed with the government, which is lower than the international price.

Over the next 20 years, as gas replaces oil as the world's largest energy source, Egypt's strategic location gives UGDC an advantage as a global supplier.

"Egypt enjoys close proximity to large European and Mediterranean markets," said Mr. Ahmed. "Our product can be moved easily to countries such as Italy, Spain, the UK and to the eastern Mediterranean because we are able minimize the shipping cost and get a good price."

Maximizing liquids production must be done without jeopardizing the heating value of the natural gas supplied to consumers, according to Mr. Ahmed. UGDC works within the constraints dictated by EGAS or EGPC. "We extract (liquids) up to the limit dictated by the national grade specifications and are well within them."

The company uses the latest technology and designs for maximum processing flexibility. For example, the plant is designed to be able to recover ethane in the future, if market conditions dictate. "If ethane recovery materializes, it will generate additional revenue for the shareholders," said Mr. Ahmed.

UGDC's production of 800 tons of LPG per day helps offset imports, which are more than 1.5 million tons per year. Production of 1 million bbl/year of high quality condensate helps reduce crude imports.

"UGDC is a good example of how Egypt can attract foreign investment," said Mr. Ahmed. "We have a $400 million plant that will expand. We want to maximize the value of investment both for the government of Egypt and for our foreign partners."

Advanced process

UGDC uses natural gas liquids recovery technology supplied by Ortloff Engineers Ltd. Expansion turbines, a key feature of the process, help recover over 99% of the propane in the gas feed, a very high recovery rate compared to other NGL plants.

According to UGDC, Ortloff's technology offers these significant advantages over conventional technology:

- Greater tolerance to carbon dioxide in the feed;
- Higher liquids recovery or higher throughput capacity for the same amount of compression horsepower;
- Lower propane loss while operating in the ethane rejection mode;

"We want to maximize the value of investment both for the government of Egypt and for our foreign partners."

Mr. Ibrahim Ahmed, UGDC Chairman and Managing Director

- Operating flexibility that allows maximum profit under all market conditions.

The carbon dioxide (CO2) tolerance of the Ortloff process can frequently eliminate the need for installing a treating unit to remove CO2 from the feed gas, resulting in both capital cost and operating cost savings.

A lower compression horsepower requirement can boost the capacity of an existing plant by retrofitting Ortloff technology without adding compression equipment. If added capacity is not needed, a simple process retrofit can significantly improve the liquids recovery efficiency of an existing plant without adding compression.

If ethane is to be recovered, the Ortloff process can respond to changing ethane markets. Ethane recovery is maximized when it is profitable to sell ethane as a liquid; if ethane is more valuable for its fuel value, ethane can be rejected into the residue gas.

Egypt's Natural Gas Operations and Plans:

EGAS guides strategy, Gasco's expanding grid supplies gas, gas liquids

As the potential of Egypt's gas resources became well defined and the benefits of clean burning fuel more important, the Egyptian Natural Gas Holding Co. (EGAS) was formed in 1991 by the Ministry of Petroleum to assume the responsibilities of the Egyptian General Petroleum Co. (EGPC) related to natural gas. Now, EGAS supervises and monitors companies involved in gas transmission, distribution and marketing.

Egyptian Natural Gas Co. (Gasco) was born in 1997 to manage, operate and maintain the national gas grid and its facilities, a system that has expanded at a healthy pace. A link between producers and consumers, Gasco is present at every point in the Egyptian gas chain, including transmission, distribution, processing and marketing.

Production and consumption

Egypt's proved natural gas reserves of 72.3 tcf are up from 53 tcf in 2001, according to EGAS. Consumption has climbed from 17.2 million ton/year in 2001 to 30 million tons in fiscal year 2007. About 60% of the country's gas is used for power generation, 28% for industry and 10% is recovered as gas liquids. About 3% is used for domestic fuel and to provide compressed natural gas (CNG) for transportation fuel.

Gas exported through the Arab Gas Pipeline totaled about 68 bcf during fiscal 2006, up from 8 bcf in 2003. In 2006, 67 cargos of LNG totaling 3.95 million tons were shipped from Damietta LNG plant. From both trains at the Idku plant, 131 cargos totaling 7.2 million tons were exported. Total LNG exports in 2006 almost doubled from the previous year.

In the Mediterranean, the West Delta Deep Marine (WDDM) fields produce 100-120 MMcfd. Other Mediterranean fields produce a total of 20-50 MMcfd. Nile Delta fields contribute 5-20 MMcfd. And the Western Desert fields produce 10-40 MMcfd.

EGAS projects

At mid 2007, EGAS had five projects scheduled for completion in 2007 and 2008 to boost production and reserves in producing fields. Two projects were for the next phases in the ongoing development of the Rosetta and WDDM concessions; the other three fields have total proved reserves of about 2,600 bcf.

With startup dates as far ahead as 2017, development of new discoveries with total reserves of about 3,630 bcf is also underway at an estimated cost of almost US$2 billion. Additional projects will be contracted to others.

In 2006, 67 cargos of LNG totaling 3.95 million tons were shipped from Damietta.

In the Rosetta concession, the third phase will raise production by 150 MMcfd at a cost of US$365 million; a fourth phase will boost gas output by 300 MMcfd when it comes on stream in early 2008 at a cost of US$864 million.

Two fields in the Ras El-Bar/Temsah concession in the Mediterranean will also come on stream in early 2008. Taurt, with reserves of 980 bcf is expected to produce 210 MMcfd and Denis, with reserves of 1,193 bcf will produce 250 MMcfd. Taurt will cost US$729 million; Denis will cost US$504 million.

In the Gulf of Suez concession, the Aml field gas cap is estimated to contain 400 bcf and will produce 70 MMcfd.

Two new discoveries went on stream in the Nile Delta in 2007: Merion-operated West Dikirnis field in the Elmansoura concession, with 137 bcf of gas and 15 million bbl of oil; and Centurion-operated Luzi field in the West Elmanzala concession, with reserves of 30 bcf.

Key projects due for completion will develop total reserves of about 3,630 bcf at an estimated cost of almost US$2 billion. Among those projects are:

- North Sinai—Fayrouz field, with 42 bcf, operated by IEOC Production BV, will start up in mid 2008;
- North Barwil (Mediterranean)—Asad and Zaraf fields, with 150 bcf, operated by IEOC, starts up in mid 2008;
- Thekka (Mediterranean)—Thekka field, operated by Tharwa, has 119 bcf, will start in 2008;
- West Mid B1 (Mediterranean)—Amerada Hess-operated El-King, El-Bahig, El-Mix and Abu Sir fields, with total reserves of 2,700 bcf, will be on stream in 2010;
- WDDM (Mediterranean)—Solar field, with 78 bcf, and Sienna UP field, with 373 bcf,

EGAS supervises and monitors companies involved in gas transmission, distribution and marketing. View of Mubarak LNG Complex.

both operated by BG Group plc, will start up in 2017/2018.

Other projects include the 630-bcf North Idco field, operated by RWE Dea AG, and scheduled for startup in mid 2009. Several fields will be developed in the North Alex/West Mid Mediterranean concession operated by BP plc, where reserves are estimated at 5,000 bcf. Start up of first phase is set for 2009. And in the East Deep Marine concession, Tennin field reserves are estimated at 800 bcf. Operated by IEOC, start up is scheduled for early 2010.

Building infrastructure

Gasco's mission is to apply the latest technologies to the construction, operation, management and maintenance of the country's gas grid and gas processing operations. A core responsibility is to encourage the use of natural gas in industry to improve air quality.

The company's expansion of the gas grid and its projects to upgrade the grid to meet international standards, will help increase the use of natural gas in the domestic and industrial markets.

Gasco also is supplying gas to a growing petrochemical industry and encouraging the use of natural gas in transportation by building CNG pipelines and reduction stations. By the end of fiscal year 2008, it expects to have 140 CNG filling stations in place, up from 46 in 2001. It expects to convert 12,800 cars to CNG in the current fiscal year.

The company controls and monitors the grid with the latest supervisory control and data acquisition (SCADA) system through the National Advanced Control Center (NATA). To enhance its capability, Gasco will establish a Piping Integrity Management Center in cooperation with an international company specializing in oil and gas pipelines inspection and rehabilitation.

While meeting its operating and development responsibilities, Gasco has two other top priorities:

- Build a workforce capable of meeting the challenges of the future;
- Achieve an accident free workplace and healthy staff, and continue to fulfill its responsibility to the environment.

Serving customers

Gasco has a broad range of customers with a variety of requirements. What they all have in common is the need for smooth, reliable, cost-effective and uninterrupted gas and product supply.

The largest user is power generation. Gasco supplies gas to 27 power stations producing 80% of the thermal electric power in Egypt. Other natural gas-fueled power stations are planned over the next few years.

Extending Arab gas pipeline.

The Minister visits new petroleum projects.

Fertilizer manufacturing and iron and steel factories are also large gas users. Gasco supplies gas to six industrial zones in Egypt where it serves more than 250 factories and is considering dozens of new applications for service.

To serve domestic customers, it supplies gas to local distribution companies.

Gasco's Western Desert Gas Complex, treats up to 550 MMcfd to extract 400 million tons/year of ethane/propane mixture to be used in the petrochemical industry; 220 million tons/year of commercial propane for export; about 280 million tons/year of LPG for local consumption; and 360 million bbl/year that is used by refineries.

At the Amerya plant, 330 MMcfd of feed gas is processed to produce 160 million tons/year of LPG for local market consumption and 260 million bbl/year of condensate for refinery use.

Extending the Arab pipeline

Under an agreement with East Gas Co., Gasco undertook the operation and maintenance of the Arab gas pipeline extending from Arish to Aqaba. Driven by a vision of the opportunities that would result from moving Egyptian gas further into the Middle East and beyond, the EGAS-led consortium was awarded the second phase of the Arab gas pipeline from Aqaba to the city of Rehab in Jordan. That extension, reaching to 24 km (15 miles) from the Jordanian/Syrian border, is a total length of 390 km (242 miles) of 36 in.

The pipeline was put in operation in early 2006 and two weeks later, began to fuel both the Rehab and Samra power stations. Along the pipeline route covering Aqaba port and the cities of Rashiedia, Safy, Samara and Rehab, gas will be supplied to power stations, the domestic sector and CNG stations.

Egypt's Natural Gas Operations and Plans:

PICO moves beyond Egypt and 'leftover' fields; new lines expand the grid

Natural gas discoveries like those in the Obaiyed and Khalda concessions will be important to the growth of Egypt's energy sector and the country's economy. There will be plenty of demand for Egypt's growing gas supply, and many opportunities for investment, said Eng. Salah Diab, Chairman, PICO Corp.

"We have enough proven gas resources to support growth for the next 30 years or so. Based on forecasts, there will be no need to begin importing gas," he said.

Mr. Diab also would like to see Egypt becoming a regional hub for gas processing and liquefaction. "We have a large population to supply, but if there is gas to spare, it makes sense to encourage people to come to Egypt and invest."

Though Egypt's political stability has historically drawn foreign investors, increasing tensions in the region threaten to erode the confidence of those considering investment in the wider Middle East.

"But Egypt has long been very stable and we see no evidence that this will change," said Mr. Diab.

Pico strategy

In 1978, PICO Petroleum Services (PPS) became the first private Egyptian enterprise to offer oilfield services for the local oil and gas market. In 1991, PICO Oil was established as the first Egyptian company to own and operate oil fields. A decade later, PICO launched its newest unit, PICO Research and Analysis (R&A). PICO Energy was established in 2002 as a holding company for the existing subsidiaries and to explore the promise of alternative energy sources.

Because Pico is well funded, it is actively seeking investment opportunities in North Africa, the Caspian and other areas in the Middle East.

"We would like to be a regional player and I think we have all the qualifications needed to become one," said Mr. Diab. "We have the equipment, technology and staff to achieve that goal."

Pico also plans to put forward an initial private offering (IPO) as soon as possible.

With an increasingly intense focus on offshore and deep water development, the company's history of increasing production levels in the fields it operates will serve the company well.

Ultrasonic testing machine, IPIC factory.

Midor Refinery.

PICO began life by "picking up the leftovers" of major international operators as they moved on to frontier areas, said Mr. Diab. "Those leftovers kept us busy trying to produce whatever we could, and I think we have had significant success."

Rather than take properties from EGPC, PICO acquired concessions that did not fit in the portfolios of international operators.

"Since those concessions were all we had, we spared no effort to maximize their potential and I think we have succeeded. What was left behind as having little potential is now producing more than 25,000 b/d."

And in 2004, a technical review confirmed that substantial value remained in all of Pico's fields.

That success is due in a large part to PICO's ability to apply fit-for-purpose solutions to the development of its assets. Low operating cost is another advantage. "We don't do any unnecessary spending," said Mr. Diab. "For example, we might use an old drilling rig as a water injection platform."

Now, the company is moving to take advantage of potential exploration opportunities in Egypt and elsewhere. "We expect to move into Iraq and Sudan as soon as conditions warrant, and to Algeria," he said.

As the first Egyptian petroleum services contractor, PICO quickly became a capable oil and gas service provider in Egypt. The company's joint-venture agreements, however, did not permit it to operate outside Egypt.

"Now we are releasing ourselves from this restriction, and I think we have accumulated the know-how to take our services to other countries," said Mr. Diab.

He also sees other companies with extensive technical expertise moving beyond being subcontractors to become operators. There is "a very thin line between the integrated services provided by the large international service companies and the way the large operators develop an oil or gas field,"

Enhancing the capacity of Egypt's gas grid will accomodate growing demand for natural gas. View of storage tanks in LNG plant.

he said. "That thin line is bound to disappear eventually."

Though the concern still exists that entry by service companies into operating ownership of fields will cause them to lose business from traditional operators, Mr. Diab thinks that is about to change.

"My biggest responsibility is to ensure that there is the qualiffied staff to continue our strategy well into the future."

Eng. Salah Diab, Chairman of PICO Corp.

To achieve the goals of its strategy, PICO is intent on developing its intellectual capital. "We are attracting young, energetic people whom we train, empower, then allow to share in the benefits of any success," said Mr. Diab. PICO has also invested heavily to attract Egypt's most skilled and well-established technicians to help optimize ultimate recovery and maximize production.

"My biggest responsibility is to ensure that there is the qualified staff to continue our strategy well into the future," said Mr. Diab.

Pipelines expand grid

Enhancing the capacity of Egypt's gas grid and upgrading its infrastructure will accommodate growing demand for natural gas and help serve new domestic and export markets.

Progress in the execution of many Gasco projects accelerated in 2006 as several pipeline projects moved ahead.

The El-Tina/Abu Sultan pipeline, a 62-km (37-mile), 32-in. line capable of moving 16 MMcfd of gas was built to support the eastern flank of the national gas grid. Started up in early 2007, it uses gas supplied by Port Fouad and northern Port Said fields to meet the demand of the domestic market in Suez and the northern Gulf of Suez. Total cost of the project was about L.E 236 million.

Dahshour-Kuraimat pipeline, 90 km (56 miles) of 36 in., has a capacity of 37 MMcfd. It serves the expansion of the Kuraimat power station and growing demand in the southern expansion of the national grid. Costing about L.E 385 million, it began operation in early 2007.

In 2006, Gasco began building a gas pipeline to feed gas to South Sinai. The Taba/Sharm El-Sheikh pipeline, 220 km (137 miles) of 20 in., will carry up to 6 MMcfd to serve the cities on the route, hotels and tourist villages, in addition to power stations in Taba, Noweba, Dahab and Sharm El-Sheikh. It went on line in early 2007 at a cost of about L.E. 511 million.

Also during 2006, Gasco completed the Shukeir-Hurgada pipeline, 127 km (79 miles) of 24 in. that can handle 7 MMcfd of gas for the Red Sea Governorate. The pipeline will serve the cities and power stations on the route. Estimated cost of the line was L.E. 336 million.

South Valley

Within the framework of the Ministry of Petroleum's plan to develop the south of the valley, and Gasco's plan to supply the South Valley governorates, Gasco began the first section of the South Valley pipeline in early 2006. The Beni-Suef/Abu Qorqas line is 150 km (93 miles) of 32 in. with a capacity of 16 MMcfd. It was completed in mid 2007 at a cost of about L.E 545 million.

The second phase, from Menya to Assiut, is 136 km (85 miles) of 32 in. Estimated to cost about L.E 520 million, it is scheduled for startup in second quarter 2008.

By the third quarter of 2007, after completing the pipelines supplying gas to the cities of Sharm El-Sheikh, Hurgada and Beni-Suef, total length of the south valley grid reached about 800 km. Grid transmission capacity was 166 MMcfd.

El-Qasr tie in

Gas production from El-Qasr field in the Khalda concession began in 1998 and by the end of 2006 was averaging almost 500 MMcfd. Oil production began in the concession in the mid 1980s and now averages 80,000 b/d. By the end of 2006, cumulative gas production was 782 bcf. The field has also produced 47 million bbl of condensate and 284 million bbl of oil.

Cooling and heating station, Gas Cool Co.

The project involves two phases: El-Qasr Early (capacity up to 150 MMcfd of gas plus associated liquids) and El-Qasr Permanent. Capacity of the first phase, completed in 2005, is expected to increase to 210 MMcfd after the commissioning of a pre-compression project in early 2008.

By tying the El-Qasr field into the Obaiyed gas processing facilities, it was not necessary to build a new gas processing plant in Khalda.

Egypt's Downstream Operations and Opportunities:

Three-phase plan will create a world-class petrochemical industry

Rising oil and gas prices have made those basic commodities increasingly valuable to countries with substantial proven reserves and attractive exploration prospects. Even more value is added when a portion of those national resources can be used to manufacture petrochemical "building blocks" and finished products.

Not all countries are equipped to make the investment needed to build a petrochemical industry; Egypt is fortunate to have that capability. In addition, it has a petrochemical master plan that will increase the value of its petroleum reserves, serve a growing domestic market for petrochemical products, and provide new export revenue.

The same advantages that have helped build its oil and gas industry—strategic location, economic and political stability, a skilled workforce—will benefit Egypt's developing petrochemical industry.

Plan summary

The Egyptian Petrochemicals Master Plan will be executed in three phases over 20 years at a total estimated cost of US$10 billion. Responsibility for implementing the development plan will fall to the Egyptian Petrochemicals Holding Co. (Echem), established in 2002 to carry out the Master Plan, and to encourage investment in the petrochemical industry.

Though the overall objectives are clear, two decades can see significant change in markets and in feedstock supply, so the plan is designed with the flexibility needed to accommodate those changes.

It will be continuously updated to reflect conditions in local and international markets and to ensure that execution of the plan is responding to real world situations. But as the plan stood in mid 2007, it included 24 projects and 50 production units, and will create almost 100,000 direct and indirect employment opportunities.

The first phase is on track to be completed in 2008. Phase II will continue through about 2015 and the final phase of the current plan will be complete in 2022.

Product slate

Products to be produced by Phase I of the plan include methanol, ammonia/urea, polystyrene, propylene/polypropylene, linear alkyl benzene and acrylic fiber. The first of three olefins complexes—one to be built in each phase—is also part of the initial phase.

Most Phase I projects were on schedule in mid 2007. The acrylic fiber project at Alexandria went on stream in February 2006 with a capacity to produce up to 18,000 tons/year using polymerization technology. Total cost of the project was US$70 million. The plant is owned by the Birla Group, (60%); Sidi Kerir Petrochemicals Co. (Sidpec), 20%; Apicorp, 10% and Egyptian Saudi for Investment, 10%.

Other projects are under construction, including methanol, ammonia/urea, polystyrene, propylene/polypropylene, and linear alkyl benzene units. The olefin complex and a planned polyvinyl chloride expansion are still under development.

Phase II of the plan calls for units to produce terephthalic acid (TPA), polyester, ethoxylates, styrene and latex; and includes another methanol unit, the second olefins complex and an aromatics complex. Three Phase II projects were under development at mid 2007—a polyester unit, the aromatics complex and the styrene unit.

Phase III plants will include a vinyl complex; additional capacity for styrene and latex; and expansion of the propylene/ polypropylene and linear alkyl benzene capacity.

Project activity

In late 2007, the linear alkyl benzene plant capable of producing up to 100,000 tons/year was nearing completion near Alexandria. Using the process supplied by UOP LLC, the plant is scheduled for startup in early 2008 at a total cost of about US$492 million.

The Petrochemicals Master Plan will increase the value of egyptian petroleum reserves.

Egypt intends to invest in new downstream projects, including an integrated oil refinery and petrochemical complex.

Major shareholders in the project are National Investment Bank with 34%, and Echem and EGAS, each with about 21%. Other owners include EGPC, the Ministry of Finance and UniChema Group.

The propylene/polypropylene plant now under construction at Port Said will have a capacity of 400,000 tons/year of polypropylene when it comes on stream in the third quarter of 2009. The plant uses the Uhde GmbH process for high density polypropylene and a process from Basell AF for polypropylene.

Arab and private investors account for the largest ownership share at 48%. Other shareholders include Echem and Gasco, each with a 13% share and Oriental Petrochemicals Co./Oriental Weavers with a 26% share. Cost of the plant is estimated at US$750 million.

A new US$950 million methanol plant at Damietta will have a capacity to produce 1.3 million tons/year when it is completed in the first quarter of 2010. Shareholders include Methanex Corp., 60%; Echem, 12%; EGAS, 12%; Gasco, 9% and Apicorp, 7%.

Starting up at about the same time at Damietta will be an ammonia/urea plant now under construction with a capacity to produce 1.4 million tons/year of urea. Cost of the unit is about US$1.4 billion. The Uhde ammonia process is combined with a UOP carbon dioxide removal process. Both urea synthesis and urea granulation are done with a process supplied by Stamicarbon BV. Ownership of the project is shared by Agrium (60%), Echem (24%) and private investors.

At mid 2007, basic engineering was under way at Alexandria for a polystyrene plant that will produce up to 200,000 tons/year after it starts up in third quarter 2009. Feedstock for the plant, styrene monomer, will be imported during Phase I of the Master Plan but styrene capacity built in Phases II and III will eliminate the need for imports.

Shareholders in the US$150 million plant include Echem, 35%; Ministry of Finance, 20%; National Investment Bank, 20%; Petrojet, 15% and Enppi, 10%.

Construction of a polyester unit at Damietta with a capacity of 315,000 tons/year of polyethylene terephthalate (PET) has been approved by the joint venture shareholders. Startup is scheduled for fourth quarter 2009. Owners are South Asian Petrochemicals Ltd. (SAPL), 70%; Echem, 23%; and Enppi, 7%.

Under study is an aromatic complex that would be built at Suez or Alexandria to produce 500,000 tons/year of gasoline and 500,000 tons/year of paraxylene. Total investment would be about US$2 billion.

The ethane cracker under consideration for Damietta would produce 300,000 tons/year followed by ethylene processes. UGDC would provide the ethane feedstock for the plant, which is estimated to cost US$925 million. If the project goes ahead, it would begin operation in 2011.

At mid 2007, the feasibility study for the ethane cracker in Alexandria was being prepared. With a planned capacity of 400,000 tons/year, the cracker would be followed by polyethylene, styrene and polyvinyl chloride (PVC) production.

Refining/petrochemicals complex

In addition to the master petrochemical plan, Egypt intends to invest in other new downstream projects, including an integrated oil refinery and petrochemical complex. Also on the drawing board are dimethyl ether (DME) capacity of 200,000 tons/year at Damietta and bio-diesel manufacturing capability.

A feasibility study was in progress in mid 2007 for the refining and petrochemical complex project that would be built in three phases. The gas-to-propylene (GTP) plant would come first, followed by the oil refinery, then the petrochemicals units.

Adding value to Egypt's natural gas resource by using it to produce propylene is the aim of the GTP plant. Design capacities are 470,000 tons/year of polypropylene, 185,000 tons/year of gasoline and 40,000 tons/year of LPG. Processes from Lurgi AG would convert gas to methanol, then convert methanol to propylene. A Basell process would convert propylene to polypropylene.

Total cost of the GTP plant is estimated at US$2.2 billion, with start up planned for 2010.

Phase two of the project under consideration is a 400,000-b/d refinery designed to produce 3.5 million tons of gasoline, 5.1 million tons of low sulfur diesel and 520 million tons of kerosene and jet fuel. Total investment is estimated to be US$8 billion and if sanctioned, the project would start up in 2012-2013.

The petrochemicals phase is aimed at producing basic and intermediate petrochemicals, including polyethylene, polypropylene, butene and its derivatives, butadiene and its derivatives, benzene and paraxylene. Feedstock would come from the units built in phase two. Estimated cost is US$6 billion.

Design capacities of the complex include:

- 1.2 million tons/year polyethylene;
- 810,000 tons/year polypropylene;
- 130,000 tons/year butene and its derivatives;
- 205,000 tons/year butadiene and its derivatives;
- 730,000 tons/year benzene;
- 1.2 million tons/year paraxylene.

Egypt's Downstream Operations and Opportunities:

Sidpec growth strategy built on product quality, export experience

Turning crude oil and natural gas components into basic and intermediate petrochemicals adds significant value to petroleum reserves. The country that produces these products from its raw materials best serves its economy and its citizens' long term interests.

With significant natural petroleum resources to serve as feedstock, growing domestic product demand and expanding export market opportunities, Egypt has a promising future in petrochemical manufacturing.

Considered the first integral step towards realizing this bright future was the formation of Sidi Kerir Petrochemicals Co. (Sidpec) as an Egyptian joint stock company in November 1997. Privatization of the company in 2005 through a successful initial public offering positioned Sidpec for continued growth.

The company supplies all the domestic demand for polyethylene raw material with a polymer portfolio that includes linear low density polyethylene (LLDPE) and high density polyethylene (HDPE).

Throughout its operations, the company applies the latest available technology and state-of-the-art process design to meet Egyptian environmental regulations and requirements.

As it marks its tenth anniversary this year, Sidpec can count significant accomplishments, as it contributed significantly to the economy of Egypt. For example, this year Sidpec became the first company to win the National Award for Excellence in Exportation. Sidpec has exported its products to more than 60 countries around the world and has distributors in more than 25 of the world's largest markets.

In the years ahead, the company hopes to double its capacity, as well as produce new products.

It all will be done with a focus on benefiting the Egyptian economy, as well as the environment, both in Egypt and wherever Sidpec's products are sold. The company's products are well known all over Europe because they are environmentally friendly.

Ethylene plant overview.

Control room.

Polyethylene bagging lines.

Expansion strategy

In many ways, natural gas will be a leading driver of Egypt's energy sector for the foreseeable future. Two of the most important contributions will be natural gas exports and natural gas used as raw material for the petrochemical industry.

Converting natural gas to methanol and then to ethylene and propylene will provide feedstock for petrochemical manufacturing. Natural gas for export will continue to come from new discoveries being made in the deep water of the Mediterranean and elsewhere.

Sidpec's strategy is to split these discoveries into three categories. One will serve the local domestic market, the second is for export and the third will be for future generations. By applying this strategy, it can be good steward of this very valuable natural gas resource.

As commodity prices and environmental concerns increase, LNG is enjoying renewed interest around the world. And Egypt is prepared to participate in this growing market with liquefaction facilities.

Besides natural resources, Egypt offers another key to growth: Political and financial stability and a long history of attracting foreign investors.

Though tensions in the wider region of the Middle East continue to concern international companies, Egypt still offers stability, and systems and programs that are sustainable.

Adding value to Egypt's locally available feedstock represents an important potential revenue stream and employment platform. And Sidpec's success is important in developing Egypt's petrochemical industry.

As the first company to produce ethylene to provide raw material for polyethylene and many other products. The first step had been taken towards Egypt's petrochemical future.

Attention to safety and the environment, and the continuous development of staff expertise, are critical elements of Sidpec's long-term strategy.

Sidpec's plants are running according to plan, without mishap and with attention to the environment. And one of the most important assets is the relatively young, but knowledgeable staff.

About 90% of the company's employees are below the age of 40. In providing the support and training they need, many are sent abroad to gain new and broader experience.

Sidpec ethylene and polyethylene plant. The company supplies all the domestic demand for polyethylene raw material.

Customers and shareholders

Following the spirit of its vision "to be a leader in providing innovative, value added and highest quality petrochemical products worldwide while creating superior shareholder value" has made Sidpec quality internationally respected.

The company's products couldn't be distributed to more than 62 countries if those products were not of good quality. Customer satisfaction has been the main goal. And with continuity, products will be improved.

One measure of Sidpec quality is that its polyethylene grades (high and linear low density) fully meet the requirements of EC Directive 2002/72/EC and UK statutory instrument 1376 (1998), as amended, for use with all classes of foodstuff. Sidpec's Egyptene polymer is used to produce film for shopping and grocery bags, heavy duty film and agricultural film.

Sidpec also produces blow-molded containers; injection-molded pallets, boxes, pails, toys and house wares; and roto-molded tanks and other items.

New capacity and markets

Sidpec shareholders have indicated their satisfaction with the company's performance by encouraging it to expand its capacity and initiate new projects. They accept the studies that the company present to them and are willing to finance expansion.

A new polyethylene project was announced by Sidpec in mid 2006 to produce plastic pipe that will be part of the effort to make natural gas available to all homes in Egypt.

One of Sidpec's objectives is to leverage the image of quality that has made its products available in scores of countries around the world to further penetrate the international markets.

First and foremost, the aim is to maintain a good relationship with the customers all over the world. In addition, Sidpec would like to penetrate new markets such as Africa and Latin America. The company already has support in America.

To maintain its relationships, the company takes the feedback it gets from customers and foreign distributors about packaging and other issues very seriously.

HSE and training

Sidpec's focus on safety, on the health of its workers and of citizens both at home and abroad—and on reducing the company's environmental footprint—is guided by a carefully thought out, detailed program.

The effort has paid off in many ways, including a significant reduction in accident rate. The company had no lost time incidents in 2003 and 2004; only one in 2005.

Sidpec's industry is a clean industry, following all the standards—both international and Egyptian—related to air, and liquid and solid waste. And trying to reverse any negative impact that has occurred.

In November 2003, Sidpec became the first petrochemical company in Egypt to be certified as meeting the requirements of both the ISO14001 and OHSAS 18001 standards.

All employees have access to policies and procedures of a hazard commutation program, respiratory protection, hearing protection, safe work practices, emergency action plans and work permits.

Sidpec's training and development department is committed to the development of each employee. And management has placed a strong emphasis on implementation of new managerial systems. These initiatives include several important programs.

A training center established in 2001 helps the company carry out these and other activities:

- New employee training;
- Training and seminars in ISO, management, safety and occupational health for related companies;
- Joint meetings with related companies on environment protection and anti-pollution initiatives;
- Training courses prepared by the company's professional instructors, and by international companies for specific training needs.

The training department also organizes summer training for Egyptian university students in science, engineering, commerce and other disciplines.

Egypt's Downstream Operations and Opportunities:

A capital-friendly environment will fuel downstream growth

Growing demand for fuel, petrochemical feedstock and petrochemical products—both at home and in global markets—combined with Egypt's petrochemical master plan offers attractive investment opportunities that will also speed the country's downstream growth.

Evidence of international interest in these opportunities comes from a number of recent agreements between Egypt and international companies.

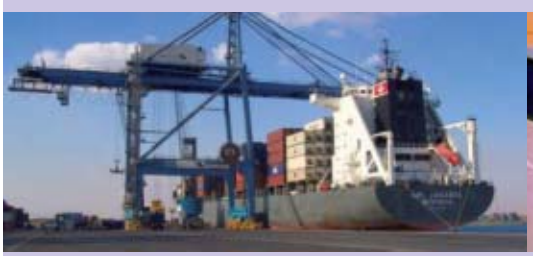
World refining capacity is stretched thin and growing economies will demand more petroleum-derived products, from gasoline to grocery bags. Many of the same advantages that draw exploration and development companies to Egypt also help attract investors to these emerging downstream opportunities:

- Freedom to choose the field of investment;
- No restrictions on the nationality of the capital;
- Owners can determine the amount of capital based on project size capacity, and there is no limit;
- Choice of legal form for the project;
- Ability to transfer and re-export profits and invested capital;
- Freedom to turn operations over to others;
- Ability to determine product prices and margins;
- Residence licenses and facilities for foreign investors upon request.

A sampling of investment plans

A number of recent announcements confirm the interest of international companies in developing petrochemical projects in Egypt.

NEXT DEVELOPMENT PHASE UNDER WAY AT SOKHNA PORT



The strategic location of Sokhna Port south of the Suez Canal on the Red Sea makes it the ideal port of call for maritime trade into and out of Egypt. As a joint venture between government and private investors, Sokhna Port is a pioneering model for public-private partnerships in Egypt. The Sokhna Port Development Co., part of Egypt-based Amiral Holdings Ltd., holds the concession for developing and managing the port for 25 years.

The next phase of development officially began in February 2007 when Prime Minister H.E. Dr. Ahmed Nazif laid the foundation stones for a new basin estimated to cost US$36 million.

Covering an area of 150,000 sq m (1.615 million sq ft), it will have a 420-m (1,378-ft) long jetty with a water depth alongside of 17 m (56 ft). Also included will be a liquid bulk terminal for product storage and handling, and to provide bunkering service.

The first phase of a livestock project at the port, which began operation at the end of 2006, includes a terminal and holding pens for up to 24,000 head of livestock. A slaughterhouse and meat processing plant will comprise phase two of the project. When complete, the US$90 million project can process between 250,000 to 350,000 head of livestock annually, primarily for the domestic market.

A sugar refinery at the port was scheduled to start production in late 2007. A joint venture between the Saudi-based Savola and British sugar pioneers Tate and Lyle, the US$120 million refinery will produce 1 million tons/year and include storage facilities.

Additional development includes a magnesium refinery, an ammonia project and a methanol plant.

"We are continuing to extend our efforts to attract more foreign investment and large scale projects to the port," said Capt. Ossama Al Sharif, President and CEO, Sokhna Port Development Co.

According to the website *oilegypt.com*, a delegation from India's Reliance Group recently met with Egyptian Minister of Petroleum, Eng. Sameh Fahmy, to discuss possible new projects in refining and petrochemicals, as well as in oil and gas exploration and marketing.

According to the report, the Reliance Group is considering the investment of as much as US$10 billion in various petroleum operations, especially in petrochemicals. The Group is interested in establishing an integrated complex for manufacturing plastics for use in industrial, agricultural, food and infrastructure products. Capacity of the complex is expected to be about 1.3 million tons/year. Investment is estimated at US$1.5 billion. The project would serve domestic demand, as well as provide exports to Europe, Africa and Arab regions.

In mid 2007, Eng. Fahmy witnessed the signing of a financing agreement for the main loan of about US$950 million for the Egyptian Agrium Co. for Nitrogenous Products project to produce ammonia/urea. Capacity of the facility would be about 1.3 million tons with an investment of about US$1.5 billion. Contribution of the Egyptian petroleum sector to the project is 33%, the Canadian Agrium Co. has 60%, and the Arab Company for Petroleum Investments (Apicorp) owns the remaining 7%.

Fahmy visits the Petroleum's aircraft fleet.

The project aims at meeting the local demand for urea used as a fertilizer and exporting the surplus. It is expected to begin commercial production in the first quarter of 2010.

Financing for the project will include US$380 million from local banks, including National Bank of Egypt, Banque Misr, Commercial International Bank CIB, Al Ahly Societe Generale Bank and the Arab Bank. Remainder of the investment will be financed by international banks. The loan period is 15 years; it will be repaid from the cash flows generated by the project.

New petrochemicals and refining projects also involve Kuwaiti, Bahraini and Egyptian investments in Suez. Two new refining and petrochemical projects there that are expected to require an investment of about US$3 billion are underway.

The first project, costing about US$1.8 billion, will initially produce 100,000 b/d of petroleum products; then a second phase will boost capacity to 150,000 b/d. Another project will produce 130,000 b/d of petroleum and petrochemical products after an investment of $1.2 billion.

Facilitating new projects

Eng. Fahmy, also met recently with a delegation of group leaders from the U.S. contractor Kellogg Brown and Root (KBR) to discuss ways KBR might increase its investment and activity in Egypt in light of the accelerated development of the country's oil, gas and petrochemicals industry.

KBR cooperated with Enppi and Petrojet and served as general contractor in executing the gas liquefaction and export complex in Damietta. KBR companies are interested in expanding their presence in Egypt to execute development projects including petrochemicals.

EGYPT'S GAS AND BIOFUELS PLANS FIT WELL WITH "GREEN REVOLUTION"

The effort to reduce the impact of energy consumption on air and water quality has accelerated in recent years as more companies, countries and consumers take measures to "go green."

The solution is not to abandon hydrocarbons, but to use lighter hydrocarbons where possible and complement them with non-hydrocarbon energy sources. Egypt's innovative strategy to use compressed natural gas (CNG) for transportation, for example, addresses a large source of emissions.

Recently, *Oil & Gas Journal* cited an Accenture report that concluded "diversity of transportation fuels will be a fundamental change…in the coming decade." The International Energy Agency forecasts a four-fold growth in ethanol and biodiesel production by 2020. It estimated 2006 global production of crop based ethanol at 13.5 billion gal, but the biodiesel market at only 1 billion gal in 2005.

Egypt has taken the initial step towards developing its biofuel industry. In mid 2007, a biodiesel production project was under study that would produce 1 million tons/year of biodiesel, along with 200,000 tons/year of synthetic diesel. Estimated cost of the biodiesel plant is US$600 million; the synthetic diesel project would cost an estimated US$500 million.

A wide range of experiments, technologies, plans and projects make up the world of biofuels:

- India plans to replace 10% of its transport fuels with biofuels by 2017, according to the web site Biofuels International;
- Biofuels International also reported that U.S.-based Blue Sun Biodiesel has proposed a $42 million four-year jatropha biodiesel project to the US Department of Energy;
- In Japan, Toyo Engineering completed a feasibility study for an integrated coco methyl-ester (CME) biodiesel plant in the Philippines' to produce a CME blend of 5%;
- German-based Petrotec's multi-feedstock technology to treat yellow grease and animal fats as well as virgin vegetable oils produced 85,000 tons of biodiesel in 2006.

Egypt and Tomorrow's Energy Markets:

Comprehensive strategy equips Egypt for a competitive energy world

If there is a single word that defines every facet of tomorrow's energy markets, it is competition—for resources, for opportunities, for customers, for qualified employees and for capital.

Beginning with significant petroleum resources of its own, Egypt's government and private companies have developed the strategies and capabilities to grow and prosper in this competitive environment.

A capital-friendly investment tradition has opened opportunities to Egyptian and international companies, both upstream and downstream. A trading culture and high quality products have helped penetrate a wide range of export markets. And Egyptian companies and agencies have well-defined programs to develop the workforce and meet health, safety and environmental responsibilities.

All these advantages will be critically important as world market trends unfold.

Global Energy Roundtable Conference in Cairo, November 30, 2006.

A global context

According to the U.S. Energy Information Administration (EIA) International Energy Outlook 2007, world marketed energy consumption will grow by 57% between 2004 and 2030. And this growth will occur even with continued high oil and gas prices.

Liquids will supply the largest share of world energy consumption over the period, but their share falls from 38% in 2004 to 34% in 2030, largely because oil prices remain high, according to EIA. World liquids consumption in the report's reference case increases from 83 million b/d in 2004 to 118 million b/d in 2030. Two-thirds of the growth will be in the transportation sector.

Rising world oil prices after 2015 will increase gas demand, said the agency. And world natural gas consumption will grow by 1.9%/year from about 100 tcf in 2004 to 129 tcf in 2015 and 163 tcf in 2030. In both total energy and natural gas, the fastest growth is in non-OECD (Organisation for Economic Co-operation and Development) countries, where natural gas consumption increases more than twice as fast as in the OECD countries.

The good news is that global petroleum resources are very large. As of January 1, 2007, proved conventional world oil reserves were 1,317 billion bbl, according to *Oil & Gas Journal*—24 billion bbl higher than in 2006. Heavy oil resources around the world are several times as much.

Proved world natural gas reserves are 6,183 tcf—71 tcf higher than in 2006, according to the *Journal* report.

And then there are undiscovered reserves. The U.S. Geological Survey (USGS) estimates global undiscovered natural gas reserves at 4,136 tcf. Of that total, an estimated 3,000 tcf is "stranded" reserves.

Oil and gas prices are expected to remain high, but costs will continue to increase, too. Meeting that challenge will require new technology, more efficient work processes and innovative partnership arrangements.

On the right track

There are two important ways a country can ensure a successful energy future: diversify supply, both geographically and by source; and optimize the value of natural resources. With a strategy that includes energy sources and markets from crude oil, to petrochemicals, to biodiesel, Egypt has a clear focus on these goals.

Egypt has properly made the development of natural gas and the exploitation of its deepwater Mediterranean discoveries and prospects top priorities. World gas markets will be strong for the foreseeable future, and technology and price will continue to lower the economic threshold for deepwater development.

The petrochemical master plan is also a critical element in optimizing the value of Egypt's oil and gas resource. With Egyptian companies playing an important role in the industry, the country can guide the direction of its future and benefit from its success.

Beyond the traditional responses to energy needs, Egypt is "ahead of the curve" in several areas, including the development of compressed natural gas and biofuels for the transportation sector.

In all industry segments, Egypt's own companies are increasing capability and expertise to compete. And whether oil, gas, or petrochemicals, Egypt's strategic location will continue to be an advantage.

Whatever the details of a strategy, the foundation is capital. Egypt's petroleum development strategy recognizes the importance of an investment environment that will attract companies that can help it achieve its energy goals.

EGYPT GENERAL DATA & ECONOMIC INFORMATION

Arab Republic of Egypt

- *Capital:* Cairo
- *System of Government:* Multi-party Republic
- *President:* Hosni Mubarak (since 1981)
- *Prime Minister:* Ahmed Nazif (since 2004)
- *Languages:* The official language is Arabic which is spoken by the majority of the population, although other important minority languages include Coptic, Nubian and Berber.
- *Location & Geography:* Egypt is located in the north-eastern corner of Africa.
- *Climate:* The larger part of Egypt has a desert climate which is hot and arid. There are two seasons.
- *Land Area:* 384,344 sq mi (995,451 sq km); total area: 386,662 sq mi (1,001,450 sq km)
- *Population (2006 est.):* 78,887,007
- *Currency:* The official currency is the Egyptian Pound (EP).
- *GDP/PPP (2006 est.):* $334.4 billion; per capita $4,200.
- *Real Growth Rate:* 6.8% GDP Inflation: 5%. Unemployment: 10.3%
- *Industries:* Textiles, food processing, tourism, petrochemicals, chemicals, pharmaceuticals, hydrocarbons, construction, cement, metals, light manufacturers.
- *Natural Resources:* Petroleum, natural gas, iron ore, phosphates, manganese, limestone, gypsum, talc, asbestos, lead, zinc.
- *Exports:* $20.55 billion f.o.b. (2006 est.) crude oil and petroleum products, cotton, textiles, metal products, chemicals.
- *Imports:* $33.1 billion f.o.b. (2006 est.) machinery and equipment, foodstuffs, chemicals, wood products, fuels.
- *Major Trading Partners:* Italy, U.S., Spain, U.K., Syria, Saudi Arabia, Germany, China (2006).

Source: Altapedia, Governments on the WWW

ENERGY OVERVIEW

Energy Minister:
Sameh Fahmy (Minister of Petroleum)

Proven Oil Reserves:
3.8 billion bbl (1 January 2006)

Oil Production:
700,000 bbl/day (2005 est.)

Oil Consumption:
590,000 bbl/day (2004 est.)

Net Oil Exports:
152,600 bbl/day (2004 est.)

Crude Refining Capacity:
726,250 bbl/day (2005 est.)

Natural Gas Reserves:
1.589 trillion cu m (1 January 2006 est.)

Source: EIA - Country Analysis brief on Egypt

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We thank everyone for their professionalism and enthusiasm that made this survey possible and a pleasure to work on.

It is wonderful to see the progress that has been made from last year's publication and we hope that our vast number of readers in the energy sector have found this in-depth overview informative and a useful tool to the Egyptian energy sector.

First and foremost we thank the Ministry of Petroleum, the Honourable Mr. Sameh Fahmy whose dedication and vision has played a vital role.

The First undersecretary of the Minister, Eng. Shamel Hamdy and his assistant Riham Galal. Mr. Khaled Ghazaly undersecretary and Iman Orfy of International investor relations whom have been a joy to work with.

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