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Offshore Europe

China fills first SPR site, faces oil, pipeline issues
First of new Nomad-class desert rigs heads to Algeria
Canadian plant hikes sales gas, cuts CO_2, S emissions
Wireless sensors enhance system safety, efficiency

OIL&GAS JOURNAL®

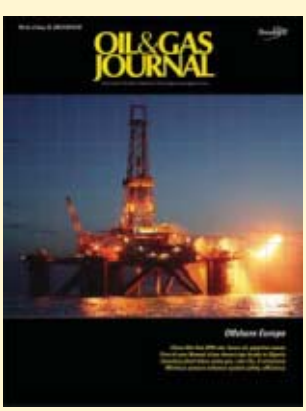
Aug. 20, 2007
Volume 105.31

OFFSHORE EUROPE

REGULAR FEATURES

COVER

The Petrolia semisubmersible flares gas on a well test for Island Oil & Gas PLC in the Celtic Sea off Ireland. OGJ's annual special report on Offshore Europe lists projects and examines the commercial situation and spending outlook for the North Sea and other sectors of the Northwest Europe Continental Shelf. Photo courtesy of Island Oil & Gas.



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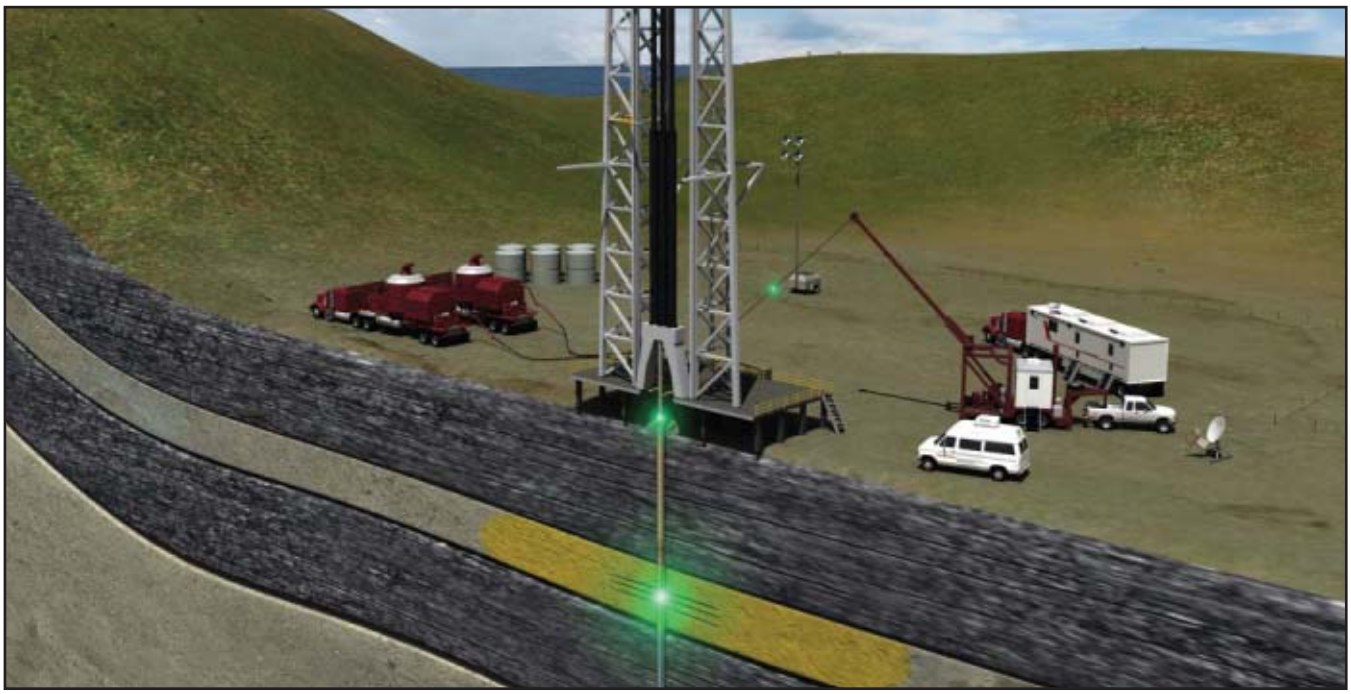

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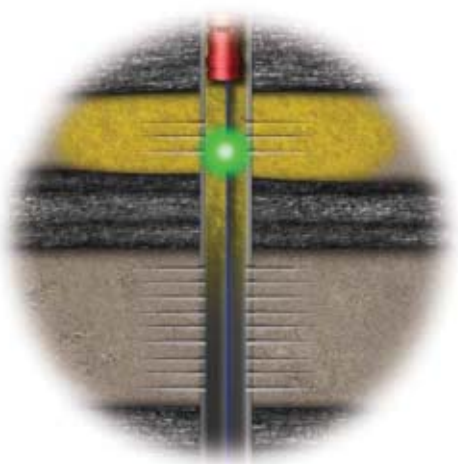

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OGJ Newsletter

Aug. 20, 2007

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General Interest — Quick Takes

US House panel considers gasoline tax increase

The US House Transportation and Infrastructure Committee is considering raising the federal gasoline tax to fund repairs of bridges and other infrastructure in the National Highway System. The proposal is part of a larger response to the Aug. 1 rush-hour collapse of the I-35W bridge in Minneapolis that killed at least five people.

"Certainly, raising [the gasoline tax] is on the table. Historically, it's how we've funded bridge and highway projects," a committee spokesman told OGJ on Aug. 9. "It probably is how we'll go this time, but nothing, including the amount of an increase, has been decided yet."

As he announced the initiative on Aug. 8 in Minneapolis, HTI Committee Chairman James L. Oberstar (D-Minn.) said the US Department of Transportation rates as "structurally deficient" about 73,784 US highway bridges. Oberstar said the bill would significantly increase bridge inspection requirements, provide dedicated funding, distribute funds based on public safety and need, and establish a fund similar to the Highway Trust Fund, which would finance repairs and replacement of structurally deficient highway bridges.

Oberstar said he has scheduled a hearing of the full committee to examine the highway bridge problem on Oct. 5, and that he will work to get the bill through Congress. He and other committee members emphasized that congressional and administrative earmarks would be prohibited under the legislation and that revenues deposited in its trust fund would not be available for any other purpose.

EU countries disagree over unbundling issue

Nine European Union countries, led by France, have sent a joint letter to the European Commission disputing the need for integrated energy operators to give up ownership of their transmission networks, unbundling gas and electricity transportation from energy production and supply. The letter was made public by France's Minister for Ecology and Sustainable Development Jean-Louis Borloo, who also oversees energy matters.

Saying the unbundling process has not been proven effective, the nine countries—France, Germany, Austria, Bulgaria, Slovakia, Cyprus, Greece, Luxembourg, and Latvia—insist it "should remain optional and not compulsory." Unbundling, they say, "brings no automatic guarantee of low prices for consumers and of sufficient investments."

Indeed, in the Netherlands, Denmark, and the UK, where unbundling has been carried out, prices have soared and are the highest in Europe, note observers close to Borloo.

The nine countries agree that stronger and harmonized regulations in Europe constitute an "efficient" answer to current market dysfunctions.

However eight other EU countries—Denmark, Belgium, Spain, Finland, the Netherlands, Romania, the UK, and Sweden—sent their own letter to the Commission June 22 backing unbundling. To these eight should be added Portugal, which holds the current 6-month presidency of the EU and is an ardent defender of unbundling.

The Commission is to present in September a series of measures to bolster the liberalization of the electric power and gas markets. The gas market since July 1 officially has been fully opened, but an open market has not yet materialized.

Meanwhile the EU Commission is giving fresh momentum to its antitrust offensive. It has opened two investigations; one concerning France's electricity utility EdF and Belgium's Electrabel, which are suspected of signing long-term contracts with industrial clients to safeguard their domestic markets, and the other with Germany's gas operator E.On AG and France's Gaz de France, which are suspected of a secret agreement under which each party would avoid entering the domestic market of the other.

The Megal gas pipeline, a joint venture of the two companies, seems to be at the crux of this suspected agreement. Megal carries Russian gas between the German-Czech Republic and German-Austrian borders on the one hand and the German-French border on the other, the only one that carries Russian gas into France.

GDF has a 44% stake in the 1,077 km Megal pipeline, E.On has 51%, and Austria's OMV AG 5%. It was built in 1976. GDF has about 60% of the Megal capacity.

Nigeria's president replaces NNPC head

Nigeria President Umaru Yar'Adua has removed Funso Kupolokun, group managing director of Nigeria National Petroleum Corp., from his post.

Yar'Adua has replaced him with the next most-senior executive, Abubakar Yar'Adua—of no relation to the president—until further notice.

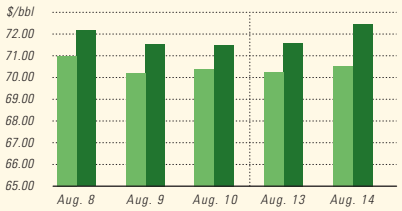
The firing comes amid intense speculation in Nigerian media that the president was unhappy with the performance of NNPC, the allegations of corruption in awarding contracts and misappropriation of funds, and that Kupolokun was on his way out. However, the president did not give a reason for dropping him.

The president, who took office on May 29, is committed to revamping Nigeria's energy sector (OGJ Online, Aug. 7, 2007).

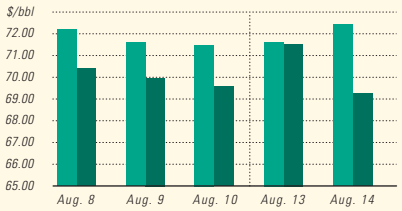
Abubakar Yar'Adua was previously the company's executive director overseeing refineries and petrochemicals since 2003. ✦

Industry Scoreboard

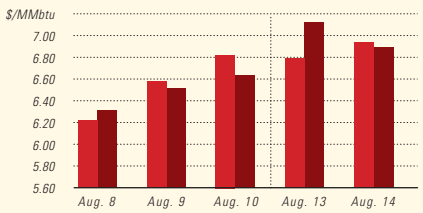
IPE BRENT / NYMEX LIGHT SWEET CRUDE



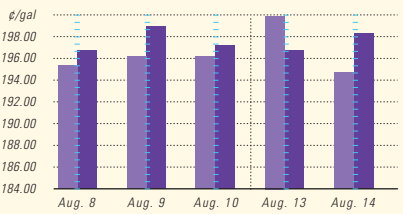
WTI CUSHING / BRENT SPOT



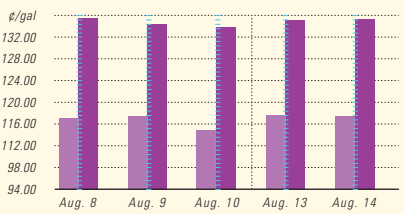
NYMEX NATURAL GAS / SPOT GAS - HENRY HUB



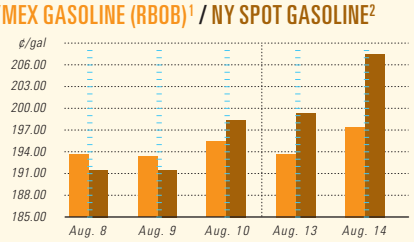
IPE GAS OIL / NYMEX HEATING OIL



PROPANE - MT. BELVIEU / BUTANE - MT. BELVIEU



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



[1]Reformulated gasoline blendstock for oxygen blending,
[2]Nonoxygenated regular unleaded.

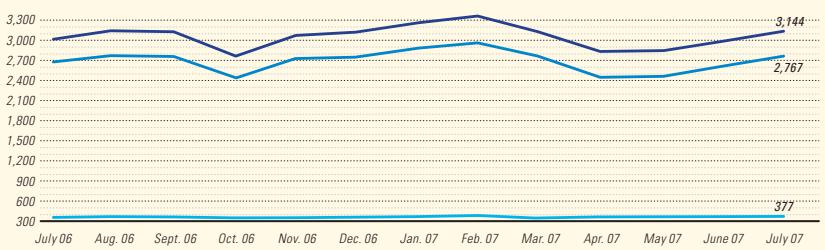
US INDUSTRY SCOREBOARD — 8/20

Latest week 8/3	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	9,659	9,583	0.8	9,287	9,174	1.2
Distillate	4,093	3,928	4.2	4,235	4,143	2.2
Jet fuel	1,620	1,692	–4.3	1,624	1,618	0.4
Residual	696	670	3.9	760	716	6.1
Other products	4,933	4,762	3.6	4,851	4,859	–0.2
TOTAL DEMAND	21,001	20,635	1.8	20,757	20,470	1.4
Supply, 1,000 b/d						
Crude production	5,183	5,170	0.3	5,185	5,096	1.7
NGL production[2]	2,413	2,428	–0.6	2,372	2,185	8.6
Crude imports	10,229	10,181	0.5	10,122	10,045	0.8
Product imports	3,611	3,712	–2.7	3,583	3,578	0.1
Other supply[3]	942	1,265	–25.5	930	1,126	–17.4
TOTAL SUPPLY	22,378	22,756	–1.7	22,192	22,030	0.7
Refining, 1,000 b/d						
Crude runs to stills	15,868	15,420	2.9	15,210	15,221	–0.1
Input to crude stills	16,030	16,161	–0.8	15,464	15.577	–0.7
% utilization	91.9	92.9	—	88.7	89.6	—

Latest week 8/3	Latest week	Previous week[1]	Change	Same week year ago[1]	Change	Change, %
Stocks, 1,000 bbl						
Crude oil	340,395	344,531	–4,136	332,609	7,786	2.3
Motor gasoline	202,997	204,720	–1,723	207,659	–4,662	–2.2
Distillate	127,516	126,542	974	132,422	–4,906	–3.7
Jet fuel-kerosine	41,340	41,119	221	41,117	223	0.5
Residual	38,607	37,190	1,417	41,991	–3,384	–8.1
Stock cover (days)[4]			Change, %		Change, %	
Crude	21.5	21.8	–1.4	21.2	1.4	
Motor gasoline	21.0	21.1	–0.5	21.6	–2.8	
Distillate	31.2	31.1	0.3	32.3	–3.4	
Propane	48.1	49.4	–2.6	66.9	–28.1	
Futures prices[5] **8/10**			Change		Change	Change, %
Light sweet crude, $/bbl	71.91	76.77	–4.86	75.60	–3.69	–4.9
Natural gas, $/MMbtu	6.41	6.25	0.16	7.30	–0.90	–12.3

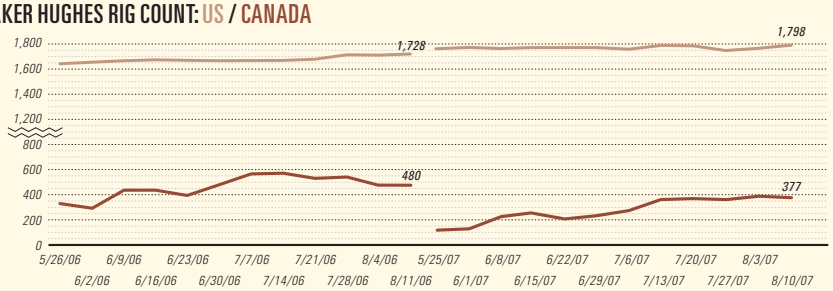
[1]Based on revised figures. [2]Includes adjustments for fuel ethanol and motor gasoline blending components. [3]Includes other hydrocarbons and alcohol, refinery processing gain, and unaccounted for crude oil. [4]Stocks divided by average daily product supplied for the prior 4 weeks. [5]Weekly average 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

Exploration & Development — *Quick Takes*

Total makes oil discovery off Congo

Operator Total E&P Congo made an oil discovery with its Cassiopee Est Marine-1 well on Mer Très Profonde Sud block in ultradeep water off Congo (Brazzaville).

The well, which was drilled to a TD of 3,330 m, flowed 5,600 b/d of oil on test. The MTPS Block lies 170 km offshore in 2,000 m of water. Field development studies will be launched once the reserves are assessed.

Total said the discovery aimed "at building an economically viable pole of development in this ultradeepwater permit."

This is the fourth discovery since 2000 on the MTPS permit, which covers more than 5,000 sq km.

Total has a 40% interest with partners Eni Congo and Esso Exploration & Production Congo (Mer Très Profonde Sud) Ltd., each with 30%.

Cabinda makes 11th oil find off Angola

Chevron Corp. unit Cabinda Gulf Oil Co. Ltd. (Cabgoc) and its partners reported an oil discovery on deepwater Block 14 off Angola.

The well, Malange-1, was drilled in December 2006 in 873 ft of water to a TVD of 15,562 ft. The well found 212 net ft of oil in the Cretaceous-age Pinda reservoir. The well was tested in March and flowed 7,669 b/d of high-quality crude.

The discovery will be followed by further drilling in addition to geologic and engineering studies to appraise the field and assess its potential reserves.

Malange-1 is the first Pinda discovery on Block 14 and the 11th exploration discovery made in Block 14 since 1997. Most recently, Cabinda and its partners drilled its 10th exploration well on Block 14 in January (OGJ Online, Jan. 26, 2007).

Cabgoc serves as operator of the block's contractor group with 31% interest. Partners are Sonangol 20%, Eni Angola Exploration BV 20%, Total E&P Angola 20%, and Galp 9%.

Centurion makes gas discovery in Egypt

Centurion Petroleum Corp., the upstream division of Dana Gas PJSC, made a gas-condensate discovery with its Dabayaa-1 well on the West Manzala exploration concession in Egypt.

On test, the well flowed 16.5 MMcfd of gas and 330 b/d of condensate through a $^{32}/_{64}$-in. choke. Centurion drilled the well to a TD of 3,001 m and encountered a hydrocarbon-bearing interval that extended over a 10-sq-km area.

The well is 6 km from existing facilities. Centurion expects to finalize the new field's development plan so as to bring the well on production, possibly by November.

Centurion has plans to drill a total 12 exploration wells in Egypt before yearend.

Tiger Shoal gulf wildcat finds more pay

McMoRan Exploration Co., New Orleans, said its Flatrock deeper pool discovery well in Tiger Shoal field has encountered Miocene gas-condensate pay in three zones deeper than the five previously indicated productive on South Marsh Island Block 212 in the Gulf of Mexico off Louisiana.

Wireline logs indicated 30 net ft of hydrocarbon-bearing sands in a 120-ft gross interval in one sand, and log-while-drilling tools indicated 41 net ft in a 153-ft gross interval in two sands, all in the Operc section. Drilling has reached 18,100 ft enroute to 19,000 ft to evaluate more of the Operc.

The well previously cut 189 net ft of hydrocarbon-bearing sands in a combined 364-ft gross interval above 16,500 ft in the Rob-L section as indicated by wireline logs (OGJ Online, July 16, 2007).

McMoRan, operator with 25% interest, is permitting three offset locations to provide further options to develop the multiple reservoirs. Plains Exploration & Production Co. holds 30%.

Tiger Shoal field produced more than 3 tcf of gas from less than 12,500 ft. ✦

Drilling & Production — *Quick Takes*

Newfield hikes gas flow in three Texas areas

Newfield Exploration Co., Houston, reported having boosted gas production in the Val Verde basin, Texas Panhandle, and South Texas areas in the quarter ended June 30.

Gas output in the Val Verde basin reached a new high rate of more than 100 MMcfd gross. Development involves the Canyon, Strawn, and Ellenberger formations. Newfield, which entered the basin in 2001 by acquiring properties from EEX Corp., has an average 70% working interest in the basin.

Production from Stiles/Britt Ranch field in Wheeler County in the Texas Panhandle reached a record 74 MMcfd gross, and five operated rigs are running in the field. Newfield is operator with 95-100% working interest.

Production reached a new high of 82 MMcfd gross in a South Texas joint venture with ExxonMobil Corp. in which Newfield has 50% interest. Two rigs are running there, and Newfield has 20 prospects ready to drill. The acreage is in Kenedy, Starr, and Hidalgo counties.

Statoil installs Tordis subsea production system

Statoil ASA has installed the 1,250-tonne Tordis subsea production unit near Gullfaks field in the Norwegian North Sea, using the Saipem S7000 heavy-lift crane vessel.

The system is said to be the world's first subsea installation to separate water and sand from oil wells and pump them directly into the bedrock from the seabed, a process that needs no energy-intensive detour to a surface platform.

The project will improve oil recovery on Tordis to 55% from 49%, essentially producing an additional 35 million bbl of oil (OGJ Online, Aug. 3, 2007).

Marine operations in Tordis field will continue over the next few months, Statoil said. The seabed separator will be tied back now with pipelines and control cables to the Statoil-operated

Gullfaks C platform, and subsea separation will begin this autumn.

Although the unit was successfully installed as planned, a man from Saipem fell overboard and died when the Tordis structure was at a depth of 180 m. Statoil has launched an investigation.

Oil is transported from Tordis by pipeline to Gullfaks C, 11 km to the southeast, for processing, storage, and export.

Operation contract let for Al Zaafarana FPSO

Gemsa Petroleum Co., on behalf of its partners, has let a contract valued at 200 million kroner to Aker Kvaerner for operation, management, and maintenance of the Al Zaafarana floating production, storage, and offloading vessel, which it operates in the Red Sea off Egypt.

The 5-year contract begins Sept. 1 and includes options to extend the primary term.

The 120-dwt FPSO processes about 30,000 b/d of crude oil from Al Zaafarana field. It also stores the produced oil, which is transported onshore via shuttle tankers. It can accommodate a crew of 25.

The vessel previously had undergone repairs of the lower strakes of two longitudinal bulkheads that had corroded (OGJ, Oct. 3, 2005, Newsletter).

Peru heavy oil fields await development

Barrett Resources (Peru) LLC, based in Lima and registered in Delaware, retained a financial advisor to review alternatives to facilitate development of three large heavy oil fields in northeastern Peru.

The Peruvian government recently approved Barrett's initial development plan for Paiche, Piranya, and Dorado fields on Block 67 in the Maranon basin. The analysis of strategic and financing alternatives should be completed by yearend.

The company said development would require 400 km of 16-in. pipeline and production could start in 2010, attaining 100,000 b/d thereafter.

The former Barrett Resources Corp., public Denver independent, discovered the three fields in 1998 and was unable to attract a partner with heavy oil development expertise before its sale to Williams Cos., Tulsa, in August 2001 (OGJ Online, Jan. 17, 2006).

Three 7,000-ft discovery wells identified an estimated 90-313 million bbl of recoverable oil. Dorado cut 71 ft of pay with 14-16° gravity oil. Pirana cut 84 ft of oil pay with 12-21° gravity oil. Paiche cut 179 ft of total pay, including 122 ft of oil pay, with 12-13° gravity oil and low-btu gas. ✦

Processing — *Quick Takes*

PDVSA building refinery in Nicaragua

Venezuela's President Hugo Chavez and his Nicaraguan counterpart Daniel Ortega recently launched construction of a 150,000 b/d refinery in Piedras Blancas, near Nicaragua's Pacific coast and about 90 km west of its capital, Managua.

Because the refinery will produce five times more product than Nicaragua uses, Chavez said the arrangement will transform the Central American nation into a net exporter after start-up in 4-5 years. Plans call for exports to other Central American countries, to the western coast of North America, and possibly to Asia.

Chavez said that total investment in the project could reach $4 billion and that the entire amount will be financed by a newly formed joint venture called Alba de Nicaragua SA (Albanisa). Albanisa is comprised of Petroleos de Venezuela SA (PDVSA) subsidiary PDV Caribe 55% and the Nicaraguan state oil company Petronic 45%.

The immediate investment aim of the Sandino-Bolivar refinery—named in memory of the national heroes of Nicaragua and Venezuela, respectively—will be to increase storage capacity to 27,000 bbl from the current 14,000 bbl. Further plans call for the eventual construction of a petrochemical complex.

Last year, PDVSA said it planned to build a pipeline through Nicaragua to transport oil from the Caribbean to the Pacific, bypassing the Panama Canal (OGJ Online, Dec. 19, 2006).

JV to build Egyptian gas liquids plant

Dana Gas PJSC reported that its Bahraini affiliate Danagaz Bahrain will build, own, and operate the Gulf of Suez gas liquids plant in Egypt by late 2009.

The 55 bcf/year plant, to be built near Ras Shukheir on the western shore of the gulf, will produce 120,000 tonnes/year of propane and butane.

Egyptian General Petroleum Corp. (EGPC) will supply gas for the plant under a long-term supply contract. Danagaz and its partners also have signed the land and sea berth agreements for products exports. Civil engineering and installation construction will be performed by local contractors.

The plant will operate at highly efficient recovery rates, recovering 99% of the propane in the gas stream and 100% of the butane, Dana Gas said. Due to the nature of the gas supply, the project will produce 110,000 tonnes/year of exportable international specification propane, which will represent about 90% of the total gas liquid product from the plant.

France, Spain, Italy, and Turkey are expected to buy propane from the plant. "Potentially higher-margin Indian Ocean region markets are a future possibility," as well, Dana Gas said. The butane produced, about 10,000 tonnes/year, will be sold on long-term contracts to help meet Egypt's domestic requirements.

Gassled to upgrade Karsto gas plant

The Gassled partnership plans to invest 6.5 billion kroner to upgrade electrical and instrumentation systems at the Karsto gas plant north of Stavanger. Work is slated to begin in third quarter 2008 and complete in 2012.

Gassco AS is operator of Gassled and the Karsto plant on behalf of the partners, handling the transportation system and plant system operations. Statoil is the technical services provider.

"The upgrade mainly concerns replacing older with more modern equipment," said Knut Barland, senior vice-president of Statoil's natural gas processing and transport group. Mechanical

modifications and upgrades also will take place to improve regularity, accessibility, and technical safety.

"This is an extensive operation that will take place in many areas of the plant and a number of systems simultaneously," Barland said. "Our main focus will be [health, safety, and the environment] receiving top priority throughout the project period."

More than 30 fields are tied back to Karsto via pipeline, and about 30% of Norway's annual gas exports exit from the Karsto plant. The work will be tailored to planned turnarounds to minimize production disruption, said Arnulf Ostensen, Gassco's vice-president for technical operations.

MW Kellogg Ltd., London, has been awarded a 1 billion kroner contract for KEP2010 engineering work. MW Kellogg has been conducting the pre-engineering since June 2006, with Sorco AS and Norconsult AS serving as subcontractors. ✦

Transportation — *Quick Takes*

Algonquin to begin Ramapo pipeline expansion

Algonquin Gas Transmission LLC soon will begin construction associated with the Ramapo expansion project, which will enable transportation of new volumes of natural gas to two major distribution companies serving the northeastern US.

The $200 million expansion involves replacing a 4.8-mile section of 26-in. pipeline with 42-in. pipe in Ramapo, NY; building a compressor station in Oxford, Conn.; adding turbine compressor units at three existing stations in New York and New Jersey; modifying piping and other facilities at an existing meter station in Ramapo; and rebuilding a meter station in Brookfield, Conn.

The expanded pipeline, to be placed into service in November 2008, will deliver 319 MMcfd of gas to KeySpan Energy and Con Edison of New York via the Millennium Pipeline, currently under construction.

Interest in the pipeline is held 100% by Algonquin's parent company Spectra Energy.

FERC gives approval for Calhoun LNG project

Gulf Coast LNG Partners LP said the US Federal Energy Regulatory Commission has issued the final environmental impact statement for its proposed Calhoun LNG receiving terminal and associated pipeline at Port Lavaca-Point Comfort in Calhoun County, Tex.

FERC concluded in the FEIS that the construction of the Calhoun LNG project, with appropriate mitigating measures as recommended, would be an environmentally acceptable action.

The Calhoun project, slated for full operation in 2009-10, consists of an LNG terminal with two 160,000 cu m storage tanks and 1 bcfd of gas vaporization and liquid separation capacity. It also includes a 27-mile, 36-in. pipeline—Point Comfort Pipeline—which will extend from the terminal and connect with nine major pipelines including five interstate and four intrastate pipeline systems serving Texas and the Midwest, the Northeast, and the Southeast. The Point Comfort Pipeline is designed to transport 1 bcfd.

Earlier this year, GCLP signed a memorandum of understanding for Port Lavaca LNG Services LLC to become operator of the terminal (OGJ Online, Mar. 27, 2007).

Malaysian firm plans tank farms in China

Malaysian trading firm Ben Rautin Sdn. Bhd. plans to develop a cluster of oil tank farms and a port in Lufeng, China, as part of a wider project to build a petroleum hub for the region.

Ben Rautin managing director Ismail Rautin Ibrahim said the firm owns a 30-sq-km site in Lufeng that it plans to develop into the petroleum hub for southern China. The development will be comprised of industrial park, township, tank farms, and a port.

Ben Rautin is working with the Beijing Petroleum Design Institute to determine storage capacity requirements and construction costs, Ismail said.

It also plans to build four storage tanks for petroleum products at Huizhou port, between Lufeng and Shenzhen in southern China. Construction starting dates were not given.

Meanwhile, Ben Rautin will discuss oil supplies and financing for the two projects with investors from the Middle East, which are due in Malaysia next month. Ismail did not name the investors or their counties.

To cut transportation costs, Ismail said, Ben Rautin may use the proposed $7 billion transpeninsular oil pipeline as part of the supply chain transporting crude from the Middle East to the China industrial park.

Last month, Malaysian Prime Minister Abdullah Ahmad Badawi said Malaysia will examine the cost and environmental impact of a proposed multibillion dollar oil pipeline before approving the project (OGJ Online, July 18, 2007).

Earlier, Ranhill Engineers & Constructors secured a contract for the design, engineering, procurement, construction, and testing of a 320-km west-east oil pipeline across Malaysia (OGJ Online, May 29, 2007).

Pertamina plans LNG plant at Senoro

Indonesia's PT Pertamina will join Mitsubishi Gas Chemical Co. Inc. in building a $1 billion LNG plant at Senoro in Central Sulawesi. An agreement will be signed by Indonesia and Japan when Japanese Prime Minister Shinzo Abe visits Indonesia Aug. 19-21, said Pertamina Pres. Director Ari Sumarno.

Construction of the 2 million tonnes/year plant is scheduled to begin this year and to come on stream by 2010.

Mitsubishi, which will become the sole buyer of the facility's LNG, is the project's majority shareholder, with a 51% stake, while Pertamina owns 29% and Medco, 20% (OGJ Online, Jan. 19, 2007).

Source gas will come from the Senoro Block, which has 1.53 tcf of proved reserves and is jointly operated by Pertamina and Medco. Additional supplies will come from Pertamina-operated Matindok Block, which has 0.7 tcf of proved reserves.

The Senoro LNG plant is one of four energy deals to be signed between Indonesia and Japan, according to Energy and Mineral Resources Minister Purnomo Yusgiantoro. The other three agreements will take up the development of a gas pipeline and two coal-fired power plants. ✦

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2007

AUGUST

American Chemical Society National Meeting & Exposition, Boston, (202) 872-4600, (202) 872-4615 (fax), e-mail: natlmtgs@acs.org, website: www.acs.org. 19-23.

NAPE Summer Expo, Houston, (817) 847-7700, (817) 847-7703 (fax), e-mail: nape@landman.org, website: www.napeonline.com. 23-24.

IADC Well Control of the Americas Conference & Exhibition, Galveston, Tex., (713) 292-1945, (713) 292-1946 (fax); e-mail: info@iadc.org, website: www.iadc.org. 28-29.

SEPTEMBER

Brasil Subsea Conference & Exhibition, Rio de Janeiro, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.pennwellpetroleumgroup.com. 1.

SPE/EAGE Reservoir Characterization and Simulation Conference, Muscat, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 3-5.

Rocky Mountain Crude Oil Market Dynamics Summit, Denver, (405) 525-3556, (405) 525-3592 (fax), e-mail: iogcc@iogcc.state.ok.us, website: www.iogcc.state.ok.us/events.html. 4-5.

Power-Gen Asia Conference, Bangkok, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.pennwell.com. 4-6.

Offshore Europe Oil & Gas Conference and Exhibition, Aberdeen, +44 (0) 208 439 8890, +44 (0) 208 439 8897 (fax), e-mail: oe2007@spearhead.co.uk, website: www.offshore-europe.co.uk. 4-7.

Black Sea Oil & Gas Summit, Istanbul, +90 312 454 00 00-1412, +90 312 454 00 01, e-mail: bsogs2007@flaptour.com.tr, website: www.bsogs2007.org. 5-6.

Iraq Petroleum Conference, Dubai, +44 (0)20 7978 0075, +44 (0)20 7978 0099 (fax) website: www.thecwcgroup.com. 8-10.

Corrosion Solutions Conference, Sunriver, Ore., (541) 926-4211, ext. 6280, website: www.corrosionconference.com. 9-13.

Global Refining Strategies Summit, Houston, (416) 214-3400, x3046, (416) 214-3403 (fax), website: www.globalrefiningsummit.com. 10-11.

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

Annual LNG Tech Global Summit, Rotterdam, +44 (0) 20 7202 7511, e-mail: anne.shildrake@wtgevents.com, website: www.lngsummit.com. 10-12.

SPE Asia Pacific Health Safety Security Environment Confer-

ence, Bangkok, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 10-12.

Turbomachinery Symposium, Houston, (979) 845-7417 (979) 845-1835 (fax), e-mail: turbo@turbo-lab.tamu.edu, website: http://turbolab.tamu.edu. 10-13.

Oil Sands Trade Show & Conference, Fort McMurray, Alta., (403) 209-3555, (403) 245-8649 (fax), website: www.petroleumshow.com. 11-12.

EXPOGAZ Gas Congress, Paris, 01 41 98 40 25, e-mail: lberthier@etai.fr, website: www.congresdugaz.fr. 11-13.

European Gas Forum, Paris, 01 41 98 40 25, e-mail: lberthier@etai.fr, website: www.congresdugaz.fr. 12-13.

AAPG Annual Eastern Meeting, Lexington, (859) 257-5500, ext. 173, website: www.esaapg07.org. 16-18.

United States Association for Energy Economics/IAEE North American Conference, Houston, (216) 464-2785, (216) 464-2768 (fax), website: www.usaee.org. 16-19.

API Fall Refining and Equipment Standards Meeting, San Antonio, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org. 17-19.

Annual American School of Gas Measurement Technology Event, Houston, (972) 224-5111, (972) 224-5115 (fax). e-mail: asgmt2007@aol.com, website: www.asgmt.com. 17-20.

IOGCC Annual Meeting, New Orleans, (405) 525-3556, (405) 525-3592 (fax), e-mail: iogcc@iogcc.state.ok.us, website: www.iogcc.state.ok.us. 23-25.

Society of Exploration Geophysicists (SEG) Annual Meeting, San Antonio, (918) 497-5500, (918) 497-5557 (fax), e-mail: web@seg.org, website: www.seg.org. 23-28.

Russia & CIS Petrochemicals Technology Conference & Exhibition, Moscow, +44 (0) 20 7357 8394, e-mail: Conferences@EuroPetro.com, website: www.europetro.com. 25-26.

Annual Engineering & Construction Contracting Association Conference, Colorado Springs, Colo., (877) 484-3322, (713) 337-1644 (fax), e-mail: Twilson@EventsiaGroup.com, website: www.ecc-association.org. 26-29.

Annual Engineering & Construction Contracting Association Conference, Colorado Springs, Colo., (877) 484-3322, (713) 877-8130 (fax), e-mail: registration@ecc-association.org, website: www.ecc-association.org. 27-28.

Russia & CIS Refining Technology Conference & Exhibition, Moscow, +44 (0) 20 7357 8394, e-mail: Conferences@EuroPetro.com, website: www.europetro.com. 27-28.

OCTOBER

IPLOCA Convention, Sydney, +41 22 306 0230, e-mail: info@iploca.com, website: www.iploca.com. 1-5.

Well Control Gulf of Mexico Conference, Houston, (979) 845-7081, (979) 458-1844 (fax), e-mail: jamie@pe.tamu.edu, website: www.multiphasre-research.org. 2-3.

ISA EXPO, Houston, (919) 549-8411, (919) 549-8288 (fax) website: www.isa.org. 2-4.

Rio Pipeline Conference and Exposition, Rio de Janeiro, +55 21 2121 9080, e-mail: eventos@ibp.org.br, website: www.ibp.org.br. 2-4.

ISA EXPO, Houston, (919) 549-8411, (919) 549-8288 (fax) website: www.isa.org. 2-4.

Kazakhstan International Oil & Gas Exhibition & Conference, Almaty, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 2-5.

Regional Deep Water Offshore West Africa Exploration & Production Conference & Exhibition, Luanda, +31 (0)26 3653444, +31 (0)26 3653446 (fax), e-mail: g.kreeft@energywise.nl, website: www.dowac.com. 2-6.

GPA Rocky Mountain Annual Meeting, Denver,

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(918) 493-3872, (918) 493-3875 (fax), e-mail: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 3.

IFP Symposium The Capture and Geological Storage of CO2, Paris, +33 1 47 52 70 96 (fax), e-mail: patricia.fulgoni@ifp.fr, website: www.ifp.fr. 4-5.

IPAA OGIS West, San Francisco, (202) 857-4722, (202) 857-4799 (fax), website: www.ipaa.org/meetings. 7-9.

Annual European Autumn Gas Conference, Düsseldorf, +44 (0)20 8241 1912, +44 (0)20 8940 6211 (fax), e-mail: info@theeagc.com, website: www.theeagc.com. 9-10.

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

NPRA Q&A and Technology Forum, Austin, (202) 457-0480, (202) 457-0486 (fax), e-mail: info@npra.org, website: www.npra.org. 9-12.

Deep Offshore Technology (DOT) International Conference & Exhibition, Stavanger, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.deepoffshoretechnology.com. 10-12.

International Bottom of the Barrel Technology Conference & Exhibition, Athens, +44 (0) 20 7357 8394, e-mail: Conferences@EuroPetro.com, website: www.europetro.com. 11-12.

The Athens Summit on Global Climate and Energy Security, Athens, +30 210 688 9130, +30 210 684 4777 (fax), e-mail: jangelus@acnc.gr, website: www.athens-summit.com. 14-16.

ERTC Petrochemical Conference, Brussels, 44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 15-17.

Oil Shale Symposium, Golden, Colo., (303) 384-2235, e-mail: jboak@mines.edu, website: www.mines.edu/outreach/cont_ed/oilshale. 15-19.

GPA Houston Annual Meeting, Kingwood, Tex., (918) 493-3872, (918) 493-3875 (fax), e-mail: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 16.

Global E&P Technology Summit, Barcelona, +44 (0) 20 7202 7511, e-mail: anne.shildrake@wtgevents.com, website: www.eptsummit.com. 16-17.

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

PIRA New York Annual Conference, New York, 212-686-6808, 212-686-6628 (fax), e-mail: sales@pira.com, website: www.pira.com. 18-19.

IPAA Annual Meeting, New Orleans, (202) 857-4722, (202) 857-4799 (fax), website: www.ipaa.org/meetings. 22-24.

SPE/IADC Middle East Drilling and Technology Conference, Cairo, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 22-24.

World Energy & Chemical Exhibition and Conference, Kuwait City, +32 2 474 8264, +32 2 474 8397 (fax), e-mail: d.boon@bruexpo.be, website: www.wecec-kuwait.com. 22-25.

Louisiana Gulf Coast Oil Exposition (LAGCOE), Lafayette, (337) 235-4055, (337) 237-1030 (fax), website: www.lagcoe.com. 23-25.

Pipeline Simulation Interest Group Annual Meeting, Calgary, Alta, (713) 420-5938, (713) 420-5957 (fax), e-mail: info@psig.org, website: www.psig.org. 24-26.

GSA Annual Meeting, Denver, (303) 357-1000, (303) 357-1070 (fax), e-mail: gsaservice@geosociety.org, website: www.geosociety.org. 28-31.

✦TAML Multilateral Knowledge-Sharing Conference, Reims, +44 (0) 1483 598000, e-mail: info@taml.net, website: www.taml.net. 29.

✦Expandable Technology Forum, Reims, +44 (0) 1483 598000, e-mail: info@expandableforum.com, website: www.expandableforum.com. 30-31.

Asia Pacific Oil and Gas Conference and Exhibition, Jakarta, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. Oct. 30-Nov. 1.

Chem Show, New York City, (203) 221-9232, ext. 14, (203) 221-9260 (fax), e-mail: mstevens@iecshows.com, website: www.chemshow.com. Oct. 30-Nov. 1.

Methane to Markets Partnership Expo, Beijing, (202) 343-9683, e-mail: asg@methanetomarkets.org, website: www.methanetomarkets.org/expo. Oct. 30-Nov. 1.

NOVEMBER

IADC Annual Meeting, Galveston, Tex., (713) 292-1945, (713) 292-1946 (fax), e-mail: info@iadc.org, website: www.iadc.org. 1-2.

Deepwater Operations Conference & Exhibition, Galveston, Tex., (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.deepwateroperations.com. 6-8.

IPAA Annual Meeting, San Antonio, (202) 857-4722, (202) 857-4799 (fax), website: www.ipaa.org/meetings. 7-9.

Regional Mangystau Oil & Gas Exhibition & Conference, Aktau, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 7-9.

GPA North Texas Annual Meeting, Dallas, (918) 493-3872, (918) 493-3875 (fax), e-mail: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 8.

GPA North Texas Annual Meeting, Dallas, (918) 493-3872, (918) 493-3875 (fax), e-mail: pmirkin@gasprocessors.com, website: www.gasprocessors.com. 8.

SPE Annual Technical Conference and Exhibition, Anaheim, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 11-14.

World Energy Congress, Rome, +39 06 8091051, +39 06 80910533 (fax), e-mail: info@micromegas.it, website: www.micromegas.it. 11-15.

API/NPRA Fall Operating Practices Symposium, San Antonio, (202) 682-8000, (202) 682-8222 (fax), website: www.api.org. 13.

Houston Energy Financial Forum, Houston, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.accessanalyst.net. 13-15.

Turkemenistan International Oil & Gas Conference, Ashgabat, +44 207 596 5016, e-mail: oilgas@ite-exhibitions.com, website: www.ite-exhibitions.com/og. 14-15.

Australian Society of Exploration Geophysicists International Geophysical Conference & Exhibition, Perth, (08) 9427 0838, (08) 9427 0839 (fax), e-mail: secretary@aseg.org.au, website: www.aseg.org.au. 18-22.

ERTC Annual Meeting, Barcelona, 44 1737 365100, +44 1737 365101 (fax), e-mail: events@gtforum.com, website: www.gtforum.com. 19-21.

Asia Pacific Natural Gas Vehicle Conference & Exhibition, Bangkok, +66 0 2617 1475, +66 0 2271 3223 (fax), e-mail: angva@besallworld.com, website: www.angvaevents.com. 27-29.

IADC International Well Control Conference & Exhibition, Singapore, (713) 292-1945, (713) 292-1946 (fax), e-mail: info@iadc.org, website: www.iadc.org. 28-29.

DECEMBER

International Oil and Gas Industry Exhibition & Conference, Suntec, +44 (0)20 7840 2100, +44 (0)20 7840 2111 (fax), e-mail: osea@oesallworld.com, website: www.allworldexhibitions.com. 2-5.

Middle East Nondestructive Testing Conference & Exhibition, Bahrain, +973 17 729819, +973 17 729819 (fax), e-mail: bseng@batelco.com.bh, website: www.mohandis.org. 2-5.

International Petroleum Technology Conference, Dubai, +971 4 390 3540, +971 4 366 4648 (fax), e-mail: iptc@iptcnet.org, website: www.iptcnet.org. 4-6.

IADC Drilling Gulf of Mexico Conference & Exhibition, Galveston, Tex., (713) 292-1945, (713) 292-1946 (fax), e-mail: info@iadc.org, website: www.iadc.org. 5-6.

Oil & Gas Maintenance & Technology Conference & Exhibition, Manama, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.oilandgasmaintenance.com. 9-13.

Pipeline Rehabilitation & Maintenance Conference & Exhibition, Manama, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.oilandgasmaintenance.com. 9-13.

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.

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Kuwait is the Persian Gulf's fourth largest oil producer and maintaining momentum to raise production capacity from around 2.6 million barrels a day to 4 million by 2020. The government is preparing to outline plans for the $ 9bn "Project Kuwait" upstream opening by the end of June. In comments reported by the Kuwait News Agency in April, the oil minister said the oil ministry would come up with a project outline within a couple of months. "Project Kuwait" is intended to use international oil company (IOC) investment to double oil production at five northern fields to around 0.9m b/d.

The oil minister says, the state owned refinery operator Kuwait National Petroleum Company (KNPC) had revised its budget estimates for the Al-Zour refinery to $ 12bn, up from the original budget of $ 6,3bn. The 600 m b/d refinery at Al-Zour is intended to provide clean fuel for power generation.

Symposium topics

Advancement in Heavy Oil Production and Processes, such as:

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b. PVT and Phase Behavior Challenges
c. Drilling Technology
d. Modern Recovery Processes
e. Other Relevant Technologies

Upgrading and Refining of Heavy Crude, such as:

a. In-Situ Upgrading of Heavy Oil
b. Latest Catalyst Developments
c. Residuals Upgrading and Processes
d. Scale-up and Modeling for Heavy Oils
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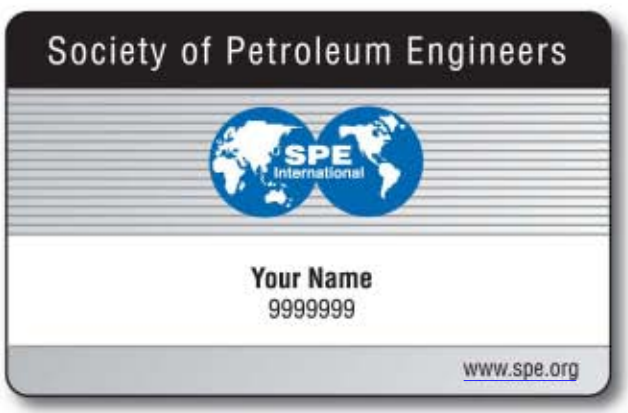

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Evolution of an industry

Judy Clark
Senior Associate Editor

China is looking for workers with engineering or technical skills or otherwise able to provide specialty energy services to a country experiencing explosive economic growth and zealously seeking the energy to fuel it.

The Chinese government in 1982 adopted international codes and standards and enabled foreign enterprises to collaborate in oil and gas exploitation. Since then, these companies have contributed to complex projects, specialty work, onshore fabrication, and offshore installations.

In the 1980s, there were few qualified Chinese engineering, procurement, and construction contractors. They came from Japan—"even welders for welding jackets and platforms," said CNOOC Engineering Co. Pres. Xizhao Jiang, who was a guest speaker last May at the Offshore Technology Conference in Houston.

In 1990, CNOOC exploration moved into the South China Sea. Equipment became more sophisticated with the first heavy jacket substructure. CNOOC formed a consortium with international companies for projects after 1990.

From 2000 CNOOC introduced more international quality in projects execution. It built 90 platforms and 2,500 km of pipelines and developed engineering and procurement capability, accomplishing most of the projects itself.

China's capabilities have advanced rapidly, with more engineering, procurement, and construction, onshore fabrication, testing, commissioning, loadout, and off and onshore transportation capabilities.

Demand forecast

China's gross domestic product has increased by more than 10%/year since 2002. In 2006 GDP was $2.68 trillion, Xizhao said, about one fifth that of the US.

China is the world's second largest oil consumer, using 7.5 million b/d in 2005. This consumption will be the driver for finding other methods and types of energy.

China is constructing LNG terminals and developing offshore wind, tide, solar, and other clean energy initiatives.

The government supports increased gas use—now only 3% of total energy consumption—and intends to make LNG imports a major goal. Ten LNG terminals are planned.

Five fabrication yards are working along China's coast, and a heavy derrick laybarge under construction will enable pipelaying in water to 3,000 m.

Oil and gas materials and equipment supplies are being produced locally, with supplies from international manufacturers and vendors providing the heavy or specialty equipment. Steel production in China has almost doubled in the last 5 years, making available more steel for offshore requirements.

Yet China remains in need of many technologies.

Opportunities

Although China is beginning to fill its own general needs, a shortage of skilled talent in specialty disciplines and advanced technologies will present opportunities.

A greater emphasis on the environment and disaster weather scenarios will make project risk control more important.

Currently offshore activities just meet basic requirements, but stricter industry codes and standards will be accepted, requiring more training.

Managing and controlling megaprojects will require a new energy regimen needing more international cooperation.

China will accelerate field development and construction facilities related to LNG and LPG. Supplies of manpower, materials, and fabrication are needed.

Shipbuilding remains one of the most active industries in the Chinese economy.

The oil industry in China will need to build more platforms and other offshore facilities, repair some existing structures and decommission others, and move operations into water as deep as 1,500 m.

CNOOC each year brings five or six offshore projects on stream and expects to continue doing so for 5-10 years.

It will invest $1.3 billion in engineering and construction in the next 4-5 years, with about 10% of that going to foreign contractors.

Training in more-advanced disciplines will have to be from experts overseas, Xizhao said, for the complex projects, specialty work, onshore fabrication, and offshore installations.

Many opportunities will exist for international companies in next 10-20 years as China's offshore industry matures. ✦

Editorial

Raising gasoline taxes

Tragic events give the US oil industry a chance to claim principled ground in its relations with customers. It must not miss the opportunity.

The collapse on Aug. 1 of a busy interstate-highway bridge in Minneapolis, the death toll for which had reached nine at this writing, has revived calls for increased taxation of gasoline. A spokesman for the US House Transportation and Infrastructure confirmed that a tax hike is under consideration. President George W. Bush has expressed reluctance to support the idea (OGJ Online, Aug. 10, 2007).

Standard argument

Bridge-maintenance needs thus join the standard argument for a deepened tax bite on gasoline: that it would discourage oil consumption and thereby reduce emissions of air pollutants and greenhouse gases, lower US dependence on foreign oil, preserve a depleting resource for future generations, and keep money away from foreign regimes that support terrorism. Each of those claims has weaknesses. But the industry doesn't need to address them when gasoline taxes are at issue. All the industry needs to do is oppose new taxation for the simple reason that higher taxes would hurt its customers. That's all. That's enough.

For oil consumers, these are not happy times. Growing demand and limited supply have pushed prices of gasoline and other oil products to uncomfortable levels. Inevitably, the government has blundered to the rescue with ill-conceived, politically motivated responses that can only aggravate the stress. Against prices elevated by market forces, consumers need no protection because they hold the ultimate defense: the option to consume less. Against costs imposed by politicians claiming to act on their behalf, consumers aren't so lucky. Here, they need an advocate. What better advocate can there be for oil and gas consumers than the industry that supplies oil and gas?

Within that industry, however, support always can be found for a gasoline tax hike. The view usually rests on the supposed need to lower consumption. Coming from the oil industry, this position can be made to seem self-sacrificial and therefore especially righteous. Within the industry itself, it can feel like the moral high ground.

Yet the assertion that lower gasoline use merits taxation carries poisonous implications. One of them is that some optimum rate of consumption exists, always below the current level, toward which it is the business of government to steer markets. But what is that optimum consumption level? Politicians and oil companies have no way of knowing and can only guess at the answer. A variation of this implication is that any lower rate of consumption is always better than the present level. In that case, there is no logical limit to the taxation rate.

Demand-based arguments for new federal taxes moreover imply that gasoline use inherently contradicts national interests. The assertion is wrong; when espoused by anyone in the oil industry it's hypocritical. The national benefits of gasoline use, which relate to unrivaled cost and convenience, far outweigh the disadvantages, mainly the environmental risks. The oil industry should focus its politics on that balance and its strategies on the environmental performance of its products and operations.

Playing defense

Attacked in politics continuously and from many directions, the oil industry always plays defense. Its public message thus tends to ring with negativity: Oil companies do not manipulate prices; their work doesn't spoil the environment; they don't have profit margins as wide as everyone thinks. This is no way to earn general political support.

The better, positive approach is to advocate strongly, noisily, and consistently on behalf of oil industry customers—energy consumers—even when they're angry about the price of gasoline. The way to do that consistently is to assert free markets over government manipulation in all matters related to energy. And the way to do it immediately is to point out the roaring fallacy of popular comparisons of oil price increases with tax hikes. The markets that raise oil prices eventually cycle and lower the harm to consumers. The governments that raise taxes seldom reverse course and more often—as the House is considering now—just return for more. ✦

China fills first SPR site, faces oil, pipeline issues

Gabriel Collins
US Naval War College
Newport, RI

After 10 years of indecision, China is building a strategic petroleum reserve (SPR) to protect against possible oil supply cutoffs and is addressing the companion issues of securing sufficient oil and improving the country's pipeline and refining infrastructure to accommodate the reserves.

From 1993 until Hu Jintao's accession to power in 2003, the "build" and "don't build" factions' debate raged within China over the merits of an SPR. This debate likely was prolonged by China's lack of a powerful central energy ministry that could control the various government bureaucracies, state oil companies, and other stakeholders who compete to shape China's energy policy. China's Ministry of Energy (1988-93) was dissolved after energy producers incorporated in 1988 and refused to work with the new ministry.

In 2004, however, Chinese companies began building four Phase 1 reserve sites. In 2006 China commenced filling the first site at Zhenhai, which reportedly was completed in June of this year.

Chinese firms also are improving the pipeline and refining infrastructure essential for utilizing SPR oil during a crisis. Fig. 1 provides a timeline of China's SPR plans.

Challenges

However, China also is facing important challenges in planning its SPR, including:

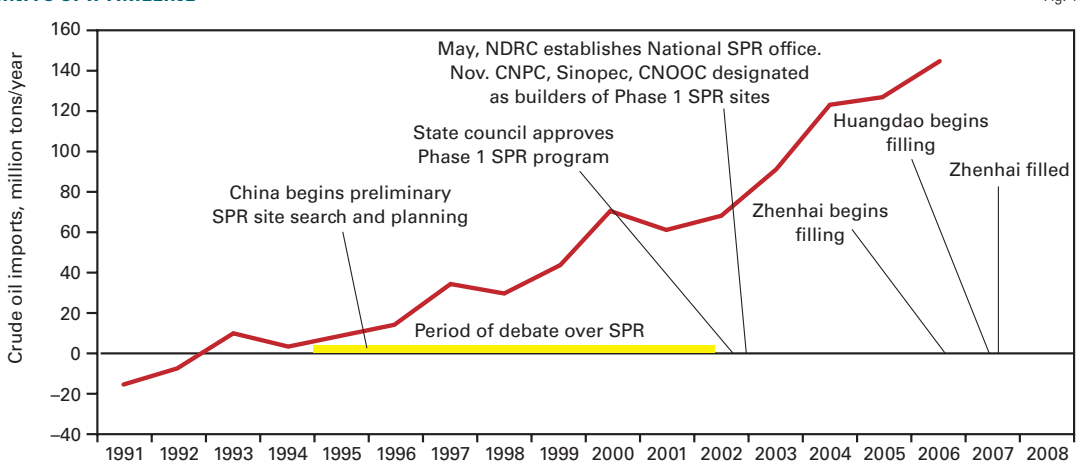
- High construction, storage, and oil acquisition costs.
- The need to formulate SPR management guidelines.
- Criticism for driving up world oil prices. This has created a vicious circle in which Chinese decision-makers found that opacity and transparency both lead to condemnation, and they ultimately chose opaque SPR oil acquisition practices.

Some Chinese analysts believe that an SPR can be used to control oil price swings. If China uses its SPR for price management, however, it would create conflict with the International Energy Agency (IEA), which helps govern the Organization for Economic Cooperation and Development countries' stockpile use. At the December 2006 Five Country energy ministers' meeting in Beijing, Chinese officials said the SPR would not be used for price management. A June 17 report from Xinhua Financial Network News, nevertheless, notes that 30% of the SPR's capacity may be leased out to commercial firms. If so, commercial and strategic storage space should be kept physically separate, or else pressure could arise to manipulate stockpile levels in response to price concerns.

The content of, and opinions expressed in, this article do not necessarily reflect official US government assessments or policies.

CHINA'S SPR TIMELINE

Fig. 1



Source: Beijing Petroleum Managenment Institute, 2006, Journal of Military Economics Academy, 2005

High costs and other factors may drive China to adopt a more flexible SPR management system than that used by Japan and the US. China's SPR is still a work in progress and is characterized more by a "crossing the river by feeling the stones" approach than by a coherent national policy. This analysis attempts to arrange the "stones" by examining the following aspects of China's SPR development:

- China's current SPR construction status.
- Possible operational models.
- Potential methods of SPR financing and management.
- Sources of oil for China's SPR.
- SPR connections to broader refining and pipeline systems.
- Key unresolved issues.

Current status

China's SPR is being constructed in three phases. In Phase 1, due to be completed by yearend 2008, some 100 million bbl of crude oil will be stored at Dalian and Huangdao, in Shandong, and Zhenhai and Zhoushan in Zhejiang province, roughly 150 km from Shanghai. Zhenhai has taken cargoes from Russia and the Middle East, and Zhoushan is injecting crude from the Middle East and Africa—particularly Angola, Iran, and Sudan—as well as local production from Bohai Gulf and Liaohe fields. The Huangdao reserve is almost certain to begin filling by yearend unless oil prices spike. The Dalian SPR site is set to be completed in 2008. Fig. 2 provides details on the status and capacities of the four Phase 1 SPR sites.

April 2007 data showed a disparity of more than 600,000 b/d between China's crude oil imports and refinery throughputs. While some of this gap may be attributable to spotty data, it is likely that a sizeable proportion of this oil flowed into commercial and strategic stockpiles. China's SPR fill rate is price-sensitive, and the final authority to purchase crude for the reserve lies with the State Council.

Phases 2 and 3 will bring China's strategic crude holdings to 300 million and 500 million bbl, respectively. Sites are still being determined. The port of Caofeidian on the Bohai Gulf 120 km northeast of Beijing apparently has been selected as a Phase 2 reserve base. Caofeidian will be able to accommodate very large crude carriers (VLCCs) and will be located near substantial refining and petrochemical projects. It also lies near the giant new Jidong Nanpu oil field, which by 2010 could be producing 200,000 b/d.

China is considering a Phase 2 SPR site in Northwestern Gansu province, which could be fed with crude piped in from Kazakhstan and Xinjiang. It would lie near Lanzhou, which has a large refining capacity. The cities of Nansha and Bao'an in Guangdong province and a site on Hainan Island are also on the Phase 2 short list. China does not appear to have begun formal selection of Phase 3 sites. Fig. 3 shows Phase 1 SPR sites and projected Phase 2 sites.

CHINA'S PHASE 1 SPR SITE DETAILS

Fig. 2

Zhenhai
- Sinopec responsible for constructing and managing the reserve.
- 52 tanks storing about 33 million bbl.
- Site is 1.032 sq km.
- Construction cost is 370 million RMB (Yuan).
- Site has taken sour cargoes from Russia and the Middle East.
- Zhenhai Refining & Petrochemicals Ltd. is China's biggest sour crude refining center (~240,000 b/d sour oil capacity).
- Reasons for location of SPR site: near Ningbo oil port, refineries (near Zhenhai Refining & Petrochemicals Co.), and the Hu-Ning pipeline network.
- 99 staffers, mainly from Zhenhai Refining & Petrochemicals.
- Tanks are now filled.

Huangdao
- Operated by Sinopec.
- Site not yet operational.
- Filling slated to begin by yearend 2007.
- 32 tanks with 100,000 cu m each capacity.
- 12 tanks built, 20 scheduled to be completed by yearend 2007.
- Tanks being built by "Number Two Reserve Tank Construction & Engineering Co."

Dalian
- Operated by China National Petroleum Corp. (CNPC).
- Site not yet operational.
- Could by filled by mid-2008.

Zhoushan
- Operated by Sinochem.
- Now being filled. Filling began in May 2007 with a 2 million bbl cargo of sour Iraqi crude (via Singapore).
- 100,000 cu m tanks with 32 million bbl storage capacity.
- 24 tanks complete as of July 2007.
- Has 250,000 dwt and 100,000 dwt oil wharves.

Source: Xinhua Financial News, Argus Monthly Vol. 1, Issue 6, June 2007, China 5E, Oil and Gas Storage and Transportation

Operational models

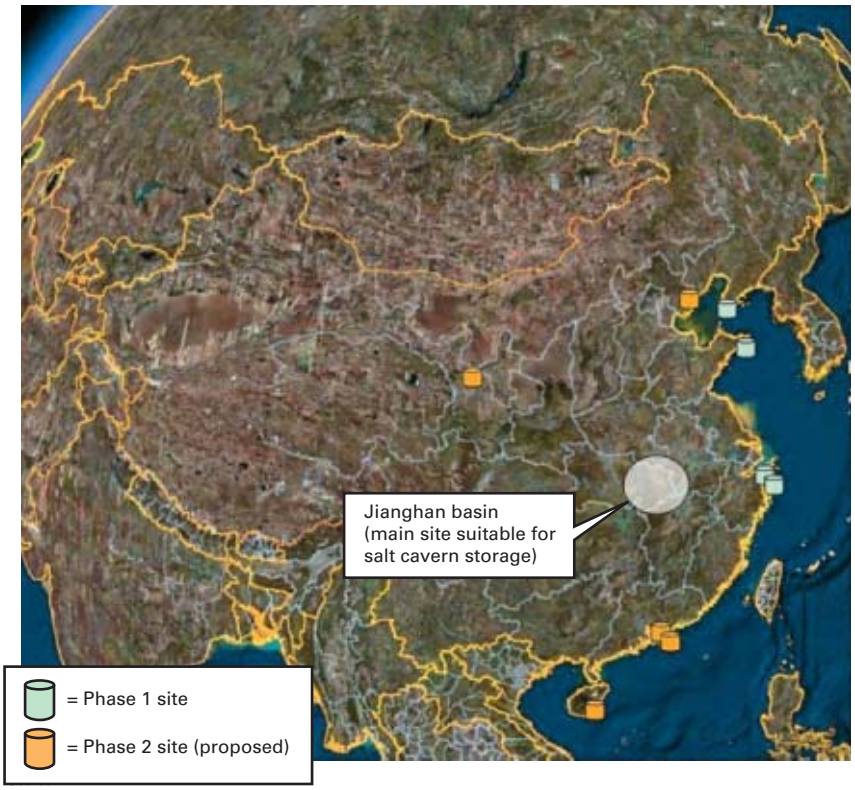
As Chinese analysts consider models for China's SPR, they primarily look to the US, Japan, and South Korea.

- ***US model.*** The fully government-funded US SPR consists primarily of 62 solution-mined caverns in salt domes along the Texas and Louisiana Gulf Coast that can store up to 727 million bbl of crude. DynMcDermott Corp. manages these sites on behalf of the US Department of Energy at a project management office in New Orleans.

US SPR management policies are conservative. The president can order a "full drawdown" of the SPR to offset a severe oil supply disruption caused by an interruption in imports, interruptions in domestic oil supplies, or an "act of God," such as floods, hurricanes, or other disruptions. He also can order a limited drawdown to cope with less serious interruptions that would have deleterious economic effects. Limited drawdowns cannot exceed 30 million bbl, last more than 60 days, or take the

CHINA'S PHASE 1 AND 2 SPR SITES

Fig. 3



SPR inventory below 500 million bbl.

The US secretary of energy has the authority to conduct test sales of less than 5 million bbl and use exchanges to introduce higher-quality crude into the SPR or help oil companies resolve delivery problems. If a ship accident blocks a channel, for example, a company can borrow or exchange crude with DOE to forestall refinery shutdowns and then return an equal volume plus an exchange premium within 1-6 months.

As of June 20, 2007, private oil companies operating in the US maintained crude and product stocks of roughly 340 million bbl, but these stocks are intended to cover commercial demands, and they provide far less forward coverage than the SPR. Unlike Japan and South Korea, the US has no mandatory commercial stockpiling.

- **Japan.** Japan uses a hybrid stockpiling system in which the government stores 292 million bbl of crude in tanks and mined rock caverns at 10 national petroleum stockpiling bases and tanks leased from private firms. Private companies are required to store a minimum of 70 days worth of oil imports. Roughly half of this is stored as crude oil and half as oil products. As of March 2006, the combined government and private stocks provide 168 days of import protection. Japanese SPR drawdown standards are considered to be even more rigid than those of the US.
- **South Korea.** Korean National Oil Co. (KNOC) currently stores roughly 78 million bbl of crude, while private Korean oil companies must maintain 40 days of forward coverage for domestic supplies. Korean oil stockpiling is funded by duties imposed on petroleum imports. Through KNOC, the Korean government takes a liberal approach to stockpile management, using measures such as joint oil stockpiling and "time swaps." Joint stockpiling means that KNOC leases storage space at 65¢-$1.00/bbl/year to petroleum producing countries in exchange for the preemptive right to purchase the stored crude in the event of a supply disruption.

China's approach

China appears to be pursuing a state-private SPR system. National Development and Reform Commission (NDRC) head Ma Kai says the commercial oil stocks of China National Petroleum Corp., Sinopec, and China National Offshore Oil Co. Ltd. will all play a role in China's SPR. As of June 2007 these stocks provide about 21 days of forward coverage. According to some sources, NDRC wants China's SPR to be run like the state grain and cotton stockpiles, which are managed by dedicated state-owned management companies who "manage autonomously and bear sole responsibility for profits and losses." One key difference is that the strategic petroleum reserve will be far more centralized than the grain and cotton reserves, which have management at the provincial, county, and city levels.

Recent events, such as the Xinhua report that China may allocate 30% of its SPR capacity for private companies' use, indicate that China may be incorporating commercial stocks into its SPR. It remains to be seen whether such reserves would be dynamically managed as in South Korea, or simply stocks that companies are forced to hold, as in Japan.

Under new rules promulgated by the Ministry of Commerce, Chinese crude oil wholesalers must now maintain at least 200,000 cu m (1.26 million bbl) of storage capacity, 50 times more than the previous requirement of 4,000 cu m.

Companies are preparing for their oil storage role. Sinopec is building more than 100 large oil storage tanks, adding to its 400 existing 30,000 cu m tanks and giving it the ability to store more than 15 million bbl of crude. In addition, Sinopec is setting up a central oil reserve management unit that will be the first of its kind among China's national energy companies (Fig. 4).

In 2004, China created an SPR office within the NDRC's Energy Bureau.

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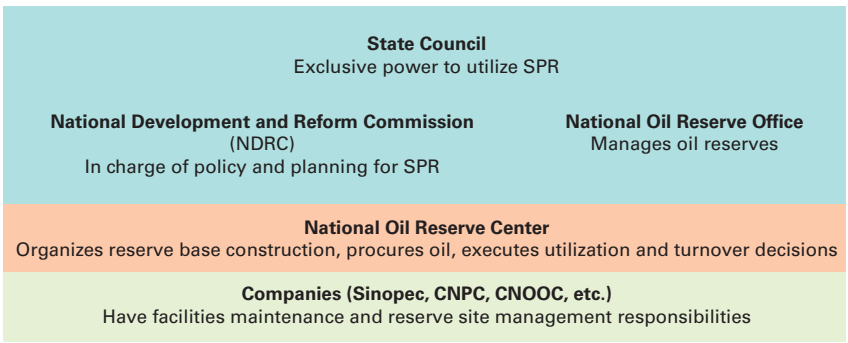
CHINA SPR MANAGEMENT AND CONTROL STRUCTURE

Fig. 4



Source: Pei Jianjun, NDRC

However, little specific information has been released. Also, it is unclear what role the Ministry of Commerce may have in running China's SPR.

Trevor Houser of China Strategic Advisory notes that the Zhenhai reserve appears to be operated more like a commercial storage facility than a US-style SPR, as Sinopec appears to be leasing tank space from the government. One advantage of having integrated oil companies operate the sites is that they will store appropriate crude streams for local refineries. In addition, regular inventory draws help maintain oil quality because oil stored in tanks needs to be circulated periodically.

If SPR site managers truly bear responsibility for profits and losses, they may be pressured to maximize returns by selling oil when prices are high and acquiring it when they fall. In essence, the SPR could eventually be run like the storage tanks used by traders in Cushing, Okla., rather than like a true strategic reserve. As such, China's new energy law will need to include restrictions on drawdowns in situations other than major supply disruptions. This could ensure inventory maintenance while reducing the incentive to manipulate prices.

SPR finance

China's SPR likely will combine commercial and government stocks because China may be unable to afford a US-style, fully government-funded SPR. The US has spent a total of $22 billion on its SPR. Of this, $5 billion was for facility construction and $17 billion for crude oil acquisition. US strategic reserves were purchased at an average of $27/bbl.

China is storing its Phase 1 reserves in aboveground steel tanks, which cost several times as much per barrel as solution-mined salt caverns. China also did not begin stockpiling oil until prices were already at $50/bbl or more. At the Jan. 29, 2007, Petrostock conference, Pei Jianjun, division chief of NDRC, noted that due to the high costs of building an SPR, China will need to establish stable and diversified long-term funding sources. Pei suggests central government financial allocations, state bank loans, and commercial lending. Some observers have suggested that China could use its $1 trillion-plus foreign exchange reserves to purchase oil for the SPR. However, People's Bank of China Vice-Governor Wu Xiaoling has said the central bank cannot directly use China's massive foreign exchange reserves to purchase energy assets, including oil for the SPR.

Funding options

Beijing currently tacks a 17% value added tax onto fuel oil imports and might consider adding duties for other imported products and crude (currently subject to a 5% export tax) to fund SPR oil purchases. Japan and South Korea use petroleum import duties to help fund their SPRs.

China could also tax coal production to help fund the SPR. The NDRC says that Chinese coal demand could hit 2.5 billion tons in 2007. Thus, assuming that half of this amount can be taxed, imposing a Y10 ($1.32)/ton coal tax could raise Y12.5 billion ($1.65 billion)/year, providing sufficient funds to purchase 70,000 b/d of oil for the SPR, assuming an average price of $65/bbl. Wholesale coal prices in China typically are Y220-320 ($29-42)/ton, so the tax would represent a 3-5% cost increase.

A coal tax would also promote environmental objectives by increasing the costs of coal usage, and because it helps fund the national SPR, Party officials could deflect criticism by framing the tax as an essential component of China's national energy security. Similarly, fuel oil taxes could help promote clean fuel use by raising the cost of fuel oil and would also help China's customs service capture revenue lost to unscrupulous oil importers who bill their cargoes as "fuel oil" to avoid crude oil import duties.

Imposing new taxes would pose formidable political and administrative challenges. However, because coal and fuel oil use is so widespread, the costs could be distributed among many different importers, producers, and consumers. The large volumes of coal and fuel oil consumed also mean that even if a sizeable amount of imports and consumption evaded the taxes, funds collected could still offset a substantial portion of the SPR's cost. The taxes could be lifted or reduced once the SPR is filled.

Transport issues

For an SPR to be most effective, it must be able to rapidly release oil into a well-developed pipeline and maritime transportation system linked to substantial refining capacity. Partly because of this, the 11th 5-year plan for energy development emphasizes creating a national oil and gas pipeline grid. Robust capacity to shift oil supplies rapidly between major demand and import areas would introduce a degree of redundancy in case an incident closed one

SELECTED CHINESE OIL PIPELINE PROJECTS

Table 1

Company	Length, km	Route	Substance carried	Status	Capacity, b/d	Remarks
CNPC	1,859	Urumqi-Lanzhou	Crude oil	Completed in 2006	—	—
CNPC	1,247	Lanzhou-Chengdu	Crude oil	Feasibility study under way	200,000	—
CNPC	1,500+	Myanmar-Kunming	Crude oil	Not yet under construction	200,000	Myanmar government dealings have been difficult*
CNPC	1,859	Urumqi-Lanzhou	Products	Completed in 2006	—	—
CNPC	900	Lanzhou-Zhengzhou	Crude oil	Operations begun in 2006	160,000	—
CNPC	915	Jinzhou-Zhengzhou	Crude oil	Operations begun in 2006	80,000	—
Sinopec	225	Tianjin (Nanjiang)-Beijing	Crude oil	Plan announced in June 2006	—	—
Sinopec	1,000	Yizheng-Changling	Crude oil	Commenced October 2004. First stage operation May 2006	540,000	Will carry oil to five Sinopec refineries along Yangtze River

*Conversations with Chinese sources.
Sources: Eric Ng, "PetroChina Plans to Put up 3.5 Billion Yuan Pipeline," South China Morning Post, Apr. 10, 2007, Energy Information Administration, China Country Profile

or more major ports capable of serving VLCCs. By 2010, Chinese companies plan to expand the country's pipeline network for oil, gas, and products to 65,000 km from 40,000 km. Table 1 shows major Chinese oil pipeline projects.

The tanks for China's Phase 1 SPR are relatively quick and simple to build and are the primary choice for areas lacking geological structures suitable for large-scale underground storage. The disadvantages of using tanks include high storage cost, exposure to high steel prices, the need for relatively large land areas, and vulnerability to natural disasters and attack.

For Phase 2 and 3 SPR sites, Chinese planners are considering underground facilities. Geological constraints—the lack of US Gulf Coast-type salt domes—will force China to use mined rock caverns. Experts at the US Geological Survey indicate that the only location in China where salt beds would be thick enough to leach out 1,000-2,000-ft tall US-style storage caverns would be the Jianghan basin near Wuhan, more than 600 miles from the sea. There appear to be no major underground salt beds

or domes near the major oil import and demand centers along China's East Coast.

China also has considered future commercial storage in which a major oil producer would acquire storage capacity in China and then sell China a call option for strategic oil release in case of a supply disruption. Both Saudi Arabia and Iran have discussed such deals with China, and Saudi Aramco apparently is prepared to build a 30 million-tonne (205 million bbl) commercial storage facility on Hainan Island. This would tie into broader Saudi moves to promote Chinese demand for Saudi oil by investing in new refineries designed to accept Saudi crude, which is often heavier and more sour than traditional Chinese crude streams. Future storage of sour OPEC crudes would mesh well with China's moves to increase sour-crude refining capacity.

Table 2 shows the costs and benefits of above-ground tanks, mined rock caverns, solution mined salt caverns, and other SPR storage options.

Crude sourcing

NDRC senior consultant Zhou Fengqi said in mid-2006 that China intended to avoid upsetting world oil markets by choosing to use equity production to fill the SPR rather than purchasing oil on the spot market. Equity barrels would come either from joint ventures of Chinese oil companies and Western firms working in China, such as in Bohai Bay, or from Chinese production in overseas areas such as Sudan.

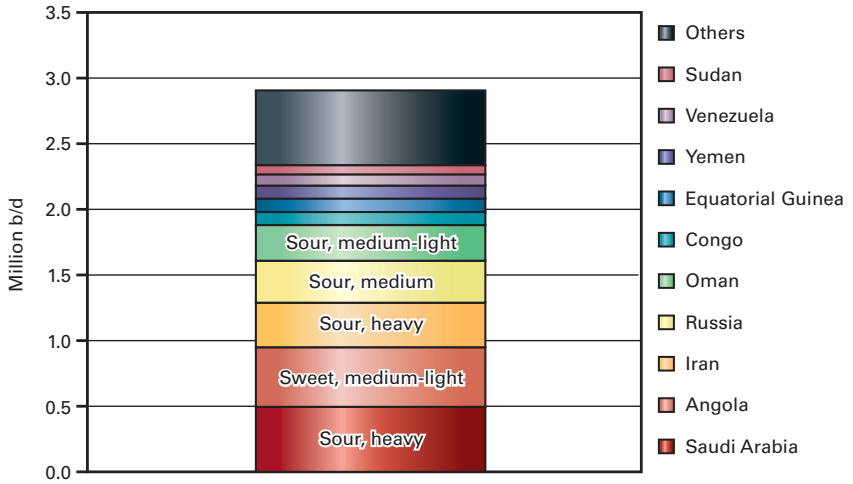
However, the ultimate price effect would be the same for each choice because using equity oil, term contracts, or spot purchases would all have the same net effect on Chinese demand and overall world oil demand. According to Xinhua, the Zhoushan SPR is being filled with a mixture of Middle East oil and crude from Bohai Bay and Liaohe oil fields. Zhenhai likely used a similar crude mix and has taken sour cargoes from Russia and the Middle East. Using domestic production to fill an SPR is not unprecedented, as the US often injects royalty production from Gulf of Mexico into its SPR. It is unclear if the Chinese government provides oil companies with incentives for making domestic production available to the SPR.

Fig. 5 provides a partial list of Chinese SPR shipment sources as well as the basic characteristics of China's primary oil import streams.

Beijing's oil taxation policies will determine where future SPR oil originates. A number of Chinese analysts suggest dropping duties on oil imports bound for the SPR, as well as providing other financial incentives for directing oil to the SPR. China might also consider adopting a royalty-in-kind (RIK)

CHINA'S TOP OIL IMPORT SOURCES

Fig. 5



policy where, instead of tax payments, companies make an equivalent value of their oil production available to the Chinese SPR. Such policies could make equity oil a prime SPR fill stream. On the contrary, without preferential or RIK policies, SPR crude will be sourced in the same fashion as other oil imports.

The composition of Chinese oil companies' refining capacity may also affect SPR oil acquisition. The companies will match crude oil purchases with their refineries' needs. Chinese sources claim that heavy and sour Middle Eastern crudes will fill tanks managed by Sinopec and Sinochem (Zhenhai, Zhoushan, and Huangdao) while lighter and sweeter crudes from West Africa will fill the Dalian SPR managed by PetroChina.

Chinese firms are planning to expand refining capacity by more than 1.25 million b/d by 2010. Much of the new capacity will have to handle sour and heavy crudes because such oil is cheaper to acquire and makes up an increasing share of global oil production.

Boosting demand

China's SPR fill will add 100,000-150,000 b/d to global oil demand for years. And given its rapid oil demand growth, China may need to boost filling rates well beyond those levels if it intends to meet its goal of 90 days of import coverage by 2020. This could greatly impact the oil market at the margin, particularly if China continues to acquire much of its crude on the spot market.

If global oil demand in 2007-08 grows by 1.4 million b/d, China's SPR fill could make up 10% of global demand growth. Compared with total world oil use of about 86 million b/d, 150,000 b/d may seem of small import. Yet in the context of an already tight oil market, that diverted supply could be important.

Price effects also could be exaggerated by the fact that SPR oil purchases will be lumpy, meaning that sometimes multiple cargoes will be bound for the reserve, while at others, none will.

If Chinese operators are transparent about oil purchases for the SPR, as the US DOE is, the market can incorporate that information and lessen the possibility of price spikes, although long-term prices may rise as a result. Many Chinese energy analysts seem to believe transparency will simply drive prices up, raise purchasing costs, and cause China to get blamed for high global oil prices. China's policy thus far has been to acquire cargoes and then release the information later. China is in a tough position, and barring a major mindset change, its SPR crude acquisition will likely remain opaque.

CHINESE STRATEGIC OIL STORAGE OPTIONS

Table 2

	Steel tank	Mined rock cavern	Solution-mined salt cavern	Forward storage	'Reserve' oil fields
Capex*	Medium	High	Low	Depends on storage type	High
Opex*	High	Low	Low	Depends on storage type	Depends on storage type
Construction speed	Rapid	Medium	Slow	Depends on storage type	Slow
Filling flexibility	High. Different tanks can accept different crude grades	Depends on whether crudes are kept separate or commingled	Depends on whether crudes are kept separate or commingled	Depends on whether crudes are kept separate or commingled	N/A
Security	Low	High	High	Depends on storage type	High
Environmental risk	High	Low	Low	Depends on storage type	Low
Geologically feasible?	Yes	Yes	Only in Jianghan basin	Yes	N/A
Comments	Phase 1 sites all use steel tanks	Phases 2 and 3 will likely incorporate mined caverns	Unlikely unless China constructs in remote Jianghan basin	Discussed with Saudi Aramco considering a 30 million-tonne storage facility on Hainan Island	High opportunity cost, cannot be rapidly brought on line to offset a disruption

*Draws on Harry Giles and Tim Reichwein, "Planning a Stockpiling Program," Jan. 29, 2007, Petrostock. Capex is capital expenditures. Opex is operating expenditures.

Key questions

Key questions remain concerning China's new SPR. Legal and regulatory issues in particular are being handled cautiously. A knowledgeable Chinese energy analyst interviewed by the author notes that many important SPR operational questions remain unresolved. Thus, questions for future analysis include:

- How will the SPR fit into China's new energy law?
- What drawdown standards will China use? Will it abide by the IEA guideline of using strategic stocks to manage 7.5% of its greater supply disruptions, or will it develop an entirely independent system?
- How closely will China coordinate its SPR management policies with the IEA? There currently are consultative meetings, but no formal cooperation.

Now that China has made the decision to build an SPR and is taking steps to implement it, it remains to be seen how the program will evolve from this point and how the SPR will affect world oil demand. ✦

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A full list of references is available from the author.

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Mulva: Industry must 'act with courage and forethought' on energy

Nick Snow
Washington Correspondent

US energy policies should diversify sources, lower carbon intensity, improve energy efficiency, and encourage investments in new technologies, recommended ConocoPhillips Chief Executive James J. Mulva in a July 19 luncheon address at the US Chamber of Commerce.

"The energy cupboard is not bare," he said. "We have the resources to bridge the gap until cleaner-burning fuels and alternative sources can provide a meaningful share of our energy. But in the meantime, we must act with courage and forethought."

Mulva urged lawmakers to recognize that no single source will replace hydrocarbons at a lower cost and with less environmental impact, that energy is a global business requiring cooperation with producing nations, and that the US competes increasingly against other countries for energy supplies.

"Reliable and affordable energy is essential for economies to prosper and grow," he said. "The world's population is expanding, economies are booming, and as a result, energy demand is rising."

He noted that existing fields and refineries have been pushed to near-maximum capacity to keep up with demand, which has cut surplus capacity to a level below what is needed to offset major disruptions. Most of the world's new oil and gas resources will come from countries with political beliefs and economic situations different from those in the US, he cautioned.

"So the available supplies of potential imports may not be as large as we would like. And to buy these imports, we will have to compete for them price-wise in the world market," he said.

Costs rising

Costs to develop new oil and gas supplies are climbing as prices for labor, equipment, and materials increase and energy prospects are more challenging, Mulva said. Increased environmental regulation, much of which is worthwhile, also adds to costs, he added.

"Meanwhile, US policies have actually undermined energy security by restricting access to new areas while doing nothing meaningful to promote energy conservation. As a result, the US now imports 60% of its oil. Natural gas imports are also growing," Mulva said.

Recent congressional actions punish the energy industry instead of solving problems, he maintained. "One proposal would cap gasoline prices during emergencies. But in the past, we have seen that temporarily higher prices help attract supplies from elsewhere and reduce demand. This restores the supply-demand balance, and prices then go back down," he said.

Mulva also criticized proposals to tax domestic production or impose new levies on major oil companies. Both would reduce investments, he warned.

And a bill that would make foreign oil producers subject to US antitrust law is "an appeal to nationalism that is the opposite of what we should be doing, which is working together to encourage production," he added.

He also expressed concern that some lawmakers won't acknowledge that oil, gas, and coal will be needed while biofuel and other renewable alternatives are being developed. "Unfortunately, some of the proposed legislation, such as further restricting drilling access would make the current situation worse." Mulva said. "There also is too much that it would not do, such as clear the permitting roadblocks we face in trying to build infrastructure or do enough to reduce demand growth."

Diversification

Of his four broad recommendations, he went into the greatest detail about diversifying energy sources, which he said must start by encouraging more domestic development of both conventional and unconventional resources.

"Industry technology and operating practices have made quantum leaps in the years since these moratoria were first enacted. Our national vulnerability no longer allows us the luxury of ignoring so much energy potential."

—ConocoPhillips Chief Executive James J. Mulva

He suggested that the US could add about 80 billion bbl of recoverable oil and natural gas to its reserves by allowing drilling in areas presently off-limits. "Critics always claim that, since one area or another offer only a few months or years of supply, it should not be developed. My response to that is: 'Why transfer $4.4 trillion of potential national wealth—the market value of these resources—to other countries through resources?' We could instead keep that money at home and gainfully employ thousands of Americas," Mulva said.

The industry should also be willing and prepared to meet environmental standards if new areas are opened, he continued. "Industry technology and operating practices have made quantum leaps in the years since these moratoria were first enacted. Our national vulnerability no longer allows us the luxury of ignoring so much energy potential," he maintained.

Meanwhile, the process for obtaining permits to build critical infrastructure such as LNG terminals, additional refining capacity, and electric power lines must be improved, he said. "Where infrastructure is clearly needed to serve the national interest, federal pre-eminence is needed over local or special interests," he said.

Mulva said the excitement over biofuels' potential is justified and that corn-based ethanol, of which the oil industry already uses 6 billion gal/year, is a good start. He said he supports the US Senate's proposal to mandate the use of 15 billion gal/year but maintained that the market should determine where certain concentrations are desirable, such as E-85 in the Midwest for flex-fuel vehicles.

Carbon intensity

To lower carbon intensity, the second of his four recommendations, Mulva said the US should establish a baseline with a system of incentives and penalties. "The first step would be to create a mandatory framework that would lower our greenhouse gas emissions, and set a price for carbon avoidance. This could be done by either a tax or a cap-and-trade system. We should also [have] incentives for development of carbon capture and sequestration. This would allow us to use our domestic fossil fuels, such as coal and oil shale, while protecting the environment," he said.

Use of solar, wind, and other renewable technologies could be expanded by extending their investment tax credits 5 years at a time, he continued. Mulva also said more nuclear power should be developed, and the government should both meet its commitment to dispose of waste from such plans and sponsor research into technology to use nuclear fuel more completely while reducing waste and proliferation risks.

His third recommendation, increasing energy efficiency, is the most effective way to reduce the US carbon footprint, stretch supplies, and im-

prove energy security, he said. In the transportation sector, this could involve improving overall fuel efficiency by encouraging the development of new technology and encouraging purchases of more-efficient vehicles by offering a rebate while placing a tax on less-efficient models.

Mulva said encouraging investment in new technologies, his fourth recommendation, is necessary to maximize recovery of conventional resources, successfully operate more-complex projects in harsher environments, and improve environmental performance. "Better technologies will also allow us to develop new alternative and unconventional sources, and enable us to lower our carbon intensity and improve the efficiency of energy use across the entire economy," he said. ✦

MMS: Ultradeepwater gulf drilling remains strong

A record number of drilling rigs are currently working in the ultradeep water in the Gulf of Mexico, according to the US Minerals Management Service. "For the first time, 15 rigs are drilling for oil and gas in 5,000 ft of water or greater in the gulf," said MMS director Randall Luthi.

And while drilling activity in deepwater remains strong, advances also have been made in the area of production. In July Atwater Valley Producers Group reported that natural gas production had begun from Independence Hub, a semisubmersible platform moored in 8,000 ft of water on Mississippi Canyon Block 920, 123 miles southeast of Biloxi, Miss., MMS said (OGJ Online, July 20, 2007).

When fully operational, Independence Hub platform, reportedly the world's deepest production platform ever installed as well as the largest offshore gas processing facility, will produce gas from 15 subsea wells. Before Independence Hub's start-up, MMS noted, the production facility in the deepest water was the Na Kika floating production system in 6,340 ft of water, operated by BP PLC.

Currently, 70% of the gulf's oil production comes from leases in water greater than 1,000 ft while 40% of the gulf's gas production comes from leases in those same water depths.

As of April, the gulf's production was estimated at 1.3 million b/d of oil and 7.7 bcfd of gas.

"As the industry continues its exploration in deeper waters, the availability of technology capable of operating in deeper water depths and more extreme conditions becomes an important issue," MMS said.

Several drilling rigs are being built for use in the deepwater gulf. These rigs under construction, which range from drillships to semisubmersibles, will be capable of operating in 12,000 ft of water or greater. Some of these rigs will be ready as early as summer 2008 and others are expected to be operational by second half 2009.

"The offshore oil and gas industry is facing

GULF OF MEXICO ULTRADEEPWATER DRILLING ACTIVITY

Operator	Block	Drilling rig	Water depth, ft
ExxonMobil Corp.	Alaminos Canyon 731	Ocean Eirik Raude	8,694
Hydro Gulf of Mexico LLC	Mississippi Canyon 961	Noble Amos Runner	7,925
Shell Offshore Inc.	Alaminos Canyon 857	Noble Clyde Boudreaux	7,819
Shell Offshore Inc.	DeSoto Canyon 353	Transocean Deepwater Nautilus	7,457
Chevron USA Inc.	Walker Ridge 758	Transocean Cajun Express	6,959
BP E&P Inc.	Green Canyon 743	GlobalSantaFe Development Driller II	6,822
Devon Energy Production Co.	Walker Ridge 278	Diamond Ocean Endeavor	6,475
BHP Billiton Petroleum (GOM) Inc.	Atwater Valley 574	GlobalSantaFe Development Driller I	6,211
BP E&P Inc.	Mississippi Canyon 778	Thunder Horse PDQ	6,033
BP E&P Inc.	Mississippi Canyon 775	Transocean Discoverer Enterprise	5,673
Chevron USA Inc.	Mississippi Canyon 860	Transocean Discoverer Deep Seas	5,667
BP E&P Inc.	Keathley Canyon 244	Transocean Deepwater Horizon	5,431
Woodside Energy (USA) Inc.	Green Canyon 949	Noble Max Smith	5,368
Kerr-McGee Oil & Gas Corp.	Green Canyon 768	Diamond Ocean Star	5,255
Chevron USA Inc.	Walker Ridge 29	Ensco 7500	5,232

WATCHING GOVERNMENT

Nick Snow, Washington Correspondent

Rockies price event planned

Rocky Mountain oil producers think they aren't getting a fair price. Royalty owners and state governments agree. That's why the Interstate Oil & Gas Compact Commission is hosting a Rocky Mountain Crude Oil Market Dynamics Summit Sept. 4-5 in Denver.

"It's been the case for some time as we've increased production throughout the Rockies. That has put a strain on pipeline infrastructure, which affects wellhead prices and, ultimately, mineral owners and states," explained North Dakota Gov. John Hoeven, who chairs the IOGCC.

When a large Denver refinery shut down in 2006, Rockies producers got $25-30/bbl less than what was paid for similar grades elsewhere in the US.

Hoeven told me that IOGCC assembled a task force to examine the problem after he and Govs. Dave Freudenthal of Wyoming and Brian Schweitzer of Montana discussed it.

Brian Jeffries, executive director of the Wyoming Pipeline Authority, said, "The situation has eased so that typically there's a $5-7[/bbl] differential to Cushing prices. Five years ago, however, it was only $1 or $2. There still are smaller producers, either because of small volumes or the quality of the crude, who are experiencing wider differentials."

Still bottlenecks

North Dakota Petroleum Council Pres. Ron Ness noted improvements in the market this year but said bottlenecks remain. "Significant infrastructure investments have been made, but as more Canadian production moves through to the Gulf Coast to replace overseas imports, we're going to see more problems in the Rockies," he said.

Royalty owners and state governments want better prices, too. "In North Dakota alone, the state lost around $19 million in tax revenues, and the producers and royalty and mineral owners lost over $203 million in revenue during 2006," Ness told me.

The conference will address how to raise transportation capacity from the Rockies, including the Williston basin, according to Hoeven. It's important to make sure crude moves east as well as west, he added. "Certain refineries want specific mixes of crude. They also have to deal with bottlenecks getting their products to market."

Looking for commitments

Because expansion is capital-intensive, pipelines won't build systems on speculation, Jeffries said.

"They're looking for commitments, either to volumes or flat fees, over 10 years," he said. "The issue now is whether there are enough credit-worthy producers who are comfortable making that kind of commitment."

Ness said project opponents and Congress aren't helping matters. "We are seeing some permitting issues with the Keystone Pipeline Project (OGJ, July 16, 2007, Newsletter). The Whiting refinery expansion in Illinois also is being opposed (OGJ, Apr. 23, 2007, Newsletter). And for a nation trying to get a more secure energy future, it's contrary to common sense to pass taxes that hurt domestic production," he said. ✦

frontier-like conditions and developing advanced technology to explore the ultradeep gulf waters in order to secure the nation's energy production," Luthi said. ✦

New BLM director faces Colorado leasing protests

Nick Snow
Washington Correspondent

The US Senate voted to confirm James L. Caswell as US Bureau of Land Management director on Aug. 3 after Sen. Ken Salazar (D-Colo.) removed the hold he had placed on the nomination (OGJ, Aug. 6, 2007, Newsletter). But Caswell and the US Department of Interior agency face other protests about oil and gas leasing from Colorado state and local government officials as well as other members of its congressional delegation.

Salazar said that he would allow the nomination to proceed because US Sec. of the Interior Dirk A. Kempthorne agreed to give Colorado 120 days to review and comment on BLM's plan to issue oil and gas leases on the Roan Plateau near Grand Junction.

"What is just as important is what [DOI] does after the 120-day period. Sec. Kempthorne gave me his commitment that BLM would respond in good faith to the comments and concerns raised during the review period and address them," Salazar said.

The Senate confirmed Caswell's nomination one day before the House passed a broad energy bill that included language banning surface occupancy on the Roan Plateau if BLM issues leases. Rep. John Salazar (D-Colo.), Sen. Salazar's brother, and Rep. Mark Udall (D-Colo.) worked to insert the provision when HR 3221 was in the Rules Committee. "While I was pleased to learn that [DOI] finally decided to delay leasing the top of the Roan Plateau, I believe we must continue to strike a balance," said Rep. Salazar on Aug. 4.

"The language protecting the top of the Roan in the energy bill does just that." He and Udall said it was a compromise, but oil and gas industry and other groups said it effectively locks up about 9 tcf of onshore natural gas.

Two days later, Rep. Salazar asked Colorado State BLM Director Sally Wisely to defer offering nine parcels in the San Luis Hills area of Conejos and Costilla counties as part of a scheduled Aug. 9 lease sale. Many local residents, including surface landholders and grazing permit holders, did not learn of the sale until a July 23 community meeting, he explained.

The federal agency already had decided to defer leasing the parcels and one other unrelated tract, a Colorado BLM spokesman told OGJ. "It's an area that had seen very little oil and gas activity in recent years. We felt that we needed more time to educate the people there about the process and its safeguards," he said, adding that 99 other parcels covering some 72,000 acres were offered. ✦

Nigeria's president assumes energy minister role

Uchenna Izundu
International Editor

Umaru Yar'Adua, Nigeria's new president, has taken on the responsibilities of the energy ministry and has appointed three junior ministers to support him in the role. Odein Ajumogobia was named junior minister for petroleum, Fatimah Ibrahim for power, and Odusina Emmanuel for gas.

Dividing the energy ministry into smaller units and appointing a minister for gas highlights the importance that Yar'Adua has given to developing Nigeria's gas resources, which the previous administration stressed will become as important as oil, if not more important. Nigeria has 187 tcf of proved gas reserves, and Yar'Adua said he wants gas to be allocated for domestic power generation (OGJ Online, June 18, 2007).

Analysts had mixed reactions to the appointments. Rolake Akinola, West Africa analyst at Control Risks, told OGJ: "With the scale of reform required in all three sectors, it probably makes pragmatic sense to split the portfolio. However, Yar'Adua is creating expectations about the government's delivery and will need to demonstrate that there have been improvements early on."

Jon Clark, director of oil and gas at Ernst & Young, told OGJ: 'Having different people responsible for different aspects of the energy chain (such as oil and power) is not uncommon. Oil companies will need to make sure they understand the new regime and have appropriate relationships in place for their business needs."

However Alex Gorbansky, managing director of Frontier Strategy Group, said the junior ministers were unlikely to have real decision-making authority or influence in the short-term and would look to accumulate influence and rents over time. "For companies, however, this new administrative structure means that they will now have to deal with yet another branch of Nigeria's corrupt and unwieldy bureaucracy and effectively another paymaster. To succeed, they will have to effectively play on both sides of the fence with the president and the junior ministers."

Priorities for the new staff in the energy ministry include gaining control over violence directed at the industry and kidnapping of oil workers by militants in the Niger Delta. They are demanding greater control of the resources, improved government accountability and transparency at the state level, and development of power generation for Nigeria's citizens, which Yar'Adua stressed in his election campaign.

Gorbansky added: "While most investors welcome the recent announcement from Nigeria as a continuation of free market policies, our views are less sanguine given continued violence in the Delta, the lack of diversification

WATCHING THE WORLD

Eric Watkins, Senior Correspondent

The Chavez oil evangel

Is oil diplomacy driving Venezuelan President Hugo Chavez over the edge? If I compared myself with Jesus, most people would think me a candidate for a straitjacket.

That's about the only kind of jacket I'm beginning to think the Venezuela president should be trying on these days.

In a speech reminiscent of the Sermon on the Mount, Chavez recently told fellow leaders in the Caribbean that his country would supply them with oil at preferential rates.

"Venezuela puts this oil wealth at the disposition of our peoples of the Caribbean," Chavez said. "We're going to share it like Christ....It will be enough for everyone."

Fish and loaves

Does that remind you of the Sermon's fish and loaves? Listen on.

"If we truly unite...the grandchildren of our grandchildren will have no energy problems," Chavez said. He predicted oil prices will soon hit $100/bbl but said, "The Caribbean shouldn't have problems this century and beyond."

Gosh, does that mean Venezuelans will be in a position to subsidize the rest of the region?

That's Chavez's idea, and it began in 2005 when he set up Petrocaribe, an organization that allows signatory countries to finance up to 50% of their oil bills over 25 years at low interest.

Underscoring Venezuela's largess, Oil Minister Rafael Ramirez said his country also is making progress by helping upgrade or build refineries in Cuba, Jamaica, and Dominica.

But lest we go too far down the garden path with Chavez and his cohorts, let's remember just who is helping Venezuela with its own refineries.

A yen for oil

In March, Japan Gasoline, a firm that designs refineries and similar plants, and Venezuela's Inelectra announced plans to carry out "extended basic engineering" work at Petroleos de Venezuela SA's Puerto La Cruz refinery.

Construction work for retooling Puerto La Cruz was due to begin in mid-2007 in time for operations in 2010. Once the work is completed, Puerto La Cruz will be able to upgrade crude from 8° to 35° gravity.

Oh, yes! And let's not forget Venezuela's other oil deal with Japan—the one signed last February. That's when Marubeni Corp. and Mitsui & Co. said they had struck a deal with PDVSA to buy crude oil and petroleum products from the Venezuelan state-run company for 15 years.

Under the deal, two financial companies that Marubeni and Mitsui have set up in the Netherlands will borrow $3.5 billion from a banking syndicate consisting of Japan Bank of International Cooperation and commercial banks.

The two firms—Yucpa Finance BV and Caribe Financing Co. BV—will lend the money to the Venezuelan firm, which will repay it by providing crude oil and petroleum products, such as fuel oil, to Marubeni and Mitsui.

Perhaps that's how Chavez is funding his largess around the Caribbean. ✦

of the economy and the shock that could result from a significant drop in oil price, and the growing influence of China in the country."

Petroleum pricing in Nigeria is a major issue that caused a recent labor strike because of the steep increase in domestic prices, which is affecting consumers and Nigeria's economy. The government has found it difficult to continue to subsidize fuel imports, although it has promised a 1-year cap on domestic fuel prices.

Akinola said the power sector, which is inefficient and has stalled in advancing privatization, also faces challenges: "The system is bureaucratic and there are some assets belonging to the old state power company NEPA that need overhauling. Investors need to sink in deep cash and in that sector you don't usually make any gains on money for years to come. Yar'Adua needs to keep on wooing investors, but they find it difficult to value assets because of the insecurity in the Delta, and the unions have occasionally accused the government of underpricing the assets."

This is not the first time Nigeria's president has taken control of the energy portfolio, as his predecessor Olesegun Obasanjo controlled it for the 8 years he was in power. Many Nigerians, however, felt that he delivered little benefit. Obasanjo, who picked Yar'Adua as his successor, is expected to wield considerable influence in the new administration.

According to Nigerian reports, Yar'Adua is expected to declare a state of emergency in the energy sector and then bring in Nasiru el-Rufai, former high-profile minister of the capital city, Abuja, to oversee it. Nasiru-el-Rufai has a track record of reforming Nigeria's slums and would be able to take on those opposing change within Nigeria's power sector.

The unveiling of Yar'Adua's new cabinet comes 2 months after he took the reins of power from Obasanjo May 29. The delay in picking a cabinet occurred because the legitimacy of Yar'Adua's mandate has been questioned. ✦

Trans-Sahara gas line start-up planned for 2015

Uchenna Izundu
International Editor

Nigeria, Algeria, and Niger hope to start gas exports via the proposed 18-25 billion cu m/year Trans-Sahara gas pipeline (TSGP) in 2015, Algeria's energy minister, Chakib Khelil told OGJ at the Trans-Sahara Gas Pipeline Conference in Brussels July 9.

Once built, the 4,300-km line would transport gas from the Niger Delta in southern Nigeria through Niger and into Algeria and Europe. The $10 billion project was estimated 6 years ago at $7.5 billion (OGJ Online, Nov. 28, 2001).

A senior energy delegation from Algeria, Nigeria, and Niger were in Brussels to promote TSGP to potential investors and European gas consumers seeking to diversify gas imports.

The TSGP project

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.

The proposal, which has been on the drawing board for at least 20 years, is now feasible, Khelil told OGJ, because there is market demand in Europe. Europe's production decline and environmental initiatives make the gas pipeline more desirable, he said.

Secondly, he said, is Nigeria's and Algeria's new commitment to the pipeline within the framework of NEPAD [the New Partnership for Africa's Development]. "The oil companies of each country have been instructed to carry out feasibility studies," Khelil said. "Thirty years ago these entities didn't have the experience or the money to do this. It's a project that is meeting the needs of the consumers and the producers, and it is being pushed very hard."

Europe expects to import 500 billion cu m of gas in 2020. Europe's Energy Commissioner Andris Pielbags cautiously welcomed the pipeline at the conference, 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 the geopolitical developments in the region. "The EU, however, can guarantee security of demand," he said.

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.

Nigeria's commitment

Nigeria currently has 180 tcf of proved gas reserves. Chukwuku told OGJ that Nigeria is committed to supplying TSGP, using gas that would otherwise be flared. It plans to eliminate gas flaring by 2008.

Instability in the Niger Delta is deterring potential investors from carrying out major gas exploration and production, jeopardizing possible future sources of gas, such as deepwater fields. Chukwuku said the government is addressing this issue by tying every major project with development in the Niger Delta—such as refineries and petrochemical plants—to ensure that the region enjoys the benefit of investments.

Some sales details have yet to be worked out. No decision has been made, for example, on how the gas would be sold into Europe, whether Nigeria would be selling to Sonatrach to market or Nigeria directly accessing the European market. Khelil and Chukwuku stressed that they are working in partnership, although Chukwuku conceded that Sonatrach has more experience than Nigeria in marketing gas to Europe. Initially, he added, it would make sense to allow Sonatrach to take the lead. Khelil said, "It is whatever is the most interesting solution and the most profitable." ✦

Basins off NW Europe offer opportunities in troubled seas

John Westwood
Douglas-Westwood Ltd.
Canterbury, UK

Despite recent production decline, Europe is still the world's largest offshore oil and gas producer.

Although oil prices have remained high for nearly 3 years, and total reserves probably still exceed 100 billion bbl, the mature parts of the region such as the UK have become less attractive for the oil majors. However, opportunities still abound for small E&P company players.

Right down the food chain, home-grown European offshore contractors are winning business worldwide and so are the European stock markets--London has hosted the IPOs of a number of international oilfield service companies.

The following is an examination of the state of plays and prospects and highlights some challenges ahead.

Hidden gems

Although generally referred to as "the North Sea," the offshore play is more correctly the North Western Europe Continental Shelf (NWECS).

The area includes the waters of several countries: Denmark, Germany, Ireland, the Netherlands, Norway, and the UK. However, Norway and the UK account for most of the action.

The Norwegian and Barents seas cover a large area of the shelf and continental slope off Norway, while the UK also has production from the Irish Sea and the Atlantic shelf west of the Shetland Islands. Ireland has gas production off its southeast coast and developments happening off its environmentally challenging western coast. This Atlantic basin is underexplored but contains a number of proven and emerging play types with potential for field developments in 500 to 2,500 m of water.

One key fact now differentiates the NWECS from other offshore producing regions—offshore oil and gas production is growing across the world but declining in Western Europe. This is due to a lack of major new oil and gas prospects in the North Sea, which is presently responsible for the bulk of the region's production.

Offshore oil production in the NWECS region as a whole peaked at 6.4 million b/d in 2000, but the natural gas production peak of perhaps 232 billion cu m is unlikely to occur before 2010-12 (Figs. 1 and 2).

For Europe, a future of declining natural gas production from its offshore waters equates to increasing dependence on Russian and North African gas and raises considerable issues regarding security of future energy supply.

The fragility of the situation has been demonstrated when, in order to force former Soviet countries to pay more realistic prices, Russia's Gazprom on Jan. 1, 2006, reduced gas supplies to the Ukraine and on Jan. 1, 2007, doubled the gas price to Belarus and Georgia. Then, on Jan. 8, 2007, in another price row Russia temporarily halted oil exports via Belarus.

The relevant giant gas pipelines are the same ones that feed Western Europe, and so does oil via Belarus. The result was political panic in capitals from Berlin to London. With 16% of the world's natural gas reserves, Gazprom, in the words of London's Financial Times, is now "a giant aware of its power."

But off Europe, exploration and development continues, and despite

the seemingly gloomy scenario of mainly small finds, exploration efforts still uncover some hidden gems even in the well-explored North Sea, and in Norway's arctic waters fringing the Russian border, big games are in play.

UK sector

UK oil production peaked in 1999 at 2.8 million b/d and has since declined to below 1.5 million b/d. Annual gas production peaked in 2001 at 108 bcm/year and by 2006 had declined to 84 bcm/year.

As natural gas is a primary fuel for power generation, this has caused major concerns--and the fact this long-forecast situation seemed to have caught politicians by surprise is in itself remarkable. However, the past two winters were relatively mild, moderating gas demand. Then on Oct. 1, 2006, the 1,200-km Langeled subsea gas pipeline from Norway to the UK was opened—quite literally Norwegian gas saved Britain's bacon and now boils its tea.

Offshore UK still has considerable numbers of small prospects to be drilled and small discoveries awaiting development, many suited to the smaller oil and gas companies that now dominate the offshore scene. According to the industry group "Oil & Gas UK," since 1999 more than 30 new companies have entered the UK continental shelf with a commitment to invest in oil and gas assets. These companies now account for 38% of the industry's total investment and 16% of production.

The emphasis is now firmly on developing the many small fields, but the current high costs of drilling and development is causing projects to be delayed. The negative impact of this cocktail of large costs and small plays was recently emphasized by Shell's decision to sell some North Sea assets and scrap plans for a new £25 million headquarters in Aberdeen.

According to the industry group Oil & Gas UK, the average capital cost for a North Sea project begun in 2005 was about $8/bbl, with opex at $7. In 2007, capex is $15, opex $10. So with $70 oil on the face of it a high profit situation exists. However, about 45% of production is natural gas, whose price has slumped since the new Norwegian supplies came on line.

Historically, the UK has adapted its tax regime to changing times, but it is now in need of realignment to modern realities. To keep the show on the road, the new Prime Minister Gordon Brown needs to offer better fiscal incentives to E&P companies. Talks between the industry and the UK Treasury are ongoing.

Examples of current UK offshore field development projects include:

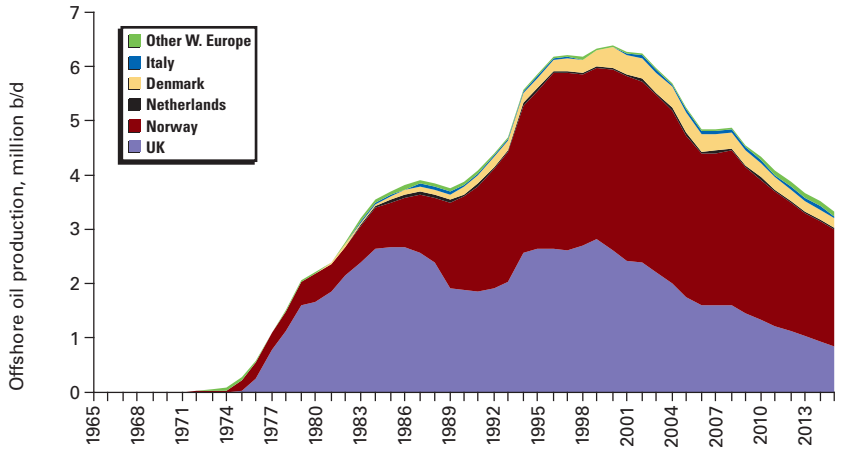
The Laggan discovery in the UK's West of Shetland waters holds about 1 tcf of gas and lies in 640 m of water with a subsea development the most likely scheme. Total E&P UK PLC and partners are assessing the viability of building a new pipeline from Laggan directly to the St. Fergus gas terminal in Scotland.

The first of three planned appraisal wells was successful at nearby Rosebank/Lochnagar and could aid the development economics of the project (OGJ Online, July 19, 2007). Small fields such as Torridon, Laxford, and Victory could also be linked to Laggan's infrastructure (Fig. 3).

Torridon field, also West of Shetland, is an important gas discovery in 700 m of water and operated by Chevron. An appraisal well was completed in April

NW EUROPE CONTINENTAL SHELF OIL PRODUCTION

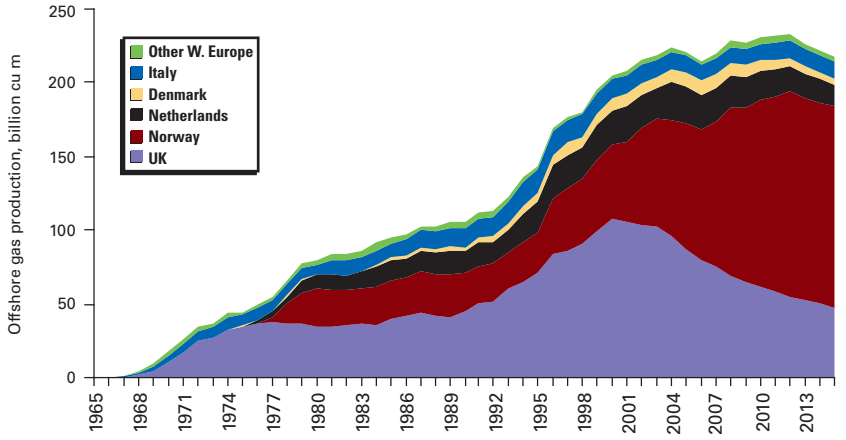
Fig. 1



Source: The World Offshore Oil & Gas Forecast 2007, Douglas-Westwood Ltd.

NW EUROPE CONTINENTAL SHELF GAS PRODUCTION

Fig. 2



Source: The World Offshore Oil & Gas Forecast 2007, Douglas-Westwood Ltd.

2000. Torridon is possibly a floating production candidate, but there is no nearby infrastructure. Alternatively, it could also be tied back to Laggan.

Rosebank/Lochnagar is a large deepwater discovery currently being appraised. The field could contain 450 million to 500 million bbl of oil, making it one of the largest discoveries off Northwest Europe.

A major 2D-offset seismic shoot over Rosebank/Lochnagar is also planned. Chevron owns 40% of the equity in the field along with fellow stakeholders Norway's Statoil with 30%, Austria's OMV, with 20% and Denmark's DONG with 10%.

Chestnut field, in shallow water on Block 22/2a, is being developed via a newbuild floating production unit, using Sevan's SSP300 cylindrical design. Chestnut was discovered in 1986 and appraised by six wells. An extended well test produced about 1 million bbl of oil.

Full field production is scheduled for 2007 following development approval in 2005. The operator, Venture Production, has the option to use the vessel on another field after it is removed from Chestnut. The well, from the well test, plus a new subsea well will produce to the FPSO. The new well, depending on production levels, will be converted into a water injector at a later date.

Norway: the long view

Norway's approach to its oil reserves has been very different from that of the UK.

With a small population and large offshore oil and gas production, its problem has been to manage the wealth that has been generated in such a way as to prevent offshore oil and gas, the country's largest industry, from overheating the economy.

So in addition to a policy of carefully managed reserve development it has invested its national oil and gas profits to fund the pensions of this, and perhaps the next, generation.

There are still large parts of the Norwegian continental shelf which the Storting (Norwegian Parliament) has not opened up for petroleum activities, including all of the northern Barents Sea, Troms II, Nordland VII, parts of Nordland VI, coastal regions off Nordland, and Skagerrak.

Many of Norway's future field development projects will be in remote arctic locations and in deep water, so have high subsea content. We estimate that Norwegian companies will spend an average of $4 billion/year on subsea developments for the next few years.

Although 52 fields are in production on the Norwegian continental shelf, the start-up of Statoil's Snohvit field is no doubt a major milestone for Norway and Western Europe in general as it marks the region's first LNG export terminal.

A key issue with the development was the hike in costs over and above the initial expected budget. This is a common problem across many LNG developments as contractor capacity is limited and raw materials prices soar.

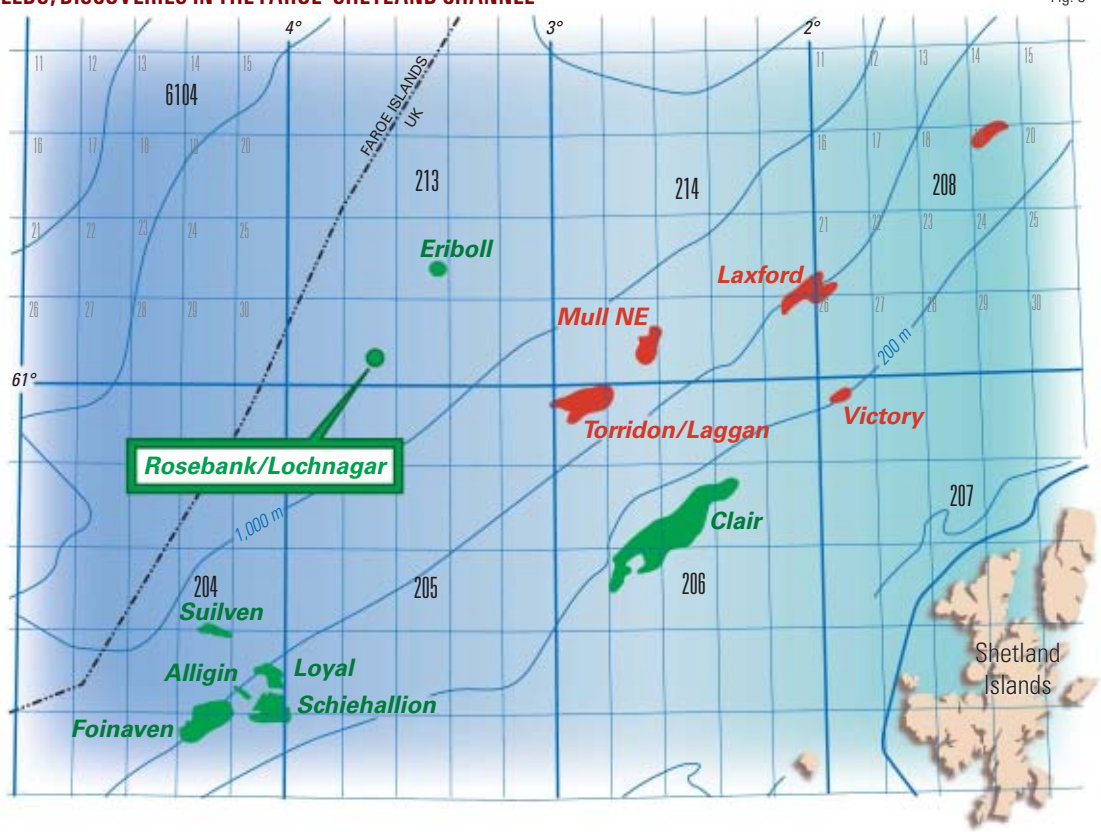
The LNG business as a whole is a major growth sector and is forecast by Douglas-Westwood in "The World LNG & GTL Report 2007-2011" to see current expenditures of $11.5 billion, rising to $25.5 billion by 2011.

Norwegian developments include:

Due to start-up in 2007, Alvheim and nearby fields including Kameleon, East Kameleon, Kneler, and Boa are to be developed by Marathon. The

FIELDS, DISCOVERIES IN THE FAROE-SHETLAND CHANNEL

Fig. 3



The situation

In 2005, Hydro had identified its *K-13* well as being at risk for calcium carbonate scaling in the upper tubing, particularly around the downhole safety valve. Scaling could lead to valve failure, resulting in several months' shut-in while waiting for a floating rig or intervention vessel to perform an acid job. Under such circumstances, lost revenue could amount to $22,000,000 per month, including associated rig costs to perform the acid job.

Offshore Norway:

Scale squeeze for Hydro sets world record for volume of produced water protected against scaling

The solution and results

After conferring with M-I SWACO* PRODUCTION TECHNOLOGIES* specialists, Hydro personnel decided to treat the well before the downhole safety valve failed. The beneficial effects of a typical squeeze treatment last for approximately six months, meaning that the Oseberg South well would need to be squeezed twice per year.

The M-I SWACO team faced considerable technical challenges, and used the water-injection flowline to pump the squeeze package. As soon as the line volume of water had been displaced into an injector well, and the inhibitor front was at the end of the line, an ROV transferred the line from the injector to the producer. Given the cost of performing a job of this complexity, a relatively large volume of scale inhibitor was pumped into the near-wellbore region to a depth of 33 to 49 ft (10 to 15 m).

To date, the M-I SWACO treatment has lasted more than 26 months and has protected more than 13 million barrels of water — a new world record with significant cost savings to the field.

"Because the M-I SWACO team thoroughly understood the capabilities of its chemicals and the customer's technical challenges, the squeeze treatment was a resounding success."

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This success story is just one of hundreds where our PRODUCTION TECHNOLOGIES people, equipment, processes and services prevent serious problems for operators every day. Your M-I SWACO representative can tell you more about our complete suite of production technologies solutions.

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development will employ at least 14 subsea wells in 120 m of water tied back to the FPSO. Gas export will be via the SAGE system.

Skarv field is thought to contain up to 500 million boe. BP has submitted a development plan for the field that includes a floating production unit with gas exported via an 80-km export line connecting to the Asgard Transport System. Skarv is due to start production by the third quarter of 2011. Nearby Idun field will be developed in conjunction with Skarv, and other surrounding finds may also be tied back to the FPSO in due course, including the overlying Snadd (gas) and Grasel (condensate) structures.

Statoil's Gudrun structure is estimated to hold at least 150 million boe. According to Statoil, Gudrun could be developed either using a platform or as a subsea solution, with output transported to a Norwegian or UK installation for further processing and export. The field is on Block 025, about 40 km north of Sleipner and 13 km east of the Norway-UK median line. Statoil is the operator, partnered with Marathon, Gaz de France, and BP.

The Tyrihans complex is made up of Tyrihans North and Tyrihans South fields in more than 250 m of water. Tyrihans South, an oil field with a gas cap, was proven in 1983. Tyrihans North, a gas-condensate field with a thin oil zone, was proven in 1984.

Stolt Offshore was awarded a contract worth more than $83 million to lay two pipelines from the field to the Kristin platform. FMC was awarded a $216 million subsea contract which includes the supply of 13 subsea trees and five templates with manifolds, one of which will be used for seawater injection. Deliveries will take place in 2007 and 2008. Aker Kvaerner won a contract to provide subsea pumps for $32 million. Production is due to commence in 2009.

Technologies

The North Sea with its challenging environment was once the leading edge of offshore oil and gas and, encouraged by governments and driven by need, considerable funds were invested in new technologies to enable its development. This resulted in some successful commercial products and services, many of which are being applied worldwide.

Subsea processing is an area which in 2000 was seen as a niche sector of the market, with a small number of experts and evangelists driving the use of the technology forward. However, the change since then has been dramatic.

Now, subsea processing is being considered as an option by the majority of the larger oil companies on many of their new field development prospects and as an option to retrofit to existing fields. Even some of the smaller oil companies are now considering subsea processing.

The second edition of the Douglas-Westwood/OTM study, "The Subsea Processing Gamechanger Report 2006-2015," surveyed more than 30 leading subsea experts from oil companies around the world and forecast that if operators' performance expectations are met then over the next decade expenditure on subsea processing could in the 'most likely' scenario exceed $3.4 billion.

In the North Sea, the Norwegian sector is seeing some major subsea processing projects moving forward such as Tyrihans, Tordis, and Asgard, which will involve the use of various technologies including raw seawater injection, subsea separation, multiphase boosting, and subsea wet gas compression.

Multiphase metering is an associated enabling technology that has been successfully taken subsea by Western European companies such as Roxar and Framo. The application of such meters on a "one-per-well" basis is likely to become increasingly common as operators recognize the value in the detail and accuracy of data that these systems provide.

In another European success story, the FPSO business has seen the development and adoption of cylindrical units move ahead with the first Sevan Marine SSP-300 platform installed at Piranema field off Brazil and second heading for Chestnut field in the UK North Sea. Overall, the floating production sector is in fine health, with a total of $38 billion forecast to be spent worldwide in the next 5 years, according to the "World Floating Production Report 2007-2011," Douglas-Westwood's latest published study on the sector.

Corporate success

Facing a future of declining production in their home market, European oil and gas service sector companies are in hot pursuit of global business prospects.

European-grown companies large and small, ranging from Allseas (Netherlands) to MCS (Ireland), Kvaerner (Norway), the John Wood Group (UK), and Technip (France) are established in the key growth markets and are achieving notable successes both in the high technology and operational know-how sectors.

Some of this success is undoubtedly a result of many years of government encouraged R&D, but in other areas such as subsea operations European companies are also world leaders. Across Europe, various governments are encouraging their companies' search for more international business, but some are more effective than others.

While the UK has suffered from constant changing of its government policies, the decimation of the Oil & Gas Division of its Department of Trade & Industry, and now the department itself, Norway has been taking the long view (OGJ Online, July 5, 2007). Its long-established oil and gas industry trade

body INTSOK has partner companies encompassing the entire supply chain structure from its oil and gas companies to technology suppliers; but most importantly it is run by time-served oil sector executives. The overall result is that Norwegian industry is becoming very effective at winning foreign business by "hunting as a pack."

As the UK's main producer, Scotland is more focused on oil and gas than the UK central government with Scottish Enterprise heavily involved in the promotion of its companies and incentives such as the industry formation of the trade body Subsea UK.

A flood of money

Across the world, capital markets are awash with cash, with too much money chasing too few investment opportunities. With oil maintaining high prices, many generalist investors are seeking energy-related exposure and the result is that oil companies are usually fully valued, therefore European oil services companies have attracted attention.

In addition, the European stock markets are now driving oil services investment and sucking business away from Wall Street. This is partly due to the Sarbanes-Oxley issue, and the associated risks for IPOs are hampering US investment activity. With high oil prices delivering greatly enhanced profits, IPOs are attractive both as an exit mechanism for service company owners or for fundraising. With a large appetite from investors, we expect to see more international firms joining the London and Singapore exchanges.

Recent examples of the international diversity of highly successful IPOs on the London market include UK subsea flexible pipe maker Wellstream, which recently opened a plant in Brazil, and the Russian oil services group Integra.

However, another outcome is that oil service companies' own desire for merger and acquisition is being outbid by institutional investors and we are still to see major group-building M&A programs by oil field services companies. Private equity is driving many transactions, both in private and public company sectors.

European future

With its main North Sea producing area in decline and the majors moving to pastures new, Offshore Europe is well into the process of becoming a very different region, dominated by small but potentially profitable players, the "puddle suckers."

Yes, there will be big plays in future years, but mainly at the extreme environmental edges—the arctic and deepwater frontiers where big plays are essential to cover the very high costs.

But the North Sea itself was once the frontier and demanded great investments in the development of technological and operational expertise. The European technology and contracting companies that evolved now number among world-leaders. Europe is also home to some of the world's leading financial centers, and this combination of capable contractors and world class financial engineering results in a region that is experiencing production decline but commercial growth.

Acknowledgments

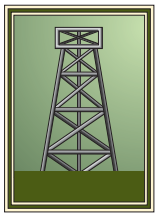
The author acknowledges the contributions to this article from his colleagues Andrew Reid, director responsible for transaction services, Steve Robertson, assistant director and oil and gas manager, and Dr. Michael Smith, who manages the Energyfiles database. ✦

The author

John Westwood (john.westwood@dw-1.com) is the founder of energy analysts Douglas-Westwood. The firm, which acts as consultant to government agencies, oil and gas companies and contractors, and the financial sector, over the past 2 years has completed commercial due diligence on M&A and financing deals totaling $5 billion. He initially spent 12 years in offshore contracting in the North Sea, Southeast Asia, South America, and the US. He has since spent 22 years working on business research and analysis. He is the author of over 90 papers and is a regular speaker at industry events and investment seminars worldwide.

First of new Nomad-class desert rigs heads to Algeria

Nina M. Rach
Drilling Editor



BP Exploration (Algeria) Ltd. has chosen a newly designed desert rig to drill in the Illizi basin. The operator has given a 1-year, extendable contract worth about $16 million to international drilling contractor KCA Deutag GMBH.

Rig fabrication and engineering company Bentec Drilling and Oilfield Services and KCA Deutag designed and completed the first of the Nomad Class rigs, Rig T-211, in July (Fig. 1). The rig is now en route to southeastern Algeria, where it will be used to drill in the South East Illizi and Bourarhet South blocks for BP in association with Sonatrach, Algeria's national oil company (Fig. 1).

Both KCA Deutag and Bentec are wholly owned subsidiaries of Aberdeen-based Abbot Group PLC.

Algeria

BP is involved in two major gas projects in Algeria, Africa's second-largest country by area, in partnership with Sonatrach and Statoil ASA: In Salah gas in the southern Sahara, and In Amenas, in the Illizi basin of southeastern Algeria, near Libya. BP Algeria is also exploring three areas awarded in Algeria's sixth international licensing round, April 2005:

- Hassi Matmat in the Benoud (Oued Mya) basin, adjacent to giant Hassi R'Mel gas field (OGJ Online, June 23, 2006).
- South East Illizi and Bourarhat South, in the Illizi basin, adjacent to the In Amenas project (OGJ, Apr. 25, 2005, p. 50).

In 2003, BP Algeria's then-President and CEO David Nagel said BP was working in Algeria because the country has the resources (9.2 billion bbl oil reserves, roughly equaling Norway and twice as much as Angola); it's well positioned (second largest supplier of gas to Europe and a leading exporter of gas to the US); and it has a "world-class oil and gas infrastructure" (extensive pipeline system, distribution, gasification, LNG facilities).[1]

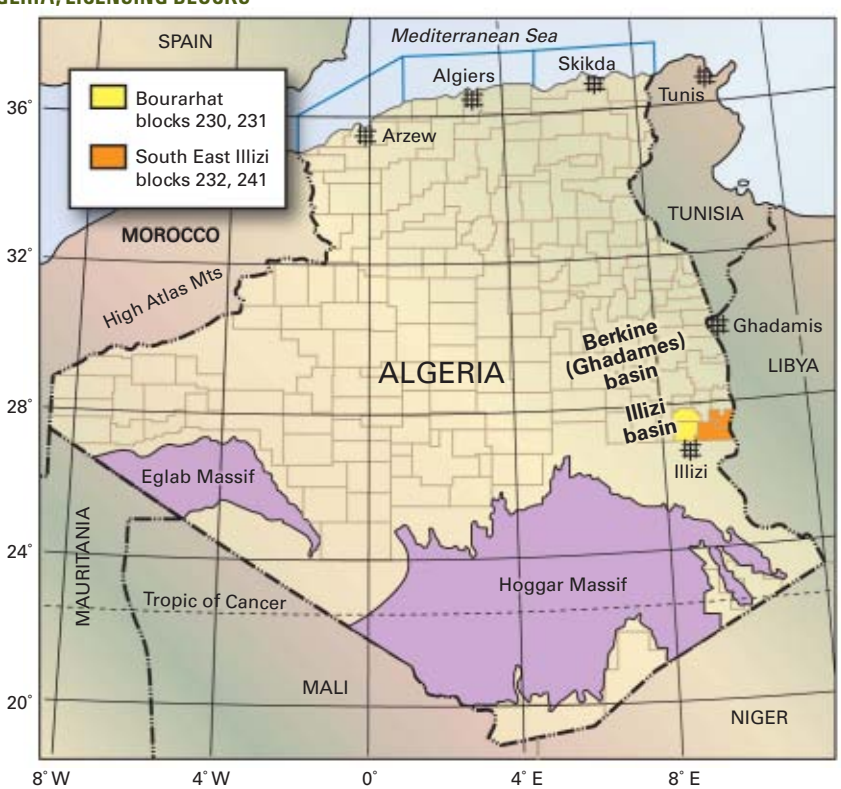
BP Algeria Drilling Manager Lina M. Serpa told OGJ that Rig 211 will start operating in the Bourarhet South exploration blocks acquired by BP in the 6th licensing round. "The wells to be drilled will test important exploration concepts, which, if successful, will impact follow-on activities in the block and surrounding areas. Our current priority is preparing to safely execute the first well" and to optimize additional drilling options.

BP's Algerian management team also includes Jens Pace, exploration director, and Gerry Peerebom, head of country based in Algiers.

KCA Deutag worked in Algeria from 1994-2001 for Anadarko, BHP, CEPSA, Repsol YPF, and Sonatrach.

Under the contract signed with BP in 2006, KCA Deutag will begin operating

ALGERIA, LICENSING BLOCKS



1,500-hp Nomad desert rig

Drilling depth capability	20,000 ft (6,096 m)
Mast	
Type	Open-faced, self-elevating
Height	152 ft
Base	30 ft
Hook load	1 million lb (454 tonnes)
Substructure	
Type	Swing-up
Height	35 ft TOR, 30 ft to underside of rotary beams
Rotary load	1 million lb
Setback load	600,000 lb
Drawworks	
Type	Wirth GH 1500 EG-DC-SV
Rating	1,500 hp
Max. line pull	40 tonnes
Top drive	
Type	NOV TDS-11SA, AC-drive
Capacity	1 million lb
Torque	37,500 ft-lb
Rotary table	Mud King RT/ZP 375 (37½-in.)
Iron roughneck	NOV ST-80
Drives	
Engines	4, Caterpillar 3512B
Rating	Each, 1,500 hp
Generators	4, Caterpillar SR4B
Rating	Each, 1,500 kVA
Voltage	600 V, 60 Hz
SCR	Bentec
Mud system	
Pumps	3, Wirth TPK 7½-in. x 12-in.
Rating	Each, 1,600 hp
Shale shakers	3, Brandt Triple King Cobra
Standpipe pressure	5,000 psi
Active volume	1,529 bbl
Reserve volume	1,856 bbl
BOP equipment	
Annular	13⅝-in. x 5,000 psi
Double + single ram	13⅝-in. x 10,000 psi
Annular	21¼-in. x 2,000 psi
2 x single ram	20¾-in. x 3,000 psi
Drilling automation	
Hydraulic catwalk system	
Bentec Infodrill system	
Automatic driller	
Iron roughneck ST-80	

the new T-211 Nomad rig in fourth-quarter 2007. KCA Deutag operates 22 rigs elsewhere in Africa: Libya (15), Nigeria (5), and Gabon (2).

In July 2005, Algeria approved newly liberal energy regulations that reduced Sonatrach's role in the oil and gas sector and gave foreign energy companies more scope to invest and produce hydrocarbons, although it was never implemented. Within a year, the country announced pending revisions, which were finalized in September 2006, and seem to pertain mainly to oil.[2]

The new amendments, introduced by Algerian President Abdelaziz Bouteflika, limit foreign participation in exploration and production and impose a windfall tax on surplus profits. Sonatrach is required to hold a minimum 51% stake in all exploration and production ventures. The new tax of 5-50% is levied whenever Brent crude trades higher than $30 (OGJ, Oct. 23, 2006, p. 5).

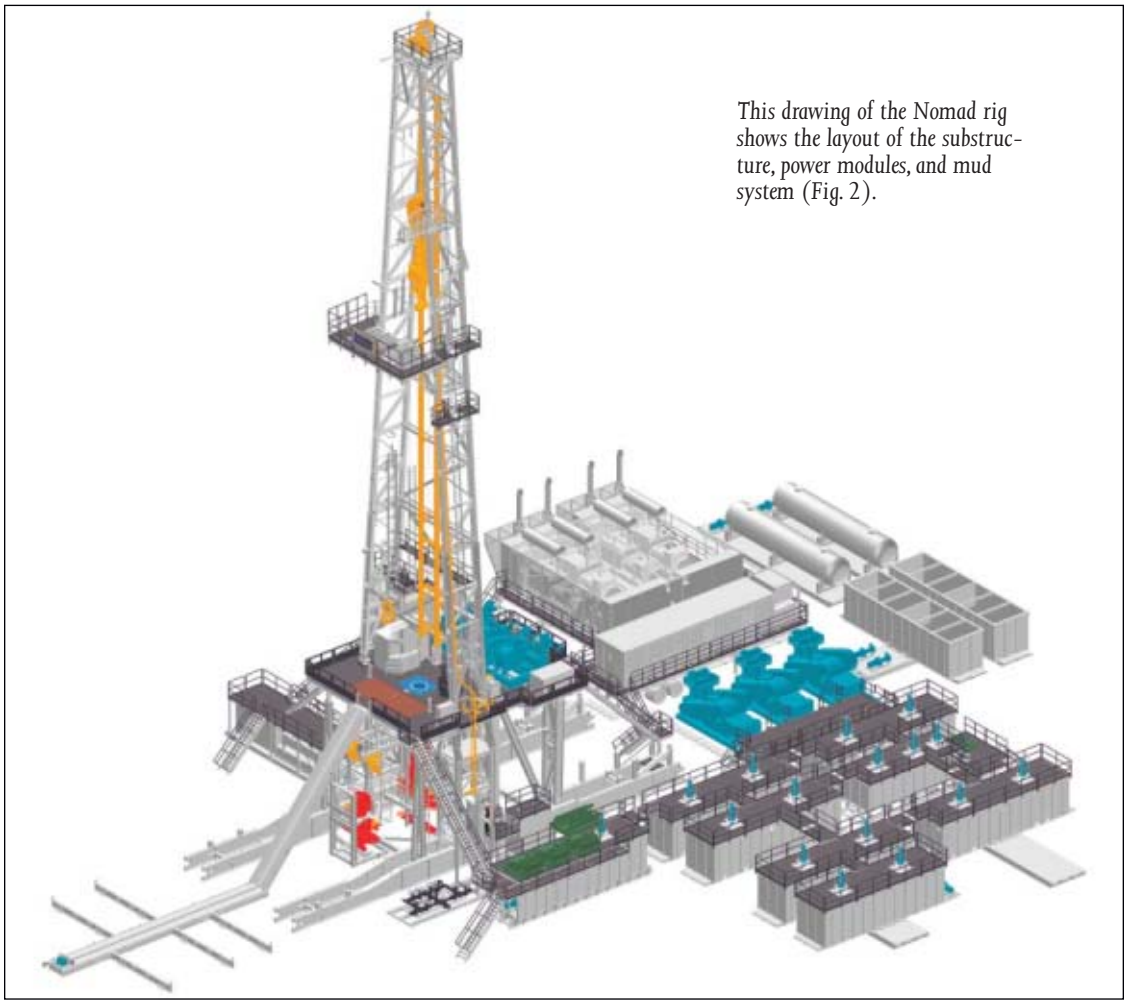
Sonatrach, based in the Mediterranean port town of Boumerdes, expected to earn $52-54 billion in 2006, up from $41 billion in 2005. It expected its foreign partners to earn $6 billion in 2006, up from $4 billion in 2005.[2]

Anadarko Petroleum Corp., Royal Dutch/Shell PLC, BHP Billiton Ltd., ENI SPA, and Hess Corp. have oil operations in Algeria. Gulf Keystone Petroleum Ltd. picked up licenses for several blocks in 2005.

Rig T-211, the first Nomad Class rig built by Bentec, will drill in Algeria's Illizi basin for BP/Sonatrach (Fig. 1; photo from Bentec Drilling and Oilfield services and KCA Deutag GMBH).

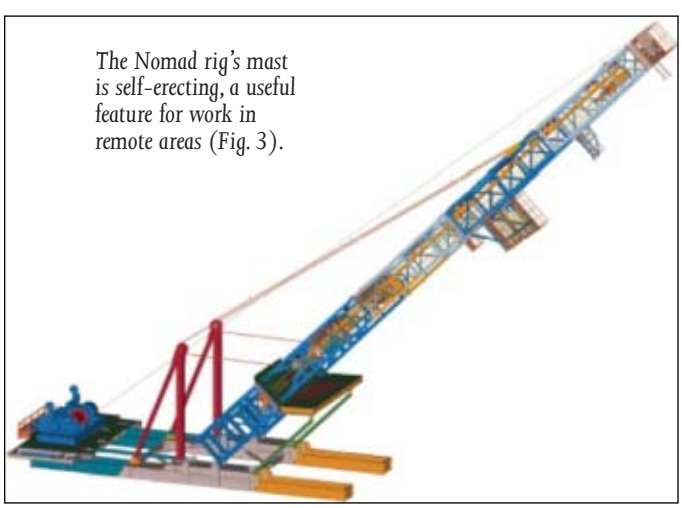
Illizi basin

The Illizi basin is one of two basins within the East Algerian syncline, separated from the Berkine (Ghadames) basin by the Ahara ridge. The nearly complete sedimentary section lies unconformably on Precambrian basement. About 10,000 ft of Paleozoic sediments outcrop on the southern margin of the Illizi basin, forming the Tassilis (sandstone plateaus) of Hoggar. Mesozoic formations outcrop in the center of the basin, and the Tertiary section is seen at surface in the northwest.[3]



This drawing of the Nomad rig shows the layout of the substructure, power modules, and mud system (Fig. 2).

BP is exploring Bourarhat South Blocks 230 and 231 (5,304 sq km) and South East Illizi Blocks 232 and 241 (5,640 sq km), adjacent to the Libyan border, as shown on map. According to Algeria's Ministry of Energy and Mining, the Bourarhat South blocks have been tested with 15 exploration wells, a drilling density of about 2.8 wells/1,000 sq km. About 40 wells have been drilled in the South East Illizi blocks, including 14 exploration wells, a density of about 7 wells/1,000 sq km.



The Nomad rig's mast is self-erecting, a useful feature for work in remote areas (Fig. 3).

Rig design

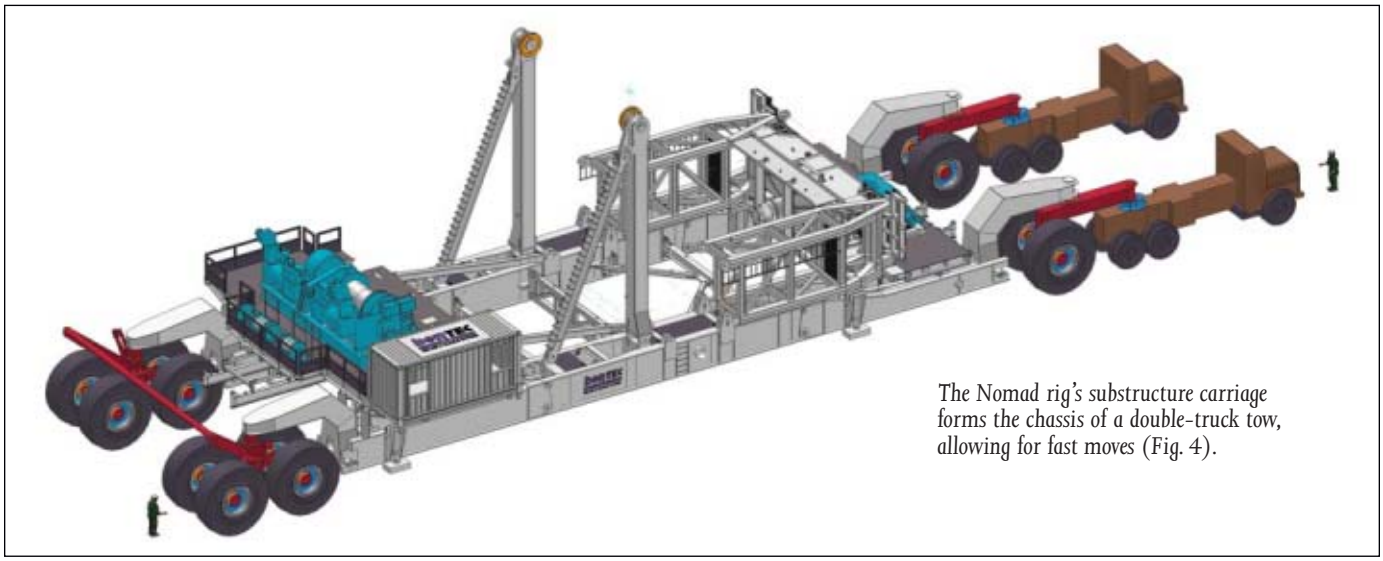
Bentec and KCA Deutag engineers developed the Nomad Class rig design in 4 months and incorporated input and suggestions from several operators working in North Africa's Sahara Desert (Fig. 2). KCA Deutag Project Manager Ron Klunder told OGJ that the final design concept was broadly in line with BP's rig specification and only a few modifications were necessary to comply with BP's requirements.

Intended for desert terrain in North Africa and the Middle East, the rig is fast moving and optimized for underbalanced drilling and cluster-bay drilling operations. The 1,500-hp Nomad rig is designed to move up to 10 km between well locations over flat terrain in only 5 days, about half the time required for existing rigs, said Klunder.

He told OGJ that specific design features are responsible for the new rig's increased mobility:

- Drill floor and substructure can be moved as a single load.
- Mast is raised with automated driller and emergency generator set.
- Mast can be moved as a single load including top drive.
- Generator packages and SCR houses are trailerized.
- Mud-treatment package and water tanks are skid-mounted.
- Special cabling arrangements simplify hookup.

The Nomad design incorporates equipment for safe and efficient operations, such as a catwalk pipe-handling system, anticollision system, iron roughneck, man-riding winch, automated driller, electronic mud pump pop-off valve savers, and dedicated equipment maintenance platforms. Special noise insulation for the generator



The Nomad rig's substructure carriage forms the chassis of a double-truck tow, allowing for fast moves (Fig. 4).

packages is work-environment friendly, says KCA Deutag.

The 152-ft tall, self-elevating mast is newly designed by Bentec, rated to support a 1 million lb static hook load and theoretically capable of drilling to 20,000 ft (see accompanying box). The mast accommodates a NOV TDS-11SA AC-powered top drive, which remains in place and is raised and lowered with the mast (Fig. 3)

The rig also has an assisting Mud King 37½-in. rotary table, powered by two 45-kw AC motors. The 1,500-hp Wirth drawworks have a maximum line pull of 40 tonnes and a Baylor 6032 eddy-current brake.

Power comes from four Caterpillar 3512B engines, each 1,500 hp, and four Caterpillar SR4B generators (1,500 kv amp). The SCR (silicon-controlled rectifier) unit is Bentec's custom design.

The mud system includes three Wirth TPK pumps, each 1,600 hp, and three Brandt Triple King Cobra shale shakers. The active mud system accommodates 1,529 bbl with an additional 1,846-bbl reserve. Wirth GMBH is based in Erkelenz, Germany, and Brandt is a division of National Oilwell Varco.

Blowout prevention equipment includes a 13⅝-in., 5,000 psi annular BOP; 13⅝-in., 10,000 psi double and single ram BOPs; 21¼-in., 2,000 psi annular BOP; 21¼-in., 2,000 psi single ram BOP, and two 20¾-in. x 3,000 psi single ram BOPs.

KCA Deutag's Claus Chur, director technical and procurement, said the Nomad Class rigs are "equipped with special carriages [that] allow the derrick and drill floor substructure to be moved as complete assemblies over flat terrain" (Fig. 4).

The substructure is a "swing-up" type, measuring 35 ft to the top of rotary table and 30 ft to the underside of the rotary beams. It has a setback load of 600,000 lb.

Bentec designs and manufactures drilling and workover rigs and mechanical and electrical rig components at its headquarters in Bad Bentheim and a nearby yard in Nordhorn, Germany. Bentec builds about eight complete rigs/year. In 2005-06, it built SCR units and mud systems for four rigs sent to Algeria by the European Drilling Rig Alliance (OGJ, Aug. 14, 2006, p. 39).

A second Nomad Class rig, T-212, will be completed in September. ✦

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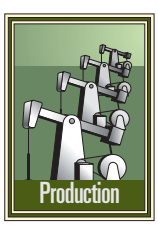
The Saipem 7000 crane barge lifted the new 455-tonne module onto the Snorre A platform (Fig. 1; photo from Statoil).

Snorre A upgrade includes new module



Statoil AS is nearing completion for upgrading the Snorre A platform, with the recent installation of a new module. The 455-tonne module includes a control room, kitchen, lifeboat station, and living quarters.

The Snorre A tension-leg platform is in the Tampen area off Norway and has been on stream since March 1992.

New module

Installation of the module, built by Leirvik Module Technology's (LMT) at Stord, north of Stavanger, involved the Saipem 7000 crane lifting the module onto the northwest corner of the TLP (Fig. 1). Statoil says the module construction contract was worth about 125 million kroner and the contract for Sorco to perform hookup and commissioning was worth about 160 million kroner.

Personnel from Sorco and LMT prepared the platform for module installation for the last 6 months, according to Statoil. The work included clearing the site, removing one lifeboat, and reinforcing the deck.

Since mid-April, about 470 people have worked on upgrading the TLP, which included 45 projects, Statoil says.

Bjørn Nysted, acting project manager, says the new module was required because a revamp of the existing control room to current requirements would have been difficult and the old kitchen was in poor condition.

The new module has a new, modern kitchen, and consequently, Snorre A can accommodate more people and avoid expensive flotels that are not readily available, according to Nysted.

With 48 new cabins in the new module, Snorre A now has a total of 268 cabins to accommodate personnel.

Improved recovery

Snorre field is in Blocks 34/4 and 34/7. Water depth in the area is 300-350 m.

Statoil expects the upgrades at Snorre A to improve recovery factors from the field to 55% from the current estimated 46% and extend the field's life another 25 years.

The increased recovery amounts to about 70 million bbl of oil, says Kjell Brustad, Snorre A platform manager.

Snorre A's current production throughput is about 115,000 bo/d.

Companies with interest in Snorre include Petoro AS, 30%; Norsk Hydro Produksjon AS, 17.7672%; Statoil ASA, 15.5497%; ExxonMobil Exploration & Production Norway AS, 11.5849%; Idemitsu Petroleum Norge AS, 9.60%; RWE Dea Norge AS, 8.2812%; Total E&P Norge AS, 6.1786%; and Hess Norge AS, 1.0384%. ✦

Solvent conversion at Canadian plant hikes sales gas, cuts CO_2, S emissions

Jamie Grant
Mark Weiss
Shell Canada Energy
Sundre, Alta.

Ken Sourisseau
Shell Canada Energy
Calgary

Shell Canada's conversion of the sour-gas treating solvent at its Burnt Timber gas plant from a Sulfinol-D solution to methyl diethanolamine (MDEA) increased processed sales-gas volumes and heating value, improved sulfur-recovery-unit performance, and reduced CO_2 and sulfur emissions.

The project was initiated primarily to offset the impact of higher CO_2 concentrations forecast in the incoming raw gas and to increase plant capacity.

Higher CO_2 content in the raw gas adversely affected the gas-treating unit as well as the sulfur-recovery unit.

MDEA was favored for its selectivity towards absorption of H_2S over CO_2 and the relatively low coabsorption of hydrocarbons.

Based on a presentation to the Laurance Reid Gas Conditioning Conference, Norman, Okla., Feb. 26-28, 2007.

Problems

Shell Canada's Burnt Timber plant was originally designed to process sour gas with Sulfinol-D with two separate treating units: Plant 1 was built in 1970 with a capacity of 65 MMscfd and Plant 2 was built in 1976 with a capacity of 71 MMscfd.

The Sulfinol-D removed essentially all of the H_2S and CO_2 along with trace sulfur compounds such as COS and mercaptans. Acid gas from each treating united is routed to a dedicated sulfur-recovery unit.

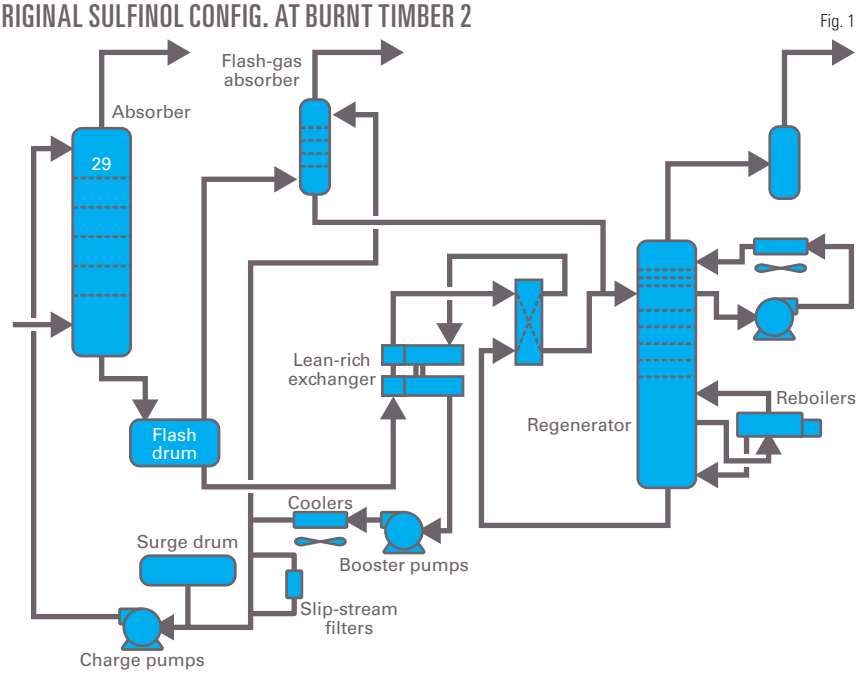
Plant 1 has a two-stage Claus followed by a Superclaus, while Plant 2 has a three-stage Claus unit.

The plant's license requires a current overall sulfur-recovery efficiency of 96.5%. The original feed to the plant came from Burnt Timber and Panther fields, had a low condensate-to-gas ratio, and contained about 12% H_2S and 7% CO_2. The acid-gas stream going to the sulfur-recovery units was more than 60% H_2S and contained 1.3% to 2.5% hydrocarbons on a methane-equivalent basis. About half of the equivalent hydrocarbon consisted of benzene and toluene.

The hydrocarbon content in the acid gas resulted in several problems. The first problem was the consumption of air to combust the hydrocarbons. Sulfur-plant capacity was often limited because the main air valve would open to 90% and control of the air would become

ORIGINAL SULFINOL CONFIG. AT BURNT TIMBER 2

Fig. 1



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difficult. The sulfur plant usually limited overall plant throughput.

The second problem with the hydrocarbons was the production of CS_2 in the reaction furnace. Levels of CS_2 as high as 1.25 % in the feed to the first Claus stage were measured. Hydrolysis rates of 90% of the CS_2 in the first bed were achievable with new catalyst, but the remaining CS_2 still had a significant impact on the overall sulfur recovery.

The third problem with the hydrocarbon was that it was not all completely combusted in the reaction furnace. The residence time of 0.5 sec with a reaction furnace temperature of 1,100° C. resulted in breakthrough of benzene to the first converter bed. This benzene cracks in the converter bed resulting in soot deposition on the Claus catalyst. Sooting of the bed reduced catalyst activity and resulted in increased pressure drop, reducing recovery efficiency and capacity.

Catalyst in the first bed of Sulfur Plant 2 was being changed every 6 to 9 months resulting in excessive operating costs and lost production.

The CO_2 in the acid gas was less of a problem than the hydrocarbons but did exacerbate the previously outlined problems. The inert CO_2 increases the pressure drop through the unit and hence backs the blowers up on their operating curves. The CO_2 in the acid-gas feed results in production of COS in the reaction furnace, reducing the overall sulfur recovery. Finally, the CO_2 reduces the reaction furnace's flame temperature, increasing the breakthrough of benzene to the first reactor bed.

The two main fields connected to the Burnt Timber facility have different gas compositions and different production profiles. The Burnt Timber field has H_2S and CO_2 contents of 10.2% and 6.4%, respectively. The Panther field on the other hand has H_2S and CO_2 contents of 7.0% and 11.5%, respectively.

With the Burnt Timber field in decline and additional drilling in the Panther field, the forecast composition for the plant inlet was that the H_2S content would decline while the CO_2 content would increase. Table 1 gives the current and future feed-gas compositions.

This change in composition would result in deterioration in sulfur-plant performance due to a less favorable H_2S/CO_2 ratio in the acid gas. In addition, because the active amine in Sulfinol-D is di-isopropanolamine (DIPA), the increasing CO_2 content increases the equivalent rich solvent loading faster than the declining H_2S content decreases the loading.

In order to maintain a constant equivalent rich loading, the solvent/feed-gas ratio would need to increase. Higher solvent-to-feed-gas ratio would increase the hydrocarbon co-absorption resulting in increased hydrocarbon in the acid gas, deteriorating sulfur-plant performance and plant capacity even further. Fixed charge-pump capacity would also mean that gas throughput would have to be reduced as the CO_2/H_2S ratio increased.

CURRENT AND EXPECTED FEED-GAS COMPOSITION Table 1

Component, mole %	Year 2005	2020
H_2S	10.1	8.1
CO_2	8.0	10.2
N_2	0.6	0.5
C_1	75.8	80.4
C_2	2.1	0.8
C_3	0.4	0.2
i-C_4	0.1	0.0
n-C_4	0.1	0.0
i-C_5	0.1	0.0
n-C_5	0.1	0.0
C_6	0.3	0.1
C_7+	3.3	1.2

An additional factor was the overall sulfur-recovery efficiency. The Burnt Timber plant was grandfathered when the regulating authority introduced new higher efficiency sulfur-recovery guidelines. Grandfathering allows the plant to build sulfur-recovery credits, which can defer a capital expenditure for a tail gas clean-up unit.

Credits can only be built, however, if sulfur-recovery efficiency is sufficiently high. Predicted efficiency with Sulfinol-D acid gas indicated that sufficient credits could not be built, which would accelerate the need for a tail-gas unit.

The direction of the gas composition, current capacity constraints, poor sulfur-plant performance, and shortened catalyst life showed a need to improve the H_2S selectivity of the treating units, reduce the hydrocarbon content of the acid gas, and increase overall plant capacity.

A feasibility study conducted by Millenia Resource Consulting, Calgary, showed that a solvent swap from Sulfinol-D to MDEA would provide these benefits, and detailed study work was initiated with Shell Global Solutions, Houston, to evaluate such a swap.

Shell's models for absorbers simulate using actual number of trays and calculate the mass transfer rates on each tray. Operation to slip enough CO_2 to give 3.8% CO_2 in the treated gas from the MDEA was targeted, as this would allow the blend of gas from Trains 1 and 2 to meet the 2% CO_2 specification for the sales gas to the pipeline with Train 1 remaining on Sulfinol-D.

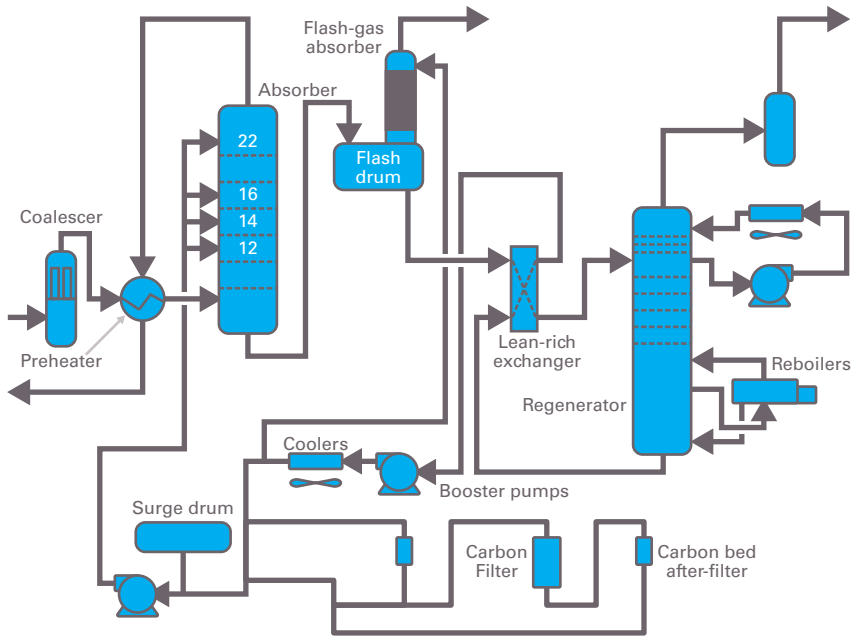
An additional reason to consider a solvent swap in only Plant 2 was that the feed gas contains COS and mercaptans that are effectively removed by the Sulfinol-D but would not be removed as well by MDEA.

The accompanying box shows treated-gas sulfur specifications, trace sulfur compounds in the feed gas, measured trace sulfur compounds in the treated gas from the Sulfinol unit, and predicted trace sulfur compounds in the treated gas from an MDEA absorber operating to give CO_2 slip.

The numbers in this box make clear that MDEA is expected barely to meet the total sulfur specification, but operating a facility so close to specification is undesirable. By keeping Train 1 on Sulfinol-D and blending the treated gases, operators expected combined sales gas to have a total sulfur content at about half of the specification. If required to operate only Train 2, they

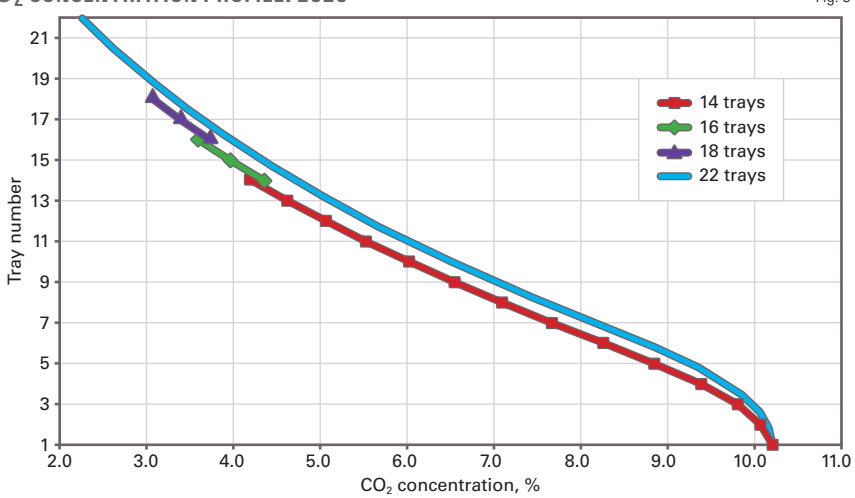
MDEA CONFIG. AT BURNT TIMBER 2

Fig. 2



CO_2 CONCENTRATION PROFILE: 2020

Fig. 3



could use a higher solvent/gas ratio and the lean solvent feed location to increase both CO_2 and trace sulfur-removal rates.

The results of the study indicated that conversion of Plant 2 was technically possible. The economics of the project, based on increased capacity, higher sales-gas heating value, and improved sulfur-plant performance were favorable.

Original configuration

The original plant configuration was of a typical Sulfinol unit (Fig. 1).

The absorber column contained 29 conventional two-pass trays and operated at a pressure of 5,800 kPa(g). Lean Sulfinol was supplied at 40° C. and the main charge pumps were capable of supplying 227 cu m/hr. Flash gases from the rich Sulfinol flash drum were treated in a flash-gas absorber.

The lean-rich exchangers consisted of the original shell and tube exchangers supplemented with a plate and frame exchanger installed during debottlenecking. The regenerator column contained 22 Shell HiFi calming-section trays in the stripping section, and seven calming-section trays in the reflux-cooling section. An internal reflux-cooling system, in which reflux water is pumped around and cooled was provided.

Two reboilers operating on 350 kPa(g) steam provide the duty for stripping. A booster pump downstream of the lean-rich exchangers provides enough pressure to flow the Sulfinol through the lean-solvent cooler, solvent filter, and to the fuel-gas absorber. The charge pump supplies cooled Sulfinol to the absorber.

Modifications for conversion

The initial project study was based on equipment capacities that had been identified in a performance test conducted in 1999. There was a desire to use as much existing equipment as possible while ensuring that it was in good shape. In addition, Shell Canada wanted to incorporate its experience with operation of two existing MDEA units to ensure long trouble-free operation.

The company passed the process design developed by Shell Global Solutions to Millenia Resource for detailed design and construction.

Solvent pumps; absorber

Both booster pumps and charge pumps had nearly the maximum impellers installed, and Shell Canada decided to use the existing pumps without modifications. Additional solvent flow would not improve capacity because other equipment limits would restrict capacity first. The design was advanced with the booster pump flow of 259 cu m/hr and a charge pump flow of 227 cu m/hr.

The most complex part of the modifications was in the absorber tower. Its design had to account for the change

in the H_2S/CO_2 ratio in the feed gas over time. Slip of up to 4% CO_2 in the treated gas was desired while achieving no more than 8 ppm (vol) of H_2S.

Because the process design was to use kinetic selectivity to obtain the desired slip, a weir height of 50 mm was selected for design. Calculations indicated that 22 trays would be required to obtain 2% CO_2 in the treated gas for the composition expected in 2020, while 14 trays would achieve less than 8 ppm (vol) H_2S for all gas compositions.

The uncertainty in gas composition and the parameters required for calculations involving kinetic slip prompted a decision to provide the absorber with multiple liquid feeds. Although this would require addition of nozzles on the existing absorber, it would also provide the flexibility to handle most of the uncertainties.

Feed locations at tray Nos. 12, 14, 16, and 22 were selected. The tower would be retrayed from the top down, so that the new Tray 22 would be in the same location as old Tray 29 and would use the existing feed nozzle.

The space for the new feed nozzles would be created by omitting the tray that was in that position. The new Tray 1 would end up where the existing Tray 5 was, providing more room in the absorber sump. The normal liquid level in the sump would be increased to provide more residence time for gas de-entrainment.

As previously pointed out, the existing absorber had conventional two-pass trays installed for the Sulfinol service. When swapping to MDEA it is generally recognized that the system foam factor will increase.

In addition, Shell tray design parameters for MDEA are more conservative than parameters for Sulfinol systems. When the hydraulic calculations were made for the existing trays in MDEA service, many of the design parameters exceeded acceptable values. A switch to Shell HiFi calming-section trays provided a tray design that would meet the more stringent design conditions for the MDEA solvent.

Shell Canada's experience with the MDEA units at Caroline prompted a review of the materials of construction. The expected maximum rich MDEA loading of 0.80 mole/mole resulted in the recommendation that the bottom section of the absorber be strip lined with stainless steel.

Materials engineers felt that strip lining from Tray 6 down would eliminate any problems with corrosion associated with rich loading of MDEA now and in the future.

Flash drum, absorber

The existing flash drum had hydrogen blistering and was showing signs of corrosion, particularly along the gas-liquid interface. It was decided to replace the existing flash drum with a

stainless steel vessel to provide 5 min of liquid residence time.

An integral flash-gas absorber also of stainless steel was added to the top of the flash drum. It was only 457 mm in diameter compared to the original diameter of 610 mm. Given the new smaller diameter, the column was packed with 5 m of No. 2 Cascade mini rings.

The reduction in size reflects the expected decrease in the amount of flash gas. The MDEA solution was expected to have about one third of the dissolved hydrocarbons compared to Sulfinol, and the additional residence time in the sump of the absorber was expected to reduce the entrained gas level.

Lean-rich exchangers

The new design duty for the lean-rich exchangers of 6,675 kw was provided by two 100% plate and frame exchangers. The clean duty of each exchanger was about 8,000 kw.

The exchangers were configured for both series and parallel operation to allow for cleaning one unit without a drop in throughput and for tighter temperature approach with the exchangers in series. The pressure profile on the lean side was controlling, as sufficient head was required at the solvent booster pump.

Regenerator; reboilers

The stripping section of the regenerator was previously fitted with 22 Shell HiFi calming-section trays, high capacity trays with limited scope for debottlenecking. The column was re-rated to account for the increased foaming tendency of MDEA relative to Sulfinol.

Although some of the design parameters were higher than desirable for a new design, they fell within acceptable limits for retrofit applications. Shell Canada felt that the regenerator flooding might become the new plant limit, but that would depend on the capacity limit of the regenerator reboilers. The inlet feed nozzle and the rich-feed zone, one tray above and one tray below the inlet nozzle of the regenerator, were strip lined with stainless steel.

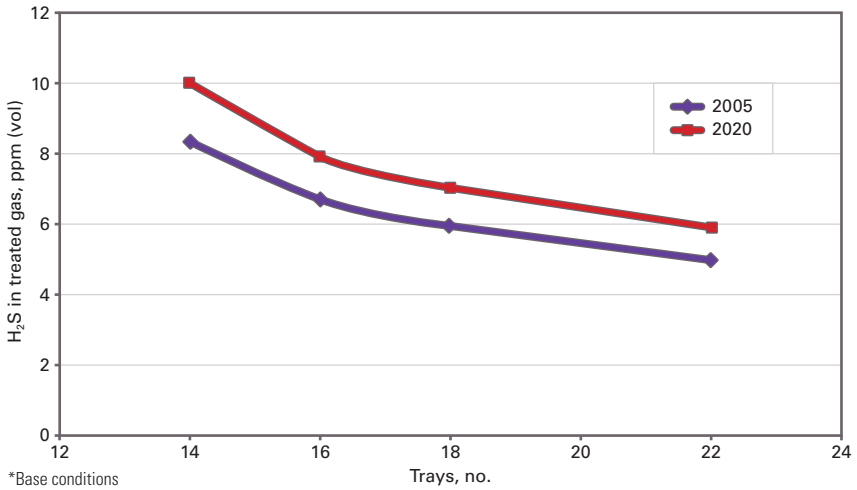
The two existing regenerator reboilers have a design duty of 12,600 kw, with the required new duty being 13,100 kw. Because performance testing indicated that the reboilers had operated at 13,000 kw previously, reboiler duty was not considered a bottleneck for the design case.

Total plant throughput might be limited in the future by the ultimate reboiler duty achievable. Metallurgy was upgraded on the reboiler feeds, overheads, and liquid returns. The reboiler vapor space had been metal sprayed in a previous turnaround and the exiting reboiler bundles were stainless steel.

Solvent coolers, filters

The lean solvent cooler actually

TREATED GAS: H_2S CONTENT VS. FEED-TRAY LOCATION* Fig. 4



*Base conditions

consisted of three aerial coolers that had been valved to run in a series-parallel combination. The design duty was 9,660 kw, with the required new duty being 8,300 kw.

The piping was modified to allow the two smaller coolers to run in series with the larger third cooler to improve cooling during the summer.

The Sulfinol system had existing full-flow particle filtration. With the swap to MDEA, activated-carbon filtration was added along with post-carbon-bed particle filtration. Capacity of the carbon bed was 5% of the solvent flow.

Inlet filter coalescer

The original inlet flow to the plant was relatively low in liquids and the original inlet separators were not overly large. During operation of the Sulfinol unit, numerous incidents occurred when the inlet slug catcher became overloaded and passed liquid to the treating unit. An inline cyclone separator existed but had limited effectiveness in slug situations. This resulted in liquid hydrocarbon and salt water entering the Sulfinol unit.

MDEA being more susceptible to foaming due to liquid hydrocarbons led to a decision to install a filter coalescer between the inlet slug catcher and the absorber. The model selected had a lower chamber to catch bulk liquid and an upper chamber with the coalescing elements. Each chamber had separate level controls.

Inlet feed-gas preheater

Two theories existed in order to maximize the selectivity of the MDEA. One was to keep the inlet gas temperature low and the other had evidence that higher temperatures would be required to obtain the desired selectivity.

Although the arguments for the feed preheater were not compelling, a suitable heat exchanger was available as surplus and was installed. Preheat of the feed gas would be provided by cooling of the treated gas, which would offload the propane refrigeration system.

Fig. 2 shows the flow for the plant reconfigured for MDEA.

Predicted performance

Process models and design experience helped predict the performance of the sweetening unit with MDEA. The design investigated the impacts of solvent strength, number of trays, lean solvent temperature, and feed-gas temperature and composition. Shell Canada selected a solvent strength of 45 wt % to balance acid gas pick-up and solvent temperature rise.

Lean solvent loadings of 0.0028 mole/mole for H_2S and 0.0045 mole/mole for CO_2 were used based on the expected performance of the regenerator. The base feed-gas conditions were 22° C. and 5,752 kPa(a) and the base lean solvent temperature was 40° C.

CO_2, H_2S removal

Fig. 3 presents the CO_2 profile in the absorber for base operating conditions in 2020 for various tray counts. The graph shows the complete profiles for 14 and 22 trays and only the last three trays for the 16 and 18-tray cases.

Note that the profiles indicate that the absorber is operating in kinetic selectivity as the CO_2 concentration is continuously decreasing with increasing tray number. Operation with 22 trays results in slightly more than 2% CO_2 in the treated gas, while operation with 14 trays results in just more than 4% CO_2.

A similar plot for the feed-gas composition in 2005 results in treated-gas CO_2 contents of 1.5% and 3% for 22 and 14 trays, respectively. These data suggest that a minimum of 16 trays is required in 2020, while fewer than 14 trays are required now to meet the CO_2 slip criteria of 4%.

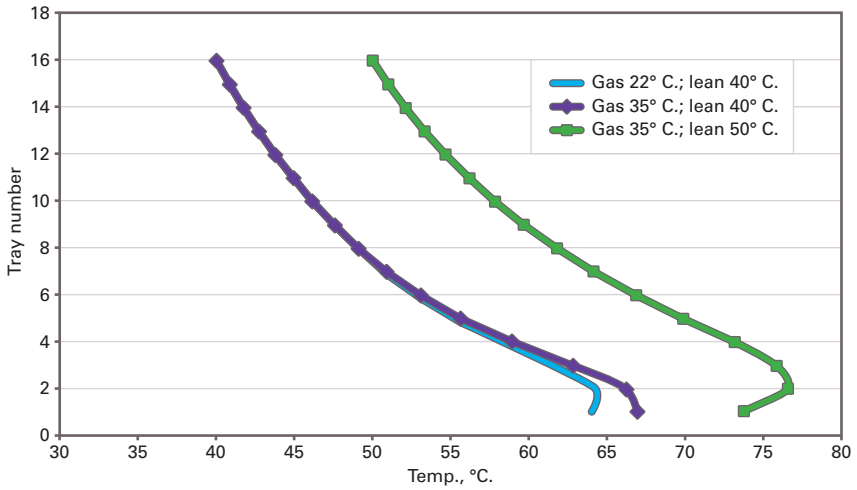
Fig. 4 presents the H_2S concentration vs. number of trays for two different gas compositions. Note that the conditions for the graph are solvent at 40° C. and a lean H_2S loading of 0.0028 mole/mole. Because it is possible to cool to less than 40° C. in the winter, H_2S removal could be improved.

Achieving lean MDEA loadings of less than 0.0028 mole/mole may also be possible, but the increased stripping steam may overload the regenerator. The minimum number of trays to achieve 8 ppm (vol) in 2020 is 16, while slightly more than 14 trays are required in 2005. Over circulation or additional stripping would reduce the number of required trays.

Calculations were also done at a lean solvent temperature of 50° C. The calculated H_2S in the treated gas was found to be 13 ppm (vol), too high for

ABSORBER LIQUID TEMP. PROFILES: 2020

Fig. 5



the required specification. Because the equilibrium H_2S concentration at these operating conditions was found to be 8 ppm (vol), even with 22 trays it would be difficult to make the 8 ppm (vol) specification.

Absorber temperature

Temperature profiles for various operating conditions were also determined (Fig. 5).

The profiles clearly indicate that the energy balance is dominated by the liquid stream, as warming the gas from 22° C. to 35° C. only shifts the lowest part of the profile by 2-3° C. Increasing the lean solvent's temperature by 10° C. shifts the entire profile by 10° C.

When all of the design calculations provided results that were similar to those reported by Weiland and Dingman,[2] Shell Canada was confident with the predicted performance of the unit.

Construction

Construction was fast tracked due to time constraints and resulted in short windows for equipment delivery. The construction premise was to have the majority of the new equipment, piping, and structural completed before the scheduled plant shutdown. Work during the shutdown was to be limited to vessel work, final tie-ins, and inspection of existing equipment.

Most of the equipment was on three skids: the gas-gas exchanger and coalescer skid, lean-rich exchanger skid, and the flash tank skid. Problems at the fabrication shops for the flash tank and gas-gas exchanger skids delayed deliveries of the skids. The added work in the turnaround scope increased costs and extended construction times.

The major work undertaken during the shutdown was the installation of three feed nozzles on the absorber, modification or removal of the tray rings, and strip lining of the lower 10 m of the absorber with stainless steel and bush lining of the nozzles.

This work was done with one contractor that was able to section off the tower into three areas so that three crews could work simultaneously. The areas of the towers that required welding were preceded with a hydrogen bake out for 16 hr, continuous weld preheat, followed by stress relieving of the new nozzles.

Installation of the new trays went well considering that the tray rings had to be converted from partial rings to full rings in order to support the Shell HiFi trays. Tray ring extensions were welded into place to ensure tray sealing. During installation of the first few trays, it became apparent that an error had been made in the tray drawings: The bottom collector tray had been fabricated to take flow from an "odd" tray. Although tray installation continued with an "odd" tray, this meant that there was an extra even tray and an odd tray was missing.

The tray fabricator was able to build the required tray on short notice and the vessel contractor was able to modify the liquid distributor piping for each feed point resulting in a small schedule impact.

Commissioning

One of the most difficult aspects of commissioning was getting the system clean after all the work in the absorber. The absorber and regenerator were first vacuumed to remove as much grit and welding slag as possible. The vessels and piping were purged free of air and gross-leak tested with nitrogen supplied from bulk transport trucks. A final leak check was then done at operating pressure using sweet fuel gas.

The magnitude of piping replacement and vessel work required for construction of the project made it necessary to flush the system before start-up to remove chemical and construction debris.

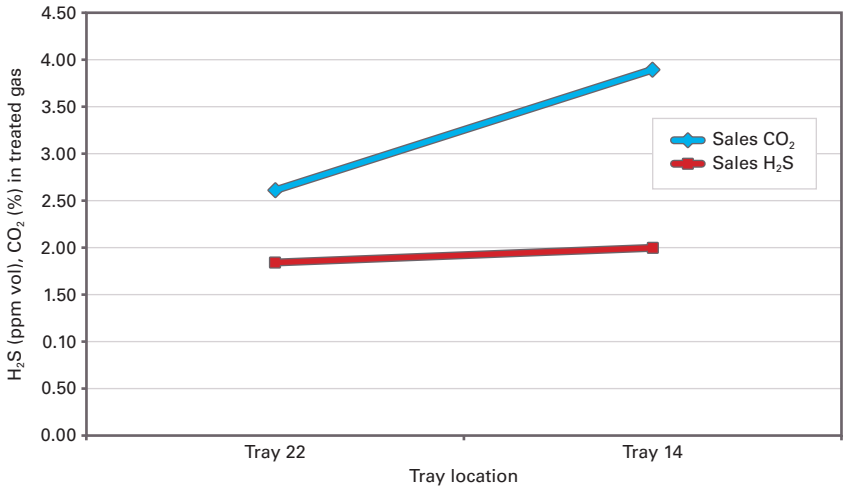
Start-up strainers were installed on the suction side of the booster pumps and the charge pumps to prevent equipment damage and to aid in removal of debris. Filters (50µ nominal) were also installed in the full-flow filter vessel to further help clean the system.

The system was then charged with steam condensate until sufficient operating levels were established. Normal circulation was established with the exception that the lean-rich exchangers were bypassed to prevent damage. All pumps and filters were closely monitored for cavitation and plugging and screens and filters were replaced as required. The booster pump suction screens plugged numerous times indicating a large amount of debris was left behind from the vessel work in the regenerator.

The steam condensate temperature

TREATED-GAS CO_2, H_2S DEPENDENCE ON FEED-TRAY LOCATION

Fig. 6



was progressively raised to 60° C. A degreasing solution was then added to the system via a pressure truck. The solution consisted of 1.0% soda ash, 1.0% trisodium phosphate, and 0.2% surfactant. The solution was circulated according to contractor recommendations.

The system was then drained completely and recharged with fresh steam condensate. The lean-rich exchangers were commissioned and steam condensate was circulated for 3 hr at 3,000 cu m/day to achieve three full circulations. The system was then drained and charged with a 50:50 MDEA/water mixture.

Start-up

Normal plant start-up practices were followed, and gas was introduced without unexpected issues or upsets. Once the lean-rich exchangers were placed in series configuration on the lean side, however, cavitation of the booster pumps occurred at circulation rates greater than 3,500 cu m/day. This cavitation resulted in damage to the mechanical seals on the pumps and required a complete unit shutdown of 3 days for delivery of replacement parts.

Once the seals were replaced and the system was returned to operation, plugging occurred in the absorber level's control valve. The manual bypass valve could not be used effectively due to high vibration; therefore a system shutdown was again required for removal of debris (welding slag, bolts, etc) from the valve trim. This issue occurred three more times with the same result. Bypass piping was then added with a redundant level-control valve installed with a different style trim.

Even though the lean-rich exchangers were only put in service after the system was cleaned, they did experience fouling in the early stages of MDEA circulation. Fouling led to pulsation in the exchangers and difficulty in controlling the still temperature. The exchangers had to be cleaned on line several times.

Optimization, operation

Once the solvent cleaned up, we conducted a series of tests to check the performance of the unit against the design. Feed tray location was varied, the maximum gas rate was determined, and steam and solvent to gas rates were varied. The key results from these tests are presented below.

CO_2 slip

Fig. 6 shows the impact of feed tray location on the CO_2 and H_2S content of the treated gas. Note that the amine circulation rate and raw gas H_2S, CO_2 concentration are similar for both cases.

Performance results

The maximum gas rate achieved during the performance test was 2.05 million cu m/day. The bottleneck was the sulfur plant in all tests completed. This value exceeded the design value of 1.8 million cu m/day.

One of the key benefits of the solvent swap has been a reduction in the steam demand for gas treating. Although the MDEA unit requires about 25% more steam for each cubic meter of solvent, the solvent flow required for each cubic meter of raw gas is about 60 % less. The net result is that per volume of raw gas the MDEA unit consumes 25% less steam than the Sulfinol unit. Part of this is the result of less CO_2 pick-up due to slip, while part is due to the higher CO_2 capacity of the MDEA.

Another benefit of the conversion to MDEA has been the drastic reduction in flash gases from the flash tank. The flash gases are sweetened in the flash gas absorber and are used in the plant as wet fuel gas. The flash gas flow during the Sulfinol operation was often greater than 30,000 cu m/day. This resulted in a surplus of wet fuel gas for the plant necessitating the flaring of the excess. The MDEA only produces 2,000-4,000 cu m/day of flash gases.

The conversion to MDEA in Plant 2 at the Burnt Timber gas plant has been very successful and has met all of the objectives for the project. Plant 2 currently slips up to 4% CO_2 to sales, which has resulted in a combined sales-gas CO_2 content of 2%.

The MDEA operates well with very few upsets and next to no foaming. This can be attributed to a combination of things. One is the fact that the inlet coalescer collects a considerable amount of hydrocarbon, which prevents it from entering the gas-treating unit where it otherwise would contaminate the MDEA and cause foaming. The carbon filter also removes any contaminants that do get into the system.

The carbon filter is not in continuous operation and is put into service to clean up the MDEA when required. The full-flow filters that were installed

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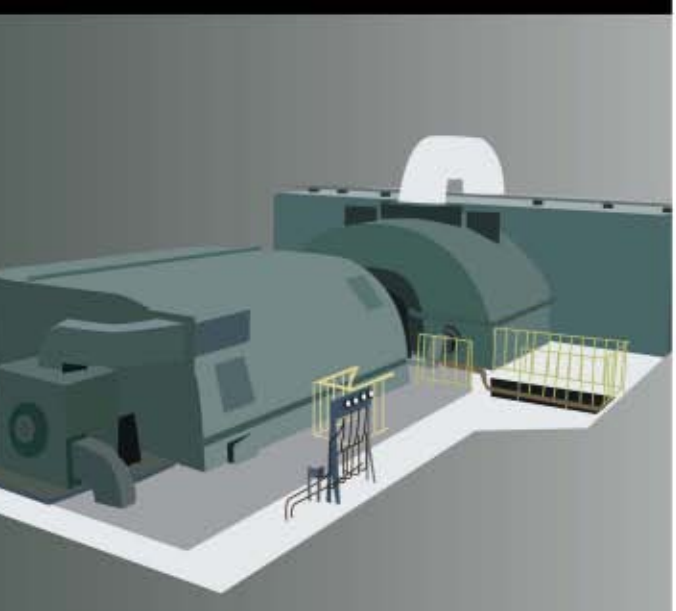

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before the MDEA conversion also help to keep the solution clean. All these factors have resulted in a relatively trouble-free amine system with few foaming incidents.

The CO_2 slip has also increased the acid-gas quality to as high as 70% H_2S from 58%, depending upon inlet-gas composition. The hydrocarbon content has dropped from greater than 2.5% to less than 1% on a methane-equivalent basis. As a result the COS content in the feed to the first Claus stage has dropped from as high as 1.25% to about 0.23%.

The lower hydrocarbon content in the acid gas has resulted in decreased sooting of the first Claus bed leading to longer bed life and increased CS_2 and COS hydrolysis. The total reduced sulfur (TRS) emitted to atmosphere from the incinerator stack has also decreased dramatically.

The COS and CS_2 concentrations in the stack have dropped to 50 and 16 ppm (vol), respectively, from about 130 and 200 ppm (vol). The total TRS concentration has dropped to 100 ppm (vol) from 600 ppm (vol). These improvements have resulted in an increase in sulfur recovery in Plant 2 to 96.9% from 95%.

One concern in converting from Sulfinol to MDEA was the removal of trace sulfur compounds. The design calculations indicated COS and mercaptan removals of 28% and 37%, respectively. A test on Oct. 13, 2006, with feed to Tray 14 indicated actual COS and mercaptan removals of 26% and 47%, respectively, with H_2S in the treated gas of 2.7 ppm (vol).

Testing of Plant 1, operating on Sulfinol, showed removal of COS and mercaptans of 85% and 80%, respectively, and 1.3 ppm (vol) of H_2S in the treated gas. The inlet gas at the time contained 112 mg/std. cu m of trace sulfur compounds compared to the design value of 117 mg/std. cu m. Under these conditions, the total sulfur content of the combined sales-gas stream was 59 mg/std. cu m, easily meeting the specification of 115 mg/std. cu m.

Unfortunately, a subsequent test on Oct. 25 showed COS and mercaptan removal rates of 8% and 15%, respectively, with an inlet gas trace sulfur content of 199 mg/std. cu m. The total sulfur content of the combined sales-gas stream was measured at 141 mg/std. cu m. This problem is being investigated by technical staff.

It was determined that field activities related to sulfur-solvent washes of production tubing resulted in the high levels of trace sulfur compounds in the inlet gas. Operational plans are being put in place to limit the concentration of mercaptans in the feed gas during these field activities. ✦

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2. Weiland, Ralph H., and Dingman, John C. (2002), "Simulator provides Guidance for Increasing CO_2 Slip in Gas Treating Applications," Gas Processing, Winter, pp. 21-28.

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Wireless sensors enhance system safety, efficiency

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Hatem Nasr
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Houston

Roberto Garelli
Pemex Gas y Petroquimica Basica
Mexico City

A new pipeline wireless sensor network system used by Pemex Gas y Petroquimica Basica is improving operational efficiency and safety and should help reduce theft and sabotage. Since its installation in January 2007, the system has operated without failure.

PGPB is the division of the Mexican national oil and gas company that transports gases and basic petrochemicals across the country. PGPB manages its network of pipelines from a control center in Mexico City and has a large portion of the pipeline integrated into its supervisory control and data acquisition system.

PGPB, however, has never before acquired information about the operational conditions of its pipelines transporting basic petrochemicals, propane, ethane, and methane among its processing centers, a network of roughly 600 km.

This article documents PGPB's search for sensor technology that would monitor and properly manage its pipeline network (Fig. 1) and provide rapid access to remote data such as gas pressures from sectioning and transport valves across the network. PGPB wanted operators in the control room, processing centers, and process final destinations to be able to provide operational alarms and monitor the status and operating conditions of the pipeline as well as monitor real-time pressure trends with a high degree of confidence.

PGPB also wanted the system to detect anomalies caused by sabotage or theft, which have proven highly dangerous. Finally, the new technology was to provide a balance system for transport schedules (sent and received) as agreed between the processing centers.

PEMEX evaluated both wired and wireless solutions for this project, concluding that a wireless solution provided a better business case based on the

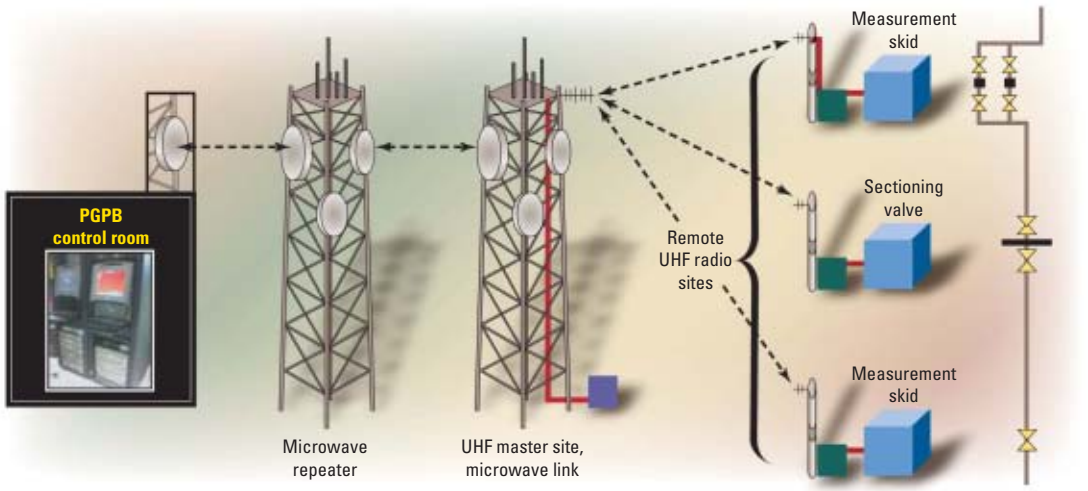
PGPB PIPELINE NETWORK Fig. 1

following evaluation criteria:

- Wireless solutions provided a total saving in installation costs that exceeded 70% of wired solutions
- Maintenance costs associated with annual battery replacement were very small comparable to maintenance costs of traditional solutions.
- Project execution time was the clear edge, with budget spending restraints and a project execution time not to exceed 2 months.

Existing PGPB communications

Fig. 2



Problems

PGPB faced problems installing any automation system.

- Power sources such as solar panels or battery banks, even copper cables and instruments were frequently stolen or damaged.
- PGPB's SCADA system operates on a UHF-microwave backbone that supports limited communication protocols such as BSAP and Pemex Modbus. Any new wireless monitoring technology, however, would have to be integrated with this system.

A new generation of wireless sensors, packaged in a low-profile explosion proof enclosure with the full assembly painted the same color of the pipeline, helped address these problems. The equipment is completely autonomous, operating on an internal battery pack designed to last 1 year with the wireless sensor transmitting every 5 sec.

This self-sufficient wireless design eliminated the need for the type of wiring that was typically stolen.

The wireless sensors transmit data to a gateway a few miles away. The sensors and gateway are both configured to communicate with Pemex Modbus protocol, using the existing UHF backbone and providing transparency to the SCADA system.

Installing a system in such a large geographic area, extending across three states in southeast Mexico is a major logistical challenge, making ease of configuration and installation important.

System architecture

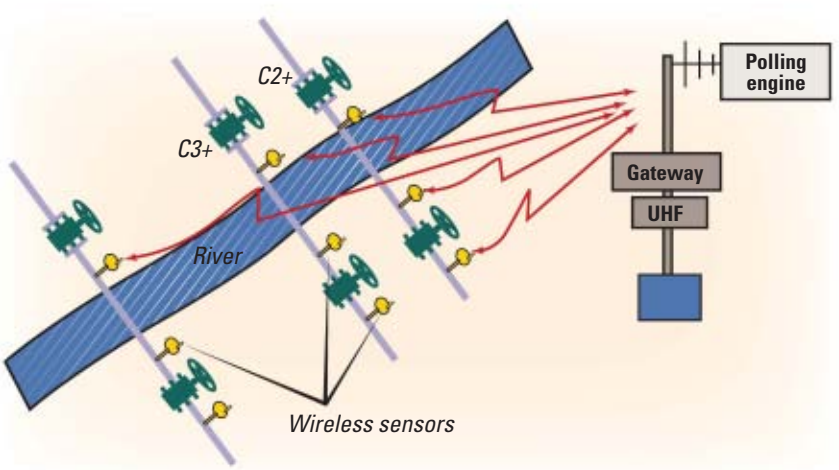
A key element of any SCADA system is communications network reliability. Any delayed or inaccurate responses can lead to an inaccurate understanding of the pipeline's operating state, potentially compromising safety. PGPB used a well-designed SCADA communications backbone (Fig. 2), consisting of point-to-multipoint master UHF towers installed alongside the pipeline network, with each master site covering pipeline in a diameter of about 80-100 km.

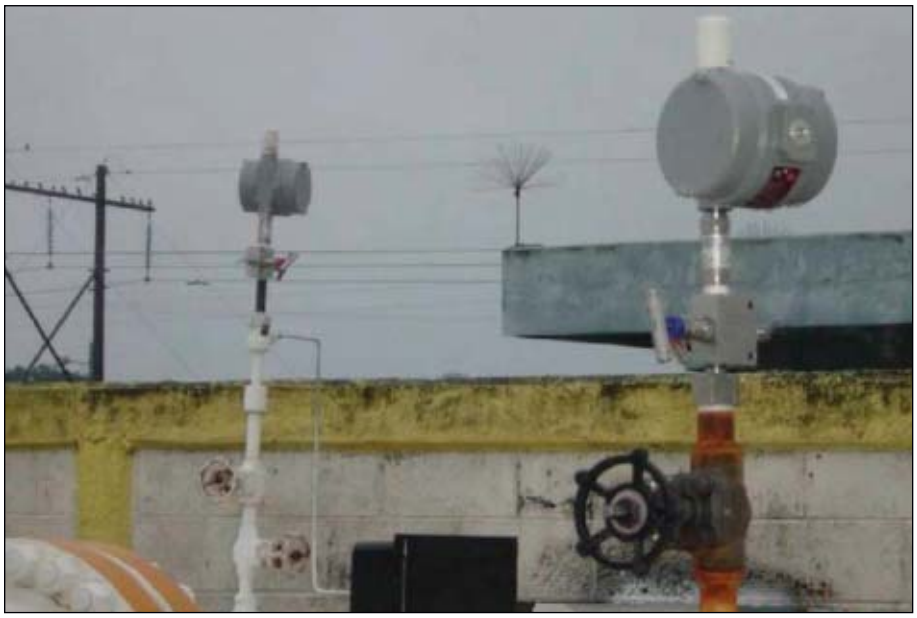
A point-to-point microwave network links each of these UHF towers to the main control room in Mexico City. This network gives PGPB a secure and redundant link with independent communications channels for each master site, improving the overall polling cycle and optimizing the performance of the whole communications network.

The wireless sensor system architecture (Fig. 3) had to work transparently with this communication backbone. Its

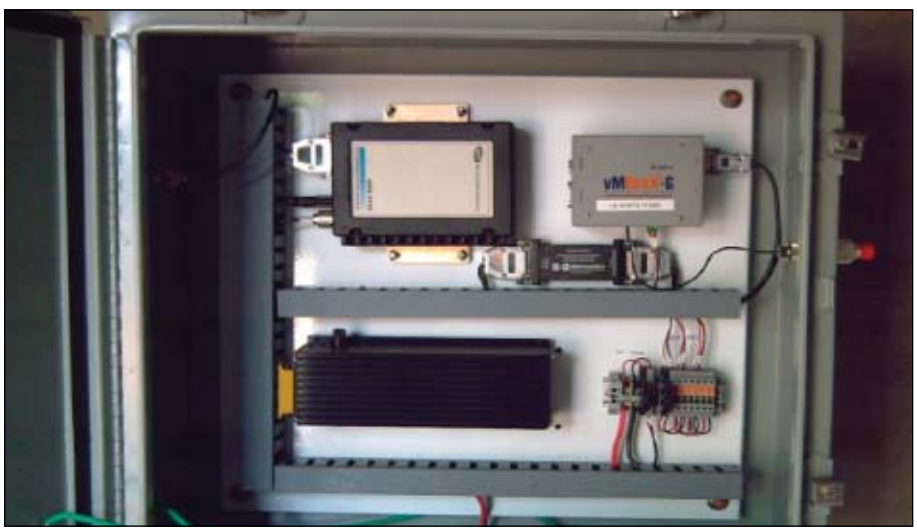
Wireless network data flow

Fig. 3





Wireless monitors such as these acquire operating measurements and convert these data into electrical signals suited for transmission over PGPB's existing communications network (Fig. 4).



The desire for a minimum 1-year battery life helped determine the 30-sec frequency with which field data gateways, such as the one shown here inside its communications shelter, receive data from the wireless sensors (Fig. 5).

main components are:

- Multiple numbers of wireless sensors at each pipeline monitoring station creating a mesh network reporting to one wireless gateway data concentrator.
- A point-to-multipoint transponder in the center of this mesh receiving messages from all wireless sensors registered with the corresponding gateway.
- Using gateway data to map from wireless sensor messages into relevant registers according to their ID.
- Serially connecting the gateway to the UHF radio network.
- The SCADA polling engine getting data from the gateway using its own UHF-microwave communications backbone.

Fig. 4 shows the final installed system.

Wireless sensors

System operation begins with collection of data. Wireless sensors installed on the pipeline acquire measurement information such as pressure and convert these data into electrical signals suited for transmission. The wireless sensors transmit once every 30 sec. This frequency used a 1-year evaluation of the SCADA system polling cycle to provide a 1-year battery pack life for the data gateway (Fig. 5).

The gateways are then scanned once per minute by an associated UHF base station, with data sent at that time. When the base station receives the data, the point-to-point microwave network relays it to the main control room in Mexico City.

In addition to receiving remote data,

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the network can also direct commands to a particular remote station. This will prove particularly useful in the second phase of this project, planned for later in 2007 and scheduled to cover control of solenoid valves for security sectioning in case of leaks or anomalies that have caused HSE incidents in the past.

Network management

Besides operating the pipeline network, the system provides diagnostic information to facilitate operations and guarantee data integrity. Each transmitted message from the wireless sensor includes a battery voltage reflecting the real voltage of the battery pack providing power to the wireless sensor.

This register will provide PGPB operations the advantage of planning maintenance trips to sites with low-battery levels, pursuing maintenance issues proactively rather than waiting for the sensor to stop reporting.

Diagnostic data allow PGPB close monitoring and configuration of its network—including sensor status at the remote stations—without the need to visit sites personally to make minor changes. With more than 600 km of pipeline to manage, frequent site visits would be time consuming and cost prohibitive for HSE purposes. ✦

Equipment/Software/Literature

Free brochure discusses casing/liner shoe

A new brochure, yours free for the request, discusses EZReam technology, which is a casing/liner shoe.

The steel reaming shoe is PDC drillable. A tungsten carbide and PDC cutting surface help enhance durability, enabling the shoe to ream longer intervals through challenging hole sections, the brochure notes.

Source: **Baker Hughes, Hughes Christensen,** Box 2539, Houston, TX 77252-2539.

Enhanced automatic hydrocarbon dewpoint analyzer

Condumax II, an automatic hydrocarbon dewpoint analyzer, includes enhanced features such as electronic sensor cooling-heating that provides readings more frequently and eliminates gas coolant utilities.

It is CSA C/US approved for Cl. 1, Div. 1, Gp. B, C, and D and can be supplied with an integral sample system for installation outdoors next to the sample tap. It also has an option of measuring hydrocarbon and water dewpoint for added functionality.

The company says the Condumax/Condumax II has been successfully applied

in onshore and offshore dehydration and hydrocarbon reduction plants to monitor the prevention of hydrate formation. It has also been used for superheat control in gas turbines to prevent flashbacks and for fiscal metering at transfer points for verification of tariff compliance.

Source: **Michell Instruments,** 11 Old Sugar Hollow Rd., Danbury, CT 06810.

Production allocation, reporting system updated

New Version 5 of the production allocation and reporting information system (PARIS) is an SQL server based application that the maker says redefines the traditional approach to production reporting and allocation.

The updated system can be used to build from scratch any combination of platforms, fields, and wells via user selectable drop down and dialog boxes. It also reads data from offshore metering, and supervisory, control, and data acquisition systems, and performs calculations using the results of well tests to determine the precise production from each well.

Source: **Petrofrac Ltd.,** 4th Floor, 117 Jermyn St., London, SW1Y 6HH, UK.

Services/Suppliers

Fusion Petroleum Technologies Inc.

Houston, has announced agreements which expand the company's presence in the Middle East.

Fusion has formed an alliance with the National Petroleum Services Co. of Kuwait (NAPESCO) to provide geophysical and geological technology, services, and software in the region.

Fusion subsidiary, Fusion Geophysical LLC, has announced formation of a joint stock company with two Libyan partners and one US partner. Libyan partners are the National Engineering Services & Supply Co. (NESSCO), and Al Daam Co. The US partner is Tex 26 Green Energy Ltd. The new company, named Fusion Libya, will provide Fusion technology, services, software, and management to the Libyan energy sector.

Grey Wolf Inc.

Houston, has named David J. Crowley as executive vice-president and chief operating officer. Prior to joining the company, Crowley served as senior vice-president of operations for Todco, a leading provider of offshore oil and gas drilling services that was recently acquired by Hercules Offshore Inc.

Grey Wolf Inc. is a leading provider of contract oil and gas land drilling services in the major natural gas producing regions of the US.

Pegasus International

Houston, has announced the appointments of Steve W. Shores as vice-president of operations for its onshore business unit, and Rebel LeBoeuf as vice-president of operations for the US offshore and subsea business units.

Shores, who holds a BS degree in mechanical engineering from the University of Tulsa, has 34 years of experience in the onshore oil and gas, and pipeline industries. He has held vice-president positions with two large engineering corporations.

LeBoeuf, who joined Pegasus in 2003, has over 25 years of engineering experience in the domestic and international offshore oil and gas industry.

Pegasus International is a full service engineering project and construction management consulting company, specializing in both offshore and onshore developments. The company has offices in the US, UK, and affiliates in Southeast Asia.

Pioneer Drilling Co.

San Antonio, has announced that Joyce M. Schuldt has joined the company as executive vice-president, chief financial officer, and secretary.

Schuldt previously had worked for Ernst & Young, CSI Leading Inc., and Maverick Tube, where she most recently served as senior vice-president, CFO, and secretary. She is a certified public accountant and an attorney.

Pioneer Drilling Co. provides land contract drilling services to operators drilling oil and gas wells in the south central US and Rocky Mountain region.

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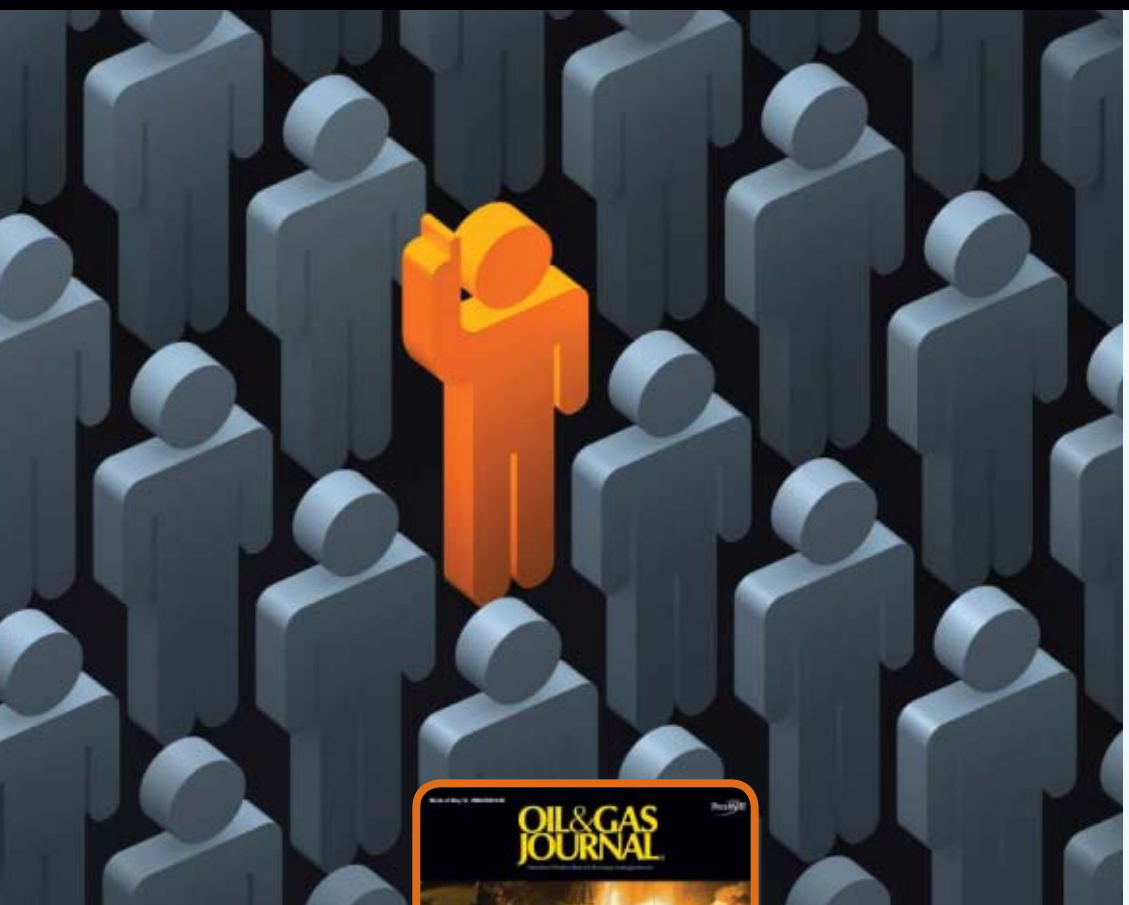

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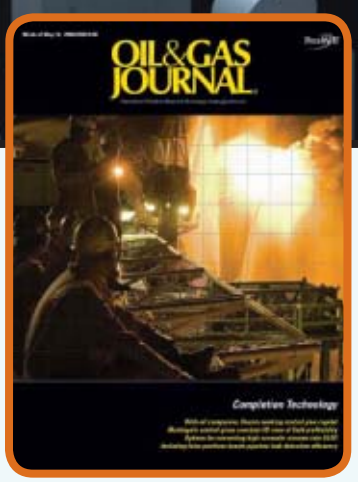

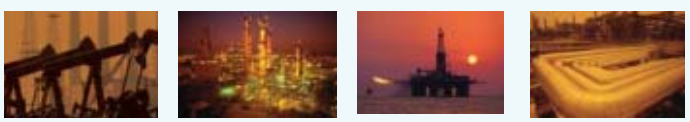

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[1] *Signet Readership Survey (February 2007)*

Imports of crude and products

	Districts 1-4		District 5		Total US		
	8-3 2007	7-27 2007	8-3 2007	7-27 2007	8-3 2007	7-27 2007	*8-4 2006
	1,000 b/d						
Total motor gasoline	1,335	1,167	62	58	1,397	1,225	1,216
Mo. gas. blending comp.	973	824	32	51	1,005	875	800
Distillate	256	339	47	0	303	339	334
Residual	396	322	6	0	402	322	164
Jet fuel-kerosine	78	145	169	120	247	265	205
Propane-propylene	82	66	0	0	82	66	151
Other	61	289	148	0	209	288	561
Total products	**3,181**	**3,152**	**464**	**228**	**3,645**	**3,380**	**3,431**
Total crude	**9,136**	**9,060**	**862**	**1,105**	**9,998**	**10,165**	**10,165**
Total imports	**12,317**	**12,212**	**1,326**	**1,333**	**13,643**	**13,545**	**13,596**

*Revised.
Source: US Energy Information Administration
Data available in OGJ Online Research Center.

Purvin & Gertz LNG netbacks—Aug. 10, 2007

Receiving terminal	Liquefaction plant					
	Algeria	Malaysia	Nigeria	Austr. NW Shelf	Qatar	Trinidad
	$/MMbtu					
Barcelona	6.43	4.67	5.91	4.57	5.27	5.89
Everett	5.07	3.00	4.69	3.09	3.56	5.36
Isle of Grain	3.42	1.47	2.93	1.42	1.97	2.89
Lake Charles	3.73	2.03	3.48	2.15	2.32	4.34
Sodegaura	4.92	6.92	5.12	6.76	6.09	4.38
Zeebrugge	5.88	3.89	5.29	3.80	4.39	5.32

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

Crude and product stocks

	Crude oil	Motor gasoline		Jet fuel, kerosine	Fuel oils		Propane-propylene
		Total	Blending comp.[1]		Distillate	Residual	
	1,000 bbl						
PADD 1	14,993	54,295	26,087	11,003	50,149	14,499	4,085
PADD 2	65,979	47,883	15,101	7,145	27,926	1,324	20,427
PADD 3	189,758	63,437	26,913	12,793	34,545	17,332	23,854
PADD 4	13,871	6,120	2,038	415	3,088	366	[1]2,012
PADD 5	55,794	31,262	22,465	9,984	11,808	5,086	—
Aug. 3, 2007	**340,395**	**202,997**	**92,604**	**41,340**	**127,516**	**38,607**	**50,378**
July 27, 2007	**344,531**	**204,720**	**93,238**	**41,119**	**126,542**	**37,190**	**49,948**
Aug. 4, 2006[2]	**332,609**	**207,609**	**91,086**	**41,117**	**132,422**	**41,991**	**59,467**

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

Refinery report—Aug. 3, 2007

District	REFINERY OPERATIONS		REFINERY OUTPUT				
	Gross inputs	Crude oil inputs	Total motor gasoline	Jet fuel, kerosine	Fuel oils		Propane-propylene
					Distillate	Residual	
	1,000 b/d						
PADD 1	1,484	1,478	1,932	88	463	137	52
PADD 2	3,238	3,235	2,118	216	907	59	221
PADD 3	7,802	7,780	3,368	671	1,936	350	730
PADD 4	584	581	308	27	189	17	[1]132
PADD 5	2,812	2,717	1,425	406	603	174	—
Aug. 3, 2007	**15,920**	**15,791**	**9,151**	**1,408**	**4,098**	**737**	**1,135**
July 27, 2007	**16,331**	**16,210**	**9,429**	**1,441**	**4,327**	**677**	**1,131**
Aug. 4, 2006[2]	**15,939**	**15,608**	**9,169**	**1,591**	**3,815**	**648**	**1,031**
	17,447 operable capacity		**91.3% 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.

OGJ crack spread

	*8-10-07	*8-11-06	Change $/bbl	Change, %
SPOT PRICES				
Product value	81.31	89.14	–7.84	–8.8
Brent crude	70.72	77.53	–6.81	–8.8
Crack spread	10.59	11.62	–1.03	–8.8
FUTURES MARKET PRICES				
One month				
Product value	81.90	90.45	–8.54	–9.4
Light sweet crude	71.94	75.60	–3.66	–4.8
Crack spread	9.96	14.85	–4.88	–32.9
Six month				
Product value	82.32	90.99	–8.67	–9.5
Light sweet crude	70.87	78.21	–7.34	–9.4
Crack spread	11.45	12.78	–1.33	–10.4

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

OGJ GASOLINE PRICES

	Price ex tax 8-8-07	Pump price* 8-8-07	Pump price 8-9-06
	¢/gal		
(Approx. prices for self-service unleaded gasoline)			
Atlanta	242.9	282.6	300.9
Baltimore	232.6	274.6	306.6
Boston	230.1	272.0	303.9
Buffalo	228.4	288.5	308.6
Miami	241.8	292.1	313.6
Newark	234.6	267.5	299.3
New York	228.0	288.1	315.9
Norfolk	228.5	266.1	295.2
Philadelphia	235.1	285.8	319.9
Pittsburgh	229.9	280.6	298.3
Wash., DC	246.9	285.3	321.6
PAD I avg.	234.4	280.3	307.6
Chicago	242.9	293.8	343.4
Cleveland	211.9	258.3	291.1
Des Moines	241.9	282.3	280.6
Detroit	236.9	286.1	299.1
Indianapolis	239.0	284.0	287.7
Kansas City	235.7	271.7	292.1
Louisville	254.0	290.9	296.7
Memphis	244.5	284.3	289.4
Milwaukee	236.0	287.3	310.7
Minn.-St. Paul	231.9	272.3	293.7
Oklahoma City	229.4	264.8	284.7
Omaha	228.1	274.5	297.5
St. Louis	253.9	289.9	293.1
Tulsa	229.4	264.8	281.0
Wichita	239.9	283.3	287.1
PAD II avg.	237.0	279.2	295.2
Albuquerque	242.0	278.7	296.6
Birmingham	231.5	270.2	288.7
Dallas-Fort Worth	230.3	268.7	293.0
Houston	234.2	272.6	291.8
Little Rock	229.4	269.6	288.1
New Orleans	234.4	272.8	291.0
San Antonio	229.6	268.0	283.3
PAD III avg.	233.1	271.5	290.3
Cheyenne	247.9	280.3	286.8
Denver	252.8	293.2	297.7
Salt Lake City	250.7	293.6	296.4
PAD IV avg.	250.5	289.0	293.6
Los Angeles	232.1	290.6	322.9
Phoenix	251.2	288.6	295.7
Portland	246.6	289.9	303.5
San Diego	244.4	302.9	331.4
San Francisco	241.4	299.9	329.8
Seattle	231.8	284.2	318.1
PAD V avg.	241.3	292.7	316.9
Week's avg.	**237.3**	**280.8**	**300.6**
July avg.	**251.6**	**295.2**	**295.2**
June avg.	**265.9**	**309.4**	**288.4**
2007 to date	**228.2**	**271.8**	—
2006 to date	**221.2**	**264.6**	—

*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

	8-3-07 ¢/gal		8-3-07 ¢/gal
Spot market product prices			
Motor gasoline (Conventional-regular)		Heating oil No. 2	
New York Harbor	200.03	New York Harbor	201.10
Gulf Coast	199.91	Gulf Coast	198.65
Los Angeles	198.90	Gas oil	
Amsterdam-Rotterdam-Antwerp (ARA)	189.80	ARA	204.09
Singapore	190.17	Singapore	204.88
Motor gasoline (Reformulated-regular)		Residual fuel oil	
New York Harbor	205.15	New York Harbor	135.43
Gulf Coast	206.50	Gulf Coast	141.67
Los Angeles	212.40	Los Angeles	156.04
		ARA	140.78
		Singapore	148.36

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

BAKER HUGHES RIG COUNT

	8-10-07	8-11-06
Alabama	4	5
Alaska	6	8
Arkansas	49	26
California	36	34
Land	35	29
Offshore	1	5
Colorado	109	92
Florida	1	0
Illinois	0	0
Indiana	4	0
Kansas	15	16
Kentucky	9	6
Louisiana	178	181
N. Land	62	52
S. Inland waters	28	14
S. Land	28	36
Offshore	60	79
Maryland	1	0
Michigan	3	3
Mississippi	14	13
Montana	18	21
Nebraska	0	0
New Mexico	87	99
New York	6	7
North Dakota	41	32
Ohio	13	5
Oklahoma	190	195
Pennsylvania	17	16
South Dakota	4	1
Texas	844	786
Offshore	9	14
Inland waters	1	4
Dist. 1	25	20
Dist. 2	33	27
Dist. 3	64	58
Dist. 4	83	80
Dist. 5	180	149
Dist. 6	124	115
Dist. 7B	38	45
Dist. 7C	58	41
Dist. 8	108	101
Dist. 8A	20	25
Dist. 9	37	31
Dist. 10	64	76
Utah	37	44
West Virginia	32	28
Wyoming	70	107
Others—NV-2; TN-5; VA-2; WA-1	10	3
Total US	**1,798**	**1,728**
Total Canada	**377**	**480**
Grand total	**2,175**	**2,208**
Oil rigs	305	315
Gas rigs	1,487	1,409
Total offshore	72	99
Total cum. avg. YTD	**1,752**	**1,600**

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	8-10-07 Rig count	8-10-07 Percent footage*	8-11-06 Rig count	8-11-06 Percent footage*
0-2,500	59	8.4	42	2.3
2,501-5,000	108	53.7	86	38.3
5,001-7,500	219	25.1	230	20.4
7,501-10,000	441	4.5	387	5.1
10,001-12,500	439	1.3	413	1.6
12,501-15,000	294	—	279	—
15,001-17,500	112	—	114	—
17,501-20,000	66	—	68	—
20,001-over	36	—	29	—
Total	**1,774**	**8.1**	**1,648**	**6.5**
INLAND	45		37	
LAND	1,658		1,546	
OFFSHORE	71		65	

*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]8-10-07	[2]8-11-06
	1,000 b/d	
(Crude oil and lease condensate)		
Alabama	19	21
Alaska	750	651
California	668	676
Colorado	50	60
Florida	6	7
Illinois	30	28
Kansas	95	98
Louisiana	1,354	1,390
Michigan	15	14
Mississippi	49	49
Montana	92	100
New Mexico	164	160
North Dakota	105	111
Oklahoma	167	174
Texas	1,344	1,361
Utah	43	49
Wyoming	143	140
All others	60	71
Total	**5,154**	**5,160**

[1]OGJ estimate. [2]Revised.

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

US CRUDE PRICES

$/bbl*	8-10-07
Alaska-North Slope 27°	57.84
South Louisiana Sweet	76.25
California-Kern River 13°	62.30
Lost Hills 30°	69.85
Southwest Wyoming Sweet	65.47
East Texas Sweet	67.50
West Texas Sour 34°	62.20
West Texas Intermediate	68.00
Oklahoma Sweet	68.00
Texas Upper Gulf Coast	64.75
Michigan Sour	61.00
Kansas Common	67.25
North Dakota Sweet	64.25

*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]	8-3-07
United Kingdom-Brent 38°	76.53
Russia-Urals 32°	74.24
Saudi Light 34°	73.53
Dubai Fateh 32°	69.55
Algeria Saharan 44°	78.29
Nigeria-Bonny Light 37°	78.81
Indonesia-Minas 34°	78.83
Venezuela-Tia Juana Light 31°	72.38
Mexico-Isthmus 33°	72.27
OPEC basket	74.81
Total OPEC[2]	73.83
Total non-OPEC[2]	73.79
Total world[2]	73.81
US imports[3]	72.19

[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]

	8-3-07	7-27-07	Change
	bcf		
Producing region	932	928	4
Consuming region east	1,544	1,511	33
Consuming region west	406	401	5
Total US	**2,882**	**2,840**	**42**
	May 07	**May 06**	**Change, %**
Total US[2]	**2,179**	**2,310**	**–5.7**

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

Statistics

International rig count

Region	July 2007 Land	July 2007 Off.	July 2007 Total	July 06 Total
WESTERN HEMISPHERE				
Argentina	73	—	73	84
Bolivia	3	—	3	3
Brazil	15	22	37	28
Canada	347	2	349	553
Chile	2	—	2	—
Colombia	41	—	41	21
Ecuador	12	—	12	11
Mexico	67	30	97	72
Peru	6	2	8	5
Trinidad	2	3	5	9
United States	1,699	79	1,777	1,681
Venezuela	63	18	81	88
Other	1	—	1	2
Subtotal	**2,330**	**156**	**2,486**	**2,557**
ASIA-PACIFIC				
Australia	12	12	24	20
Brunei	1	3	4	2
China-offshore	—	18	18	17
India	57	25	82	83
Indonesia	39	20	59	45
Japan	2	—	2	1
Malaysia	—	19	19	15
Myanmar	7	1	8	9
New Zealand	3	2	5	4
Papua New Guinea	3	—	3	4
Philippines	—	—	—	2
Taiwan	—	—	—	—
Thailand	2	8	10	9
Vietnam	—	7	7	10
Other	2	1	3	5
Subtotal	**128**	**116**	**244**	**226**
AFRICA				
Algeria	24	—	24	27
Angola	—	3	3	4
Congo	2	—	2	2
Gabon	3	—	3	3
Kenya	—	—	—	—
Libya	13	1	14	10
Nigeria	—	5	5	9
South Africa	—	1	1	—
Tunisia	2	1	3	2
Other	2	3	5	2
Subtotal	**46**	**14**	**60**	**59**
MIDDLE EAST				
Abu Dhabi	10	4	14	14
Dubai	1	—	1	2
Egypt	34	12	46	40
Iran	—	—	—	—
Iraq	—	—	—	—
Jordan	1	—	1	1
Kuwait	14	—	14	13
Oman	49	—	49	40
Pakistan	19	—	19	18
Qatar	2	12	14	10
Saudi Arabia	69	9	78	63
Sudan	—	—	—	—
Syria	21	—	21	22
Yemen	17	—	17	17
Other	1	—	1	2
Subtotal	**238**	**37**	**275**	**242**
EUROPE				
Croatia	—	—	—	1
Denmark	—	5	5	2
France	1	—	1	—
Germany	4	—	4	4
Hungary	2	—	2	2
Italy	4	1	5	5
Netherlands	1	3	4	6
Norway	—	18	18	15
Poland	2	—	2	1
Romania	2	—	2	2
Turkey	5	—	5	4
UK	—	27	27	25
Other	4	—	4	4
Subtotal	**25**	**54**	**79**	**71**
Total	**2,767**	**377**	**3,144**	**3,155**

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	238	2.00
Caribbean	Houston	Resid.	380	154	1.45
Caribbean	Houston	Resid.	500	159	1.49
N. Europe	New York	Dist.	200	281	3.76
N. Europe	Houston	Crude	400	160	3.14
W. Africa	Houston	Crude	910	101	2.19
Persian Gulf	Houston	Crude	1,900	48	1.94
W. Africa	N. Europe	Crude	910	100	1.60
Persian Gulf	N. Europe	Crude	1,900	65	1.90
Persian Gulf	Japan	Crude	1,750	69	1.64

*July 2007 average.
Source: Drewry Shipping Consultants Ltd. Data available in OGJ Online Research Center.

Waterborne Energy Inc. US LNG imports

Country	July 2007	June 2007	July 2006	Change from a year ago, %
	MMcf			
Algeria	—	11,300	3,030	—
Egypt	12,120	11,940	14,900	–18.7
Equatorial Guinea	9,140	2,880	—	—
Nigeria	15,070	22,840	6,120	146.2
Qatar	—	5,760	—	—
Trinidad and Tobago	61,950	36,200	33,350	85.8
Total	**98,280**	**90,920**	**57,400**	**71.2**

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

Baker Oil Tools workover rig count*

Region	June 2007	June 2006	Change, %
Gulf Coast	277	328	–15.5
Midcontinent	259	311	–16.7
Northeastern	90	88	2.3
Rocky Mountains	255	251	1.6
Southeastern	195	198	–1.5
West Texas	325	338	–3.8
Western	147	133	10.5
Total US	**1,548**	**1,647**	**–6.0**
Canada	486	760	–36.1
Total N. America	**2,034**	**2,407**	**–15.5**

*Wells over 1,500 ft deep and tubing out of the wellbore. Excludes rigs on rod jobs. Definitions, see OGJ Sept. 18, 2006, p. 42. Source: Baker Hughes Inc. Data available in OGJ Online Research Center.
NOTE: This data has been discontinued. The table will not appear in future editions.

Propane prices

	June 2007	July 2007	June 2006	July 2006
	¢/gal			
Mont Belvieu	113.90	119.00	109.66	116.54
Conway	113.34	118.18	107.92	114.17
Northwest Europe	112.44	117.28	96.51	104.57

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					
July 2007						
Product revenues	95.72	87.91	96.76	93.31	85.96	80.46
Feedstock costs	–80.45	–78.18	–72.25	–70.36	–76.64	–76.03
Gross margin	15.27	9.73	24.51	22.95	9.32	4.43
Fixed costs	–2.05	–2.37	–2.31	–2.70	–2.31	–1.80
Variable costs	–2.04	–1.41	–1.82	–3.35	–2.80	–0.89
Cash operating margin	**11.18**	**5.95**	**20.38**	**16.90**	**4.21**	**1.74**
June 2007	15.70	11.14	21.68	23.46	7.23	4.27
YTD avg.	14.62	8.16	19.98	25.38	6.32	2.96
2006 avg.	12.49	6.01	14.99	23.73	5.88	1.06
2005 avg.	12.53	6.98	12.31	20.55	5.51	1.52
2004 avg.	6.16	3.70	6.64	11.76	5.08	1.83

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

Muse, Stancil & Co. gasoline marketing margins

June 2007	Chicago*	Houston	Los Angeles	New York
	¢/gal			
Retail price	341.26	294.22	322.82	317.30
Taxes	59.62	38.40	61.20	52.14
Wholesale price	244.12	235.38	241.38	239.85
Spot price	223.64	221.13	232.75	225.21
Retail margin	37.73	20.44	20.24	25.31
Wholesale margin	20.48	14.25	8.63	14.64
Gross marketing margin	**58.21**	**34.69**	**28.87**	**39.95**
May 2007	15.17	24.82	28.86	28.22
YTD avg.	25.15	19.88	18.40	28.50
2006 avg.	19.74	20.34	18.03	27.90
2005 avg.	19.77	16.26	20.39	27.13
2004 avg.	22.49	17.49	23.61	30.38

*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.
Note: Margins include ethanol blending in all markets.

Muse, Stancil & Co. ethylene margins

	Ethane	Propane	Naphtha
	¢/lb ethylene		
July 2007			
Product revenues	58.10	96.34	115.80
Feedstock costs	–31.44	–67.79	–103.79
Gross margin	26.66	28.55	12.01
Fixed costs	–5.38	–6.36	–7.19
Variable costs	–5.18	–6.11	–8.21
Cash operating margin	**16.10**	**16.08**	**–3.39**
June 2007	14.29	17.78	–4.89
YTD avg.	14.08	15.90	–7.99
2006 avg.	19.55	22.53	1.77
2005 avg.	14.43	20.68	1.28
2004 avg.	9.00	12.03	0.51

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

Muse, Stancil & Co. US gas processing margins

July 2007	Gulf Coast	Mid-continent
	$/Mcf	
Gross revenue		
Gas	5.95	5.08
Liquids	1.23	3.53
Gas purchase cost	6.63	6.82
Operating costs	0.07	0.15
Cash operating margin	**0.49**	**1.64**
June 2007	0.32	1.33
YTD avg.	0.27	1.02
2006 avg.	0.26	0.97
2005 avg.	–0.06	0.25
2004 avg.	0.07	0.33
Breakeven producer payment % of liquids	58%	52%

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

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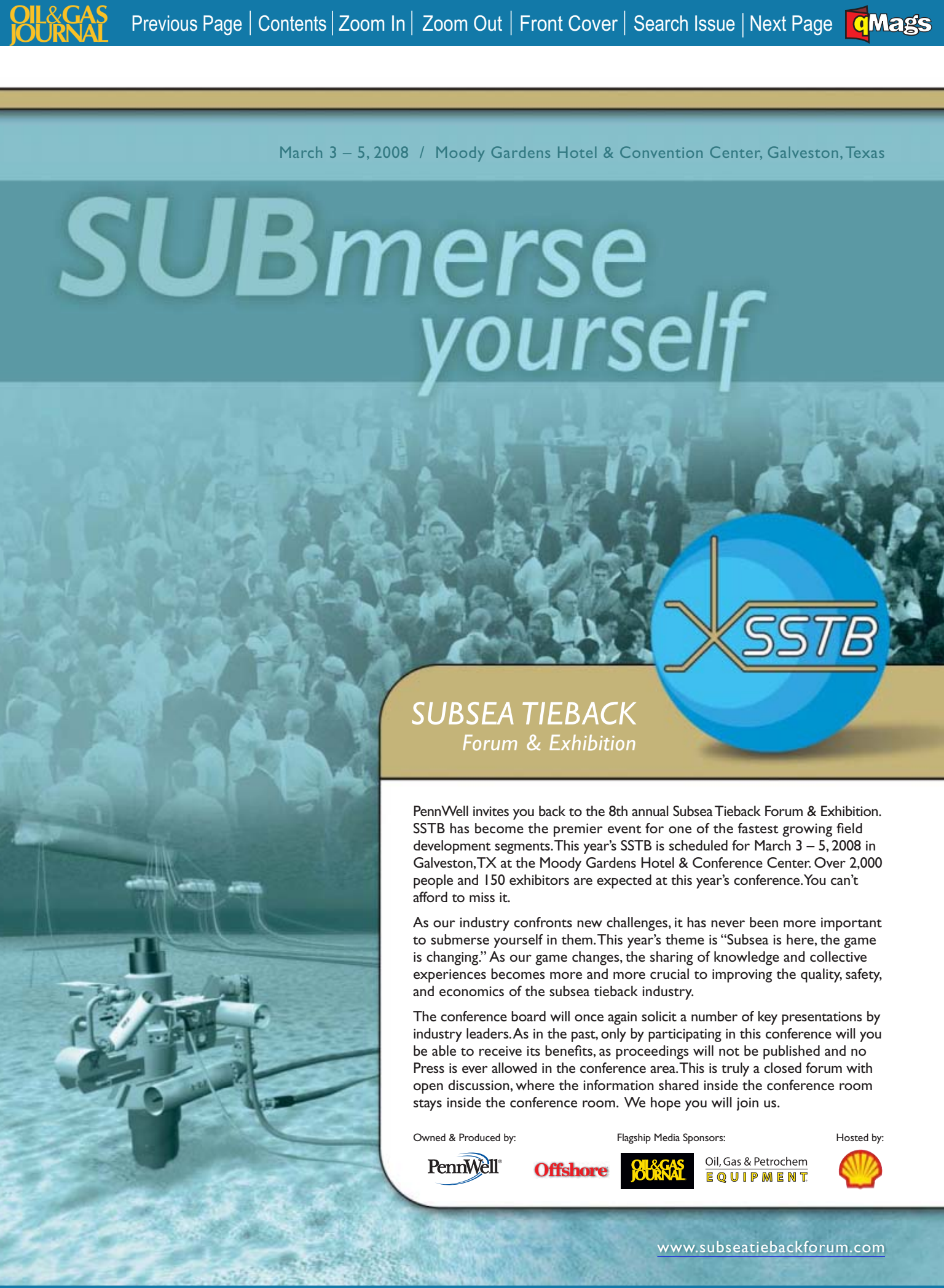

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New energy bills fill many pages, raise many costs

People facing overhaul of fundamental energy systems should read the legislation that proposes to change their lives.

Here's what you do: Go to http://thomas.loc.gov. In the "Search Bill Text" field, type "HR 3221," select "Bill Number," then hit "Search." When you finish reading HR 3221, repeat the steps for HR 2776.

It shouldn't take more than—well, much depends on reading speed.

The Editor's Perspective

by Bob Tippee, Editor

HR 3221 fills 496 pages. It takes a lot of words—161,662 of them, to be exact—for a government to overhaul the energy-use patterns of the US economy. All those incandescent light bulbs to replace. All those tax favors to help promoters of uneconomic energy get rich.

HR 2776 is shorter. Its 56 pages and 16,479 words would hike taxes on the industry that produces and processes oil and gas to raise money for various kinds of support for energy forms that House members like better—expensive forms with limited scope for raising total supply.

The apparent strategy: Discourage investment in economic energy able to boost supply meaningfully, and stimulate investment in uneconomic energy with much lower supply potential.

Anyone who thinks that sounds less than sensible should remember all the wonderful conservation measures the House proposes, such as replacing cheap light bulbs with expensive ones.

There's a lot of substitution of the cheap with the costly going on here. But that's okay to anyone who accepts a central motivation behind all this: the fight against global warming, about which HR 3221 has much to propose, all very expensive.

With global warming, of course, costs aren't supposed to matter. Bills that profess to bring the Age of Petroleum to a premature end can claim to be fighting global warming.

But would HR 3221 and HR 2776 end the Age of Petroleum? No. They might nibble at demand and raise the energy-market shares of nonfossil fuels by a few percentage points. They wouldn't end the dominance of oil, gas, and coal, though. Mostly, they'd make everything more expensive than it is now.

So what's the point? Somewhere amid 178,141 of words that would raid American bank accounts, there really should be one.

(Online Aug. 10, 2007; author's e-mail: bobt@ogjonline.com)

Market Journal

by Sam Fletcher, Senior Writer

Data vital to energy markets

Fear that the Organization of Petroleum Exporting Countries would undersupply peak market demand for crude in July and August increased the price at which refiners were willing to draw down crude stocks and inflated oil prices in June and July, the International Energy Agency in Paris said in its Aug. 10 monthly report.

Therefore, said IEA analysts, prices remain high and crude futures markets "have been toying with backwardation"—in which futures prices for near-month contracts exceed those of farther-out months—despite high levels of crude stocks among countries of the Organization for Economic Cooperation and Development at the end of June. The September contract for US light, sweet crudes closed at a record high of $78.21/bbl July 31. By Aug. 10, it closed at $71.47/bbl.

Data problems

However, IEA complained: "With the limited hard data to hand, there is still a wide margin for interpretation of current and future fundamentals. We have weekly data for the US and Japan, but to get a preliminary picture of the OECD takes 6 weeks." Outside the OECD, it said, "there is still very little information on stock levels."

Although some countries are struggling to establish data collection systems, most are monitoring stock levels at ports, loading terminals, and refineries. "Many (if not most) companies probably have the ability to report these data on a real-time basis. So why the lack of data?" IEA wondered.

IEA reported two common answers to that question. "Some non-OECD officials have indicated that several years of high prices have led the industry to run on minimal stocks, and they worry that if they release this information, they might push oil prices higher than they already are. That is the easiest issue to address: do not worry—the market already implicitly assumes they are zero," it said.

The second argument is that stock data are commercially sensitive. "That may be the case, but keeping it secret has scarcely led to consumers paying less, and the US and Japan show [timely reports] can be done. US regulations are generally very responsive to industry's needs, yet the comprehensive weekly data published by the EIA demonstrate that commercial sensitivities can be overcome," IEA said.

"This is not just about data coverage. It is also about the timeliness of data. In the OECD, weekly European data are conspicuous by their absence (even China and Russia industry publications provide some weekly data!). While there are some genuine concerns in Europe about cost and quality of the trade data available, some of the often-heard arguments against the publication of more frequent data fail to see the bigger picture."

Some statisticians claim data quality deteriorates if produced more frequently. Others are more willing to accept less accurate but more timely information. IEA said, "Weekly data are less accurate than monthly data; monthly data are less accurate than annual." But data quality improves when collection is regular and subject to continual assessment. "It is also wrong to interpret the focus on the US weekly data as a sign that more timely data increase market volatility," IEA said. "Experiences in other commodity markets show that it can have the opposite effect."

IEA argues that more-comprehensive and more-frequent data improve market understanding. If that knocks several hundredths of a cent off the price of each barrel of traded oil, it would be more cost-effective than the current situation, where "uncertainties associated with a lack of data could bear a much higher cost," IEA said.

Furthermore, the agency argued that traders' usual focus on the high level of US crude and petroleum stocks as evidence that the market is well supplied ignores the low level of Japanese crude stocks and the average levels of European inventories. In term of future demand, IEA said, "These stocks are below normal, and logic suggests they may be even lower from a global perspective. Our projections suggest stocks will be drawn down further in August and September, yet when OPEC members come to assess the market at their Sept. 11 meeting, they will have to hand only OECD data from June. If ever there was a compelling argument for the benefits of wider and more frequent stock data coverage, it is now."

US inventories

US crude inventories fell 4.1 million bbl to 340.4 million bbl in the week ended Aug. 3. Gasoline stocks dropped 1.7 million bbl to 203 million bbl. Distillate fuel inventories rose 1 million bbl to 127.5 million bbl.

(Online Aug. 13, 2007; author's e-mail: samf@ogjonline.com)

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