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Pipeline Report

OIL&GAS JOURNAL®

Nov. 26, 2007
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PIPELINE REPORT

REGULAR FEATURES

COVER

Crews handle 42-in. pipe for a natural gas pipeline being constructed between Groveton and Farrar in East Texas for Energy Transfer Partners LP. Work on the pipeline included the directional-drill crossing shown here in Crockett, Tex., August 2007. The Groveton-to-Farrar section, to be completed in the second quarter of 2008, is part of 135 miles of looping for ETP's Cleburne-to-Carthage pipeline. Oil & Gas Journal's special Pipeline Report, which begins on p. 68, discusses corrosion modeling of such pipelines and the increasing prevalence of joint-ventures in new pipeline ownership. Photo from Willbros USA Inc. by Lindy King.

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General Interest

Exploration & Development

Drilling & Production

Processing

Transportation

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OGJ Newsletter

Nov. 26, 2007

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General Interest — Quick Takes

WEC: TNK-BP calls on Russia to change tax regime

Russia will have to change its tax regime if it is to attract future investment from energy companies, a senior figure from TNK-BP said.

Speaking at the World Energy Congress in Rome, Lord George Robertson, TNK-BP deputy chairman, said the company has paid $50 billion in taxes to the Russian government over the last 4 years. "There are rising levels of taxation and cost, which means that margins are being squeezed, and so there is less cash to invest," Robertson said. "Russia's tax environment supports prices of under $25/bbl but when it's beyond $27/bbl, the Russian government takes the bigger share."

Russia is looking for investments in Siberia and offshore in the arctic, but Robertson said this would be difficult if costs remain high. TNK-BP, with production of 1.3 million boe/d, is one of Russia's largest oil and gas producers.

"Diversity of supply will be key to the future so that we can find flexible ways of solving our problems," Robertson said.

Forging closer ties with Asia also is a major priority for Russia, said Sergey Boydanchikov, Rosneft chairman and president. The company plans to more than triple to 18% its supplies to Asia by 2020, but Boydanchikov stressed that Europe would still remain an important market.

"Europe is our traditional partner and it won't suffer because of our policy," Boydanchikov said. "This will be in the interest of Russia to sell oil and continue to seek profit and higher added value."

OPEC discusses carbon capture for reducing GHGs

Members of the Organization of Petroleum Exporting Countries discussed carbon capture and storage (CCS) during a Nov. 17-18 meeting in Riyahd.

Algeria's Energy Minister Chakib Khelil discussed energy and the environment as it related to a draft declaration at the Third OPEC Summit on Nov. 18.

"Carbon storage could reduce the impact of fossil fuels on climate change, and developed countries have the technology on this," Khelil said.

United Nations Framework Convention on Climate Change (UNFCCC) Executive Director Yvo de Boer addressed OPEC delegates and spoke with reporters during the Riyahd meeting.

"I think the debate here points to a constructive willingness to participate in international dialogue about climate change," he said. The UNFCCC's International Panel on Climate Change calls CCS the most promising technology for rapidly reducing global greenhouse gas emissions.

A UN climate change conference is scheduled for December in Bali. UN approval of CCS methodologies could promote CCS technology research and development efforts.

Separately, the European Commission is expected to approve CCS as an emissions reduction method, beginning in 2013. The third phase of the cap-and-trade European Trading Scheme (ETS) would make CCS projects eligible for ETS emissions-reduction credits.

Former executive pleads guilty in bribe plot

A former executive of a Willbros Group Inc. subsidiary pleaded guilty to conspiring to bribe Nigerian government officials with more than $6 million to secure a major natural gas pipeline construction contract in that country, the US Department of Justice announced on Nov. 5.

Jason Edward Steph of Sunset, Tex., pleaded guilty to violating the Foreign Corrupt Practices Act. He is cooperating with the government's investigation and faces a sentence of up to 5 years in prison and a $250,000 fine. Sentencing was scheduled for Jan. 25, 2008.

Steph worked for Willbros's overseas subsidiary Willbros International Inc. from 1998 to April 2005 and was general manager of its onshore operations in Nigeria from 2000 until April 2005, DOJ said.

As part of his guilty plea, he admitted that in late 2003 he, a senior executive in charge of Willbros Group's international business, two purported consultants working for Willbros International, and certain Nigerian-based employees of a German engineering and construction company agreed to pay the millions in bribes. The money was to go to officials of Nigerian National Oil Corp. and its Nigerian Petroleum Investment Services subsidiary, a Nigerian political party, and a senior official in the Nigerian government's executive branch.

Steph also admitted that he, former Willbros International executive Jim Bob Brown, and others arranged to pay about $1.8 million in cash to government officials in Nigeria to further the scheme. Brown pleaded guilty to a similar charge on Sept. 14, 2006, DOJ said. ✦

Exploration & Development — Quick Takes

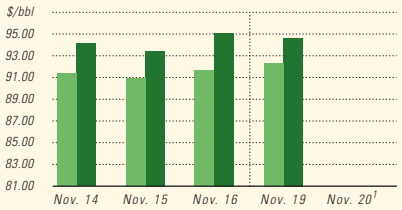
WEC: Algeria to offer 10-15 blocks in next round

Algeria will offer 10-15 blocks in its next licensing round in January 2008, Chakib Khelil, Algeria's energy minister, told OGJ in an exclusive interview during the World Energy Congress.

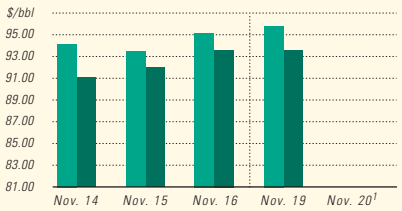
State-owned Sonatrach will seek prequalified partners that can offer upstream asset swaps, he said. "I can't say where the blocks will be offered. Some of those proposed are controlled by Sonatrach and others by the state, but the same process will apply to both."

Industry Scoreboard

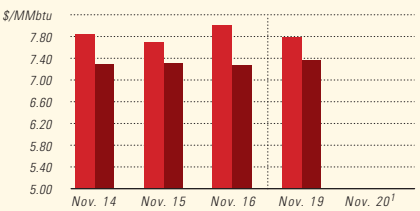
IPE BRENT / NYMEX LIGHT SWEET CRUDE



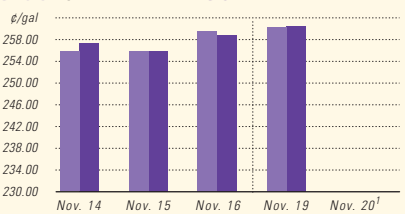
WTI CUSHING / BRENT SPOT



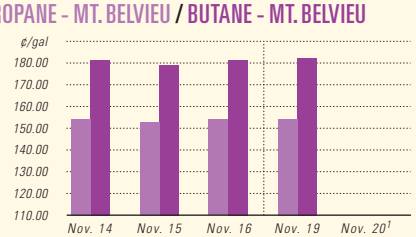
NYMEX NATURAL GAS / SPOT GAS - HENRY HUB



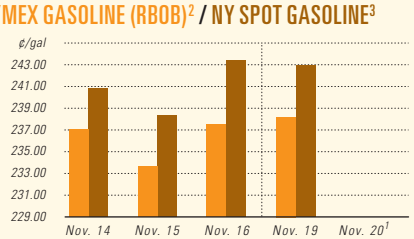
IPE GAS OIL / NYMEX HEATING OIL



PROPANE - MT. BELVIEU / BUTANE - MT. BELVIEU



NYMEX GASOLINE (RBOB)[2] / NY SPOT GASOLINE[3]



[1]Data not available. [2]Reformulated gasoline blendstock for oxygen blending, [3]Nonoxygenated regular unleaded.

US INDUSTRY SCOREBOARD — 11/26

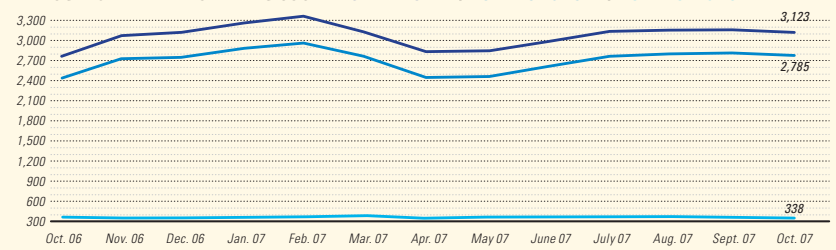
Latest week 11/9	4 wk. average	4 wk. avg. year ago[1]	Change, %	YTD average[1]	YTD avg. year ago[1]	Change, %
Demand, 1,000 b/d						
Motor gasoline	9,321	9,261	0.6	9,303	9,245	0.6
Distillate	4,298	4,277	0.5	4,220	4,159	1.5
Jet fuel	1,603	1,607	–0.2	1,624	1,634	–0.6
Residual	603	587	2.7	746	696	7.2
Other products	4,765	5,009	–4.9	4,799	4,890	–1.9
TOTAL DEMAND	20,590	20,741	–0.7	20,692	20,678	0.1
Supply, 1,000 b/d						
Crude production	5,124	5,106	0.4	5,138	5,096	0.8
NGL production[2]	2,446	2,375	3.0	2,381	2,206	7.9
Crude imports	9,657	10,044	–3.9	10,008	10,180	–1.7
Product imports	3,437	3,184	7.9	3,515	3,665	–4.1
Other supply[3]	895	899	–0.4	987	1,070	–7.8
TOTAL SUPPLY	21,559	21,608	–0.2	22,029	22,217	–0.8
Refining, 1,000 b/d						
Crude runs to stills	11,215	15,003	–25.3	15,233	15,228	—
Input to crude stills	11,344	15,322	–26.0	15,471	15,586	–0.7
% utilization	65.0	88.1	—	88.7	89.7	—

Latest week 11/9	Latest week	Previous week[1]	Change	Same week year ago[1]	Change	Change, %
Stocks, 1,000 bbl						
Crude oil	314,676	311,862	2,814	334,690	–20,014	–6.0
Motor gasoline	195,027	194,313	714	204,033	–9,006	–4.4
Distillate	133,412	135,377	–1,965	138,583	–5,171	–3.7
Jet fuel-kerosine	40,933	41,505	–572	42,226	–1,293	–3.1
Residual	39,294	38,471	823	41,941	–2,647	–6.3
Stock cover (days)[4]			Change, %		Change, %	
Crude	21.0	20.8	1.0	22.3	–5.8	
Motor gasoline	20.9	20.8	0.5	21.7	–3.7	
Distillate	31.0	32.2	–3.7	31.2	–0.6	
Propane	52.2	51.2	2.0	59.5	–12.3	

Futures prices[5] 11/16			Change		Change	%
Light sweet crude, $/bbl	93.68	95.77	–2.09	59.88	33.80	56.4
Natural gas, $/MMbtu	7.89	7.82	0.07	7.76	0.13	1.6

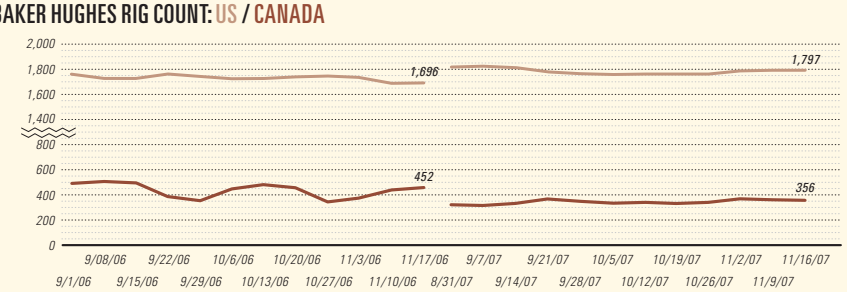
[1]Based on revised figures. [2]Includes adjustments for fuel ethanol and motor gasoline blending components. [3]Includes other hydrocarbons and alcohol, refinery processing gain, and unaccounted for crude oil. [4]Stocks divided by average daily product supplied for the prior 4 weeks. [5]Weekly average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

Khelil told OGJ that the government had introduced these terms because it needs technology and assistance to develop the blocks.

"Algeria and Sonatrach have money; we don't need that. Sonatrach has the know-how. We want Sonatrach to become an important player in the international arena," he said.

He denied accusations of resource nationalism, a major subject discussed during the World Energy Congress in Rome, saying that the phenomenon was not particular to Algeria.

Sonatrach will not seek other international partners to help it with Gassi Touil integrated production and LNG export project in the Berkine basin in the Sahara Desert after terminating the agreement with Gas Natural and Repsol (OGJ, Sept. 20, 2007, Newsletter).

"It poses too many problems to find other partners and start from scratch, so we have decided to do it alone," Khelil said. Production will start in 2012, 3 years later than originally planned.

Khelil said Sonatrach ended the agreement because of delays and rising costs. The former partners are now in arbitration. "This is a commercial issue, not one of resource nationalism. Even the Spanish foreign minister has said that."

He defended Algeria's decision to impose tax on exceptional profits as one of "logic," saying, "When oil was $15/bbl in the '80's and the contracts were signed, there was no mechanism to have oil prices go that high. The state of Algeria said it would take a fair share, but a similar thing is happening in Alberta, the US, and the UK."

BP reports deeper-pool Shah Deniz discovery

BP PLC has reported a deeper-pool discovery in Shah Deniz gas-condensate field off Azerbaijan in a well BP says justifies a second phase of development.

The SDX-04 appraisal and exploration well, 70 km southeast of Baku, discovered a high-pressure gas-condensate zone older than those now on production in the northern flank of the field.

BP said the well was drilled to a Caspian-record depth of more than 7,300 m in the southwestern part of Shah Deniz. It plans appraisal drilling in the next few years.

The well encountered gas and condensate in Pliocene Fasila and Balakhany VII zones, which are productive to the north.

On test, the well flowed at an equipment-restricted rate of 35 MMscfd.

BP said production from the second stage of development, plans for which depend on results of appraisal work, probably would be similar to or greater than first-phase output, which is to reach 8.6 billion cu m/year.

The field began intermittent production from the first of four predrilled wells last December and has been producing steadily since March.

Production flows from a 15-slot production, drilling, and quarters platform in 105 m of water through a 26-in. gas pipeline and 12-in. condensate pipeline to processing facilities in the Sangachal Terminal onshore. After processing, the gas enters the South Caucasus Pipeline between Azaerbaijan and Turkey, which was laid as part of the Shah Deniz development.

At midyear, Shah Deniz was producing more than 14.2 million cu m/day of gas and 30,000 b/d of condensate.

Partners in the Shah Deniz production sharing agreement are BP, operator, and StatoilHydro, 25.5% interest each; State Oil Company of Azerbaijan Republic, Lukoil, NICO, and Total, 10% each; and TPAO, 9%.

Total finds more oil off Congo (Brazzaville)

Total E&P Congo has found six oil reservoir levels in its ultradeepwater Persee Nord Est Marine-1 discovery well. The well, which targeted Miocene rock, was drilled on Mer Tres Profonde Sud (MTPS) block off Congo (Brazzaville).

The well, which reached 4,110 m TD, is 185 km offshore in 2,120 m of water.

Total will now start on field development studies to bring together its other previous oil discoveries after assessing the resources.

"Following Andromede in 2000, Pegase Nord in 2004, Aurige Nord in 2006, and Cassiopee Est in 2007, this new drilling success is the fifth oil discovery in the MTPS permit," Total said.

MTPS block spans more than 5,000 sq km and lies in 1,300-3,000 m of water. Total is operator with a 40% interest. Partners include Eni Congo 30% and Esso E&P Congo (Mer Tres Profonde Sud) Ltd. 30%.

Brazil official seeks nuclear sub for Tupi

Brazilian Defense Minster Nelson Jobim claims that a new oil discovery off Brazil underlines the need for his country to develop a nuclear submarine for protection.

"When you have a large natural source of wealth discovered in the Atlantic, it's obvious you need the means to protect it," Jobim told a defense conference in Rio de Janeiro.

Jobim's statement followed a Nov. 8 announcement by the Brazilian government and Petroleo Brasileiro SA that 5-8 billion bbl of oil and associated gas had been found in the block containing offshore Tupi field in the Santos basin (OGJ Online, Nov. 16, 2007).

The discovery well is in 2,126 m of water.

Meanwhile, Petrobras said it will drill 32 wells to appraise the area around Tupi field, according to Hugo Repsold, general manager for exploration and production.

The field is in a presalt frontier extending through the Espirito Santo, Campos, and Santos basins. ✦

Drilling & Production — *Quick Takes*

Cantarell and Ku Maloob Zaap production falling

Production of crude oil in Mexico's main oilfields—Cantarell and Ku Maloob Zaap, in the Gulf of Mexico Campeche Sound—is falling due to water and salt seepage into the reservoirs, official documents reveal.

According to documents of state oil firm Petroleos Mexicanos, the seepage is causing a reduction in production equivalent to 84,300 b/d of oil. Pemex said the loss of production due to water and salt dates back to 2004, and is a natural result of the maturing of these fields.

"As in all deposits, the problem of water production in mature fields is not something that can be reversed, but rather it is a situation that must be managed to continue producing crude oil, now with a percentage of water," Pemex said.

In September, Pemex produced an average of 1.5 million b/d of oil from Cantarell, 15% less than in September 2006, the Pemex documents revealed. As recently as November 2006, output of 415,000 b/d at Ku Maloob Zaap field in the Gulf of Mexico had been expected to climb to 800,000 b/d by 2010, partly offsetting Cantarell's decline (OGJ, Nov. 6, 2006, p. 33).

BP starts up gas field off Trinidad and Tobago

BP Trinidad & Tobago (BPTT) on Nov. 17 began natural gas production from its wholly owned and operated Mango field on Galeota block about 35 miles southeast of Galeota Point in 235 ft of water off Trinidad and Tobago.

The field is expected to add an incremental 750 MMscfd of gas deliverability plus some associated condensate.

Mango field, discovered in 1971 and further appraised in 2000, has been developed using a single unmanned platform with a capacity to produce from nine wells. Gas is transported through a 4-mile, 26-in. subsea pipeline tied into the current Cannonball pipeline and the Cassia B gas processing hub. Gas from Mango will supply Atlantic LNG's liquefaction plant and the LNG will be used locally and will be exported to international markets.

The Mango platform was the second to be built to the same standardized design as the Cannonball platform, which is the first offshore platform to be designed in Trinidad. Cannonball was installed in 2005. The 860 tonne Mango jacket and the 890 tonne topsides were built at the Trinidad Offshore Fabricators yard in La Brea, Trinidad. Trinidad Offshore is a joint venture of Chet Morrison Contractors and Trinidad's Weldfab. Mango platform was installed in February. It was built simultaneously with the Cashima platform, which also followed the Cannonball template. ✦

Processing — *Quick Takes*

Chevron signs agreement for Piceance production

Chevron USA Inc. has entered into a long-term agreement with Enterprise Gas Processing LLC for the gathering and treatment of natural gas produced from Chevron's Piceance basin operations in western Colorado.

Under the agreement, Enterprise will process all gas produced by Chevron from its Piceance program at its 750 MMcfd Meeker, Colo., gas processing facility, which lies 26 miles north of Chevron's development. Gas production will be transported through Enterprise's 48-mile, 36-in. Piceance Creek gathering system to the Meeker facility, which was placed into service in October.

The Meeker facility also has the capability to extract as much as 35,000 b/d of natural gas liquids. Phase II, which will double capacity of the facility to 1.5 bcfd of gas and 70,000 b/d of NGLs, is projected to begin operations in the summer of 2008.

Initial volumes from Chevron's Piceance production are slated to be 50 MMcfd starting in 2008.

Under the terms of a separate transportation and fractionation exchange agreement, Enterprise will transport Chevron's mixed NGLs extracted at Meeker through its Mid-America Pipeline (MAPL). In the third quarter, Enterprise completed an expansion of MAPL, adding 50,000 b/d of incremental capacity.

Chevron began its Piceance basin drilling program with a 13-well delineation program in 2005 on 33,000 acres that it owns on Colorado's western slope. Two purpose-built rigs began drilling the first development wells this summer, using extended-reach directional drilling techniques that will allow Chevron to complete up to 22 wells from a single pad. The entire development program may involve more than 2,000 wells and could last from 10 to 15 years, with production operations continuing for several decades.

Enterprise has already executed agreements totaling more than 2 bcfd of gas with six of the 12 largest producers in the region.

Ivory Coast starts construction on second refinery

Ivory Coast has started construction on its second oil refinery, a 60,000 b/d facility on a 400-hectare site in the Vridi district of Abidjan.

The facility is being funded by US energy firms Energy Allied International and WCW International, together with Ivory Coast's state-owned Petroci.

"The implementation of this new refinery is a much anticipated next step in our vision to make Abidjan and [Ivory Coast] a major center for refining and redistribution of high-end petroleum products along the West African Atlantic Basin," said Petroci general manager Kassoum Fadika.

Fadika said Angolan, Nigerian, and possibly Congolese crude will be treated in the refinery, which will target US markets.

State-owned refining firm Societe Ivoirienne de Raffinage manages Ivory Coast's other refinery, which is in the same industrial area of Vridi, and it can process 70,000 b/d.

The SIR facility is 47.21% owned by the Ivorian government, while Burkina Faso owns another 5.39%. Four international oil companies—Total SA 25.3%, Royal Dutch Shell PLC 10.3%, ExxonMobil Corp. 8.1%, and Chevron Corp. 3.7%—own the remainder.

French producers asked to lessen oil price impact

France's Finance and Economy Minister Christine Lagarde urged all producers and distributors of fuel in that country to reduce the impact of high oil prices on consumers.

Oil majors Total SA, Royal Dutch Shell PLC, BP PLC, ExxonMobil Corp.'s Esso subsidiary, and Eni SPA unit Agip, as well as smaller distributors, all promised at the Nov. 10 meeting to continue the policy, started in 2005, of "smoothing out" price hikes and passing on price drops to consumers as quickly as possible. In this way, said Total Chief Executive Officer Christopher de Margerie, "No company can outrageously take advantage of market movements."

Lagarde acknowledged that, as a result of that policy, pump prices in France are lower than average fuel prices in the European Union. She noted that a liter of premium gasoline was almost a third more expensive in Germany than in the competitive French market where large "hypermarket" outlets now account for 57%

of motor fuel sales. She said she would encourage the opening of more super and hyper markets. The majors have developed different strategies to remain competitive in that market.

At that meeting, representatives of the major oil companies confirmed their commitments to invest 3.5 billion euros in 2006-10 to increase and upgrade refining capacities. Total's share of that investment is 3 billion euros. In addition, Total will invest another 500 million euros in the same period to develop in new energy technologies.

Lagarde said she strongly backs the International Energy Agency's plea for oil and gas producing countries to increase production. She said the matter would be taken up at the Euro group and European financial ministers meeting this week in Brussels, as well as at the Nov. 17 meeting in South Africa of the "Group of 20"—a bloc of developing nations established Aug. 20, 2003.

Lagarde advocated more transparency of oil inventory levels, which should be published weekly, "as in the US." ✦

Transportation — *Quick Takes*

Saudi gas pipeline fire kills at least 28

At least 28 people were killed and another 10 injured on Nov. 18 when a fire broke out after an explosion along the Haradh-'Uthmaniyah natural gas pipeline in Saudi Arabia's Eastern province.

The explosion and blaze occurred when workers were welding a plate on the pipeline, one source said, adding that the gas plant was unaffected. "This is purely maintenance-related," said an adviser to the Saudi oil ministry.

The fire broke out in the early morning hours about 30 km from the Hawiyah gas plant, where maintenance work for new tie-ins was being conducted, Saudi Aramco said in a statement.

"Emergency response teams were immediately mobilized; affected lines have been isolated and the fire has been brought under control," Aramco said.

Saudi Oil Minister Ali Al-Naimi said the fire would have no impact on the company's production capacity since it was a new pipeline, while a Saudi adviser to Saudi Arabia's oil ministry said there was no question the fire was an accident. A technical committee will investigate its causes.

Oil output begins from Oyong oil field off Java

Santos-operated Oyong oil field off East Java has shipped its first cargo of oil from the field's Shanghai floating production, storage, and offloading (FPSO) vessel.

The company said 250,000 bbl were loaded into the Emerald Queen export tanker the week of Nov. 12. Production is expected to stabilize at 8,000-10,000 b/d.

Field commissioning is virtually complete, Santos said, with gas injection operational and all production wells on line.

Oil is produced via a wellhead platform from oil wells and two gas wells. It is processed on the Sea Good 101 production barge and piped to the FPSO for storage and offloading.

Participants in the Sampang production-sharing contract are Santos, Adelaide, with 45%, Singapore Petroleum 40%, and Cue Energy Resources, Melbourne, 15%.

Controversy looms over Kerch Strait fuel oil cleanup

Russian officials and environmental experts are in disagreement over the short and long-term effects of 1,300 tonnes of heavy fuel oil spilled by the sunken tanker Volgoneft-139 in Kerch Strait (OGJ Online, Nov. 12, 2007).

Russian Prime Minister Viktor Zubkov said the majority of fuel oil will be removed from the shoreline within 3 weeks, while work to put things back in order in the aftermath of the disaster will be completed "within 40-45 days."

On Nov. 13 Zubkov said, "Measures are being taken today, and we think the large volume of oil will be removed from the shoreline." But Alexey Zimenko, an environmentalist with Russian Program Office World Wide Fund for Nature said the region's ecological system will not recover soon from the consequences of the tanker's sinking.

"The consequences [to the Krasnodar territory region] will persist for many years," Zimenko told Interfax news agency.

"The environmental system of the region has sustained serious damage," Zimenko said. "It is insufficient to collect the oil on the water's surface and on the shoreline. A considerable part of the black oil will sink to settle on the bottom, and it will participate in the environmental cycle." Russian federal weather forecasting service Rosgidromet warned Nov. 13 that oil products from the sunken tanker could spread beyond Kerch Strait to the Sea of Azov.

"In the current stormy situation the greatest danger lies in intensive pollution of the coastline in the shipwreck zone, including on Ukrainian territory with oil products," Rosgidromet said.

Greece-Turkey gas pipeline link inaugurated

Greece and Turkey Nov. 18 took a major step in linking Caspian Sea producers with west European consumers as Greek Prime Minister Kostas Karamanlis and Turkish Prime Minister Recep Tayyip Erdogan inaugurated a 178-mile pipeline link that will transport natural gas from Shah Deniz field off Azerbaijan.

The new line initially will carry 250 million cu m/year of gas from Karacabey, in western Turkey, to Komotini, in northeastern Greece. The line's capacity is expected to triple by 2012, when Poseidon, a 132-mile undersea pipeline between Italy and Greece begins operation (OGJ, Aug. 13, 2007, Newsletter).

US Energy Sec. Samuel Bodman, on hand for the inauguration ceremonies, welcomed the new line as an "extraordinary project" and a "critical new energy bridge" between the East and West.

"This Turkey-Greece Inter-Connector is a critical first step in a new energy supply chain, and it comes on line at a critically important time," Bodman said, adding that the European Union is the world's biggest gas import market and one of the world's fastest-growing. "It is reasonable to expect that Europe's dependence on energy imports will continue to grow over the next 25 years, meaning that Azerbaijan and the rest of Central Asia is poised to become Europe's newest main source of supply, alongside the North Sea region, Russia, and North Africa," Bodman said.

Azerbaijan's President Ilkham Aliyev, also at the ceremonies, said his country is ready to implement projects aimed at expanding energy cooperation with the European Union. ✦

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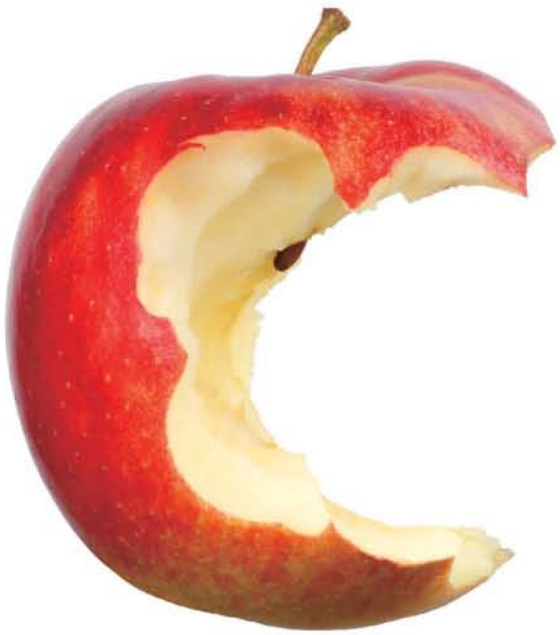

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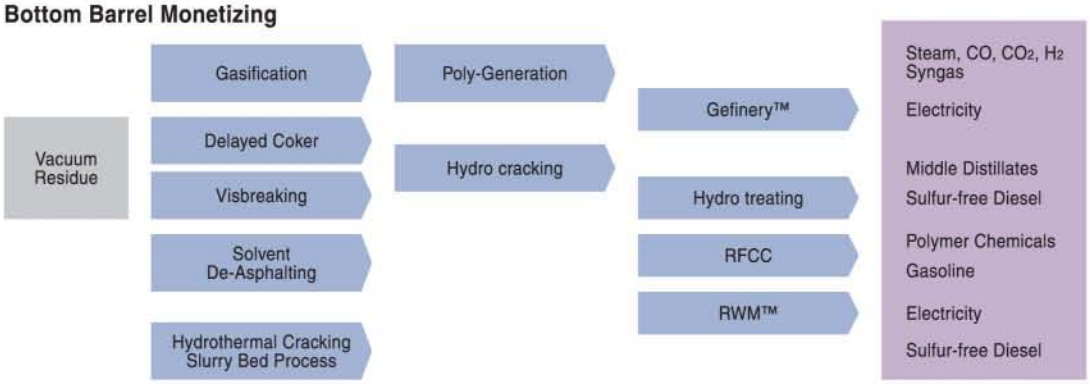

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NOVEMBER

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Dry Tree & Riser Forum, Houston, (918) 831-9160, (918) 831-9161 (fax), e-mail: registration@pennwell.com, website: www.drytreeforum.com. 28.

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JANUARY

Middle East Petrotech Conference and Exhibition, Bahrain, +60 3 4041 0311, +60 3 4043 7241 (fax), e-mail: mep@oesallworld.com, website: www.allworldexhibitions.com/oil. 14-16.

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API Exploration & Production Winter Standards Meeting, Ft. Worth, Tex., (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 21-25.

API/AGA Oil & Gas Pipeline Welding Prac-

tices Meeting, Ft.Worth, Tex., (202) 682-8000, (202) 682-8222 (fax), website: www.api.org/events. 23-25.

International Forum Process Analytical Technology (IFPAC), Baltimore, (847) 543-6800, (847) 548-1811 (fax), e-mail: info@ifpacnet.org, website: www.ifpac.com. 27-30.

SPE/IADC Managed Pressure Drilling & Underbalanced Operations Conference & Exhibition, Abu Dhabi, (972) 952-9393, (972) 952-9435 (fax), e-mail: spedal@spe.org, website: www.spe.org. 28-29.

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SIHGAZ International Hydrocarbon and Gas Fair, Hassi Messaoud, Algeria, website: www.sihgaz2008.com. Jan. 30-Feb. 3.

FEBRUARY

Middle East Corrosion Conference, Bahrain, + 973 17 729819, + 973 17 7299819 (fax), e-mail: bseng@batelco.com.bh, website: www.mohandis.org. 3-6.

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Rocks and docs

Judy R. Clark
Senior Associate Editor

Two of Houston's major industries—medicine and oil and gas—surprisingly have discovered many similarities in the technologies they use and the challenges they face. This discovery prompted a meeting to examine the parallels and determine if there are crossover technologies that could benefit each.

On Nov. 12, in a session called "Pumps & Pipes 1," a group of petroleum, medical, and imaging experts met at the University of Houston's (UH) Texas Learning and Computation Center to explore their similarities in the hope of sparking solutions to problems inherent to both industries.

Alan B. Lumsden, professor of surgery at the Methodist Hospital's DeBakey Heart Center, organized the session along with William E. Kline, manager of the drilling and subsurface technology division of ExxonMobil Upstream Research Co., and Ioannis Kakadiaris, the University of Houston's Eckhard Pfeiffer professor.

The invitation-only audience included researchers from medical device manufacturers; computer scientists; imaging specialists; physicists and engineers from academia; geologists, physicists, and researchers from the oil and gas industry; and surgeons, vascular biologists, researchers, and clinicians interested in cardiovascular disease. The room was packed.

Anatomy and geology

In an introduction they dubbed, "Docs and Rocks," Lumsden explained the anatomy and physiology of the human cardiovascular system, while Kline followed with an overview of the geology and physics of conventional hydrocarbon production.

Meeting presenters examined three common areas: fluid dynamics (hydraulics, conduits, and pumps); accessing targets (navigation, metallurgy, and robotics), and imaging and remote monitoring.

Like participants in a tennis match, medical topic experts were paired with petroleum engineers and other experts to discuss like issues. One pair discussed the use of corrosion inhibitors in pipelines compared with drugs to dissolve plaque in blood vessels.

A discussion of left ventricular assist devices (heart pumps) was followed by an explanation of subsurface well pump effectiveness. Atherosclerosis was compared with corrosion and scale management; mechanical repair of blood vessels compared with through-tubing workovers; and navigating through the body to view anomalies was compared with geosteering a drillbit for a horizontal well.

Such medical imaging as computed tomography (CT) scans, ultrasound, and three-dimensional pattern scans were compared to and contrasted with oil and gas seismic and other imaging and computing proficiencies. Kakadiaris explained medical imaging and computing that UH is working on with its biomedical cluster competencies.

At the meeting, questions followed each presentation as meeting participants focused on learning as much as possible about the two industries' methodologies and problems.

Ideas and solutions

The idea for this gathering came from discussions Lumsden had with oil professionals while traveling and with hospital board members from the oil industry. He and the oil workers soon recognized similarities in terminology and concepts. Lumsden visited the Ocean Star rig and museum in Galveston, Tex., and the Wiess Energy Hall in Houston and again was struck by similarities between the industries.

About 18 months ago Lumsden and Kline began planning the meeting to discuss topics with potential crossover benefits. They hope that learning of technologies used by each industry will stimulate ideas for resolving problems common to both. Perhaps some technologies in one industry can be modified for use, on a very different scale, by the other with ideas emerging from this and other such gatherings. ✦

Editorial

Markets under assault

Governmental activism has roared back into fashion in the energy-consuming world. In the US, a Republican president and Democratic Congress spar over energy policies that differ on specifics but converge around the assumption that energy choice is a fitting purpose of government. In Europe, progress toward energy-market deregulation is giving way to supposedly weightier concerns. Indeed, the main movement toward market economics now is by countries trimming price subsidies, and those steps relate less to enlightenment than to fiscal pressure.

The reinvigoration of energy governance in major consuming nations has many possible explanations. Some observers see the oil price surge of the past few years as a market failure and summons to govern. To some, the excesses of Enron and rogue traders elsewhere discredited the deregulation of electricity markets if not trading more broadly and the legitimacy of free markets in general.

Transcendent problems

A belief also seems to be at work that transcendent problems have emerged, problems massive and complex enough to overwhelm whatever remediation might be expected from the simple working of free markets, problems only governments can address. Energy insecurity and climate change are popular favorites.

To some degree, too, activism by consuming-nation governments responds to menacing initiatives of producer governments empowered by surging oil revenue. Oil money, for example, has rekindled Russian hegemony. It has given mavericks such as Venezuela's Hugo Chavez and Iran's Mahmoud Amadinejad international maneuverability they wouldn't otherwise possess.

But these are excuses, not good reasons, for governments to yield to their natural urges to govern with abandon. They dodge the question whether consumers fare better in markets working freely or in markets misshapen by intrusions such as fuel-use mandates, consumption limits, and price controls. Yet history answers clearly: For consumers, free markets always are preferable. They're preferable even when prices are stressfully high because they keep supply flowing to priority uses. Inevitably, consumption mandates raise costs, and price controls create shortage.

US and European energy markets strained under regulation in the 1970s then flourished, to the extended benefit of consumers, after price and consumption controls eased in the 1980s. Elevated prices of the moment in no way repudiate the comfort that followed deregulation where it occurred. In fact, years of depressed energy prices contributed to unprecedented economic growth in much of the world, growth that has blunted the sting of an inevitable price upswing. Nothing—not elevated prices, not tension over energy security, and not climate change—warrants distortions like those of the '70s.

As governments lunge toward past errors, oil and gas companies can serve national interests by proclaiming whenever possible the superiority of market freedom over regulated energy systems. And they should anticipate three standard counterarguments.

Appeals for market freedom reflect blind ideology, goes one typical complaint. In some cases, this may be true. Yet a preference for market freedom can flow from simple pragmatism born of experience with what works and what doesn't. Markets act swiftly and efficiently; governments can't. Therefore, matters such as fuel choice and pricing are best left to markets. Besides, what's wrong with ideology?

Supporting regulation

Supporters of markets vis-a-vis governments also face accusations that they thoughtlessly abhor governance. This claim is extreme and unfair. To support market freedom is not automatically to oppose government as an institution or regulation as a practice. In fact, most free-market advocates support regulation to limit trading misbehavior, for example, and to guide whatever responses to climate change may be in order. In all issues, though, governments should restrain themselves and orient their actions to market freedom. The point of such a framework is to make governance effective, not to disparage governance itself.

The other standard argument against a preference for market solutions is the supposition that problems can be too big for markets to handle. Yet energy-market distortions create problems bigger than those that the policy mistakes causing them aim to solve. Price and market controls leap to mind.

Energy markets aren't yet in retreat in the consuming world. But they're under assault. Energy consumers have reason to worry. ✦

Energy system limits future ethanol growth

Larry Kumins
Energy Policy Research Foundation Inc.
Washington, DC

The rapid increase in ethanol consumption during 2002-06 will prove to have been a one-time event that captured two thirds of the ultimate near-term market.

Growth beyond the remaining third of ethanol's potential will depend on ethanol's ability to replace gasoline as a primary fuel.

Gasoline replacement by ethanol is constrained by two factors: The gasoline-ethanol distribution infrastructure does not deliver ethanol for gasoline blending everywhere in the country, and there are physical limitations on existing vehicles—all 240 million of them—as to how much ethanol they can use in combination with gasoline.

Ethanol's surge

Ethanol has been around since the internal combustion engine was invented. Used intermittently as an octane booster over the years, it received renewed interest with the Energy Tax Act of 1978, which offered a 4¢/gal blending credit for "gasohol." That worked out to 40¢/gal of neat ethanol. The American Jobs Creation Act of 2004 streamlined the credit and expanded it to 51¢/gal for ethanol blended with gasoline.

The Energy Policy Act of 2005 (EPACT) mandates more use of ethanol, 4 billion gal in 2006 and 7.5 billion gal in 2012 and years thereafter. Current consumption, because of this boom in ethanol use in the last year, exceeds 6 billion gal/year.

Between 2002 and 2006, ethanol consumption increased by a factor of 2.5, from 2.1 billion gal to 5.4 billion gal. While this gives the illusion of boundless consumption of ethanol in the future, it would be a mistake to translate that growth rate ad infinitum. The reason ethanol became such a hot item in 2006 was that the additive methyl tertiary butyl ether was removed from the gasoline pool because of public displeasure with leaks of the substance into water supplies and the related threat of defective-product litigation against refiners.

The MTBE phase-out had been under way since 2000, when public opposition to it began to grow. Consumption, which had peaked at about 300,000 b/d, ceased last year. About 400,000 b/d of ethanol poured into the market to replace MTBE as an oxygenate, octane booster, and supply extender.

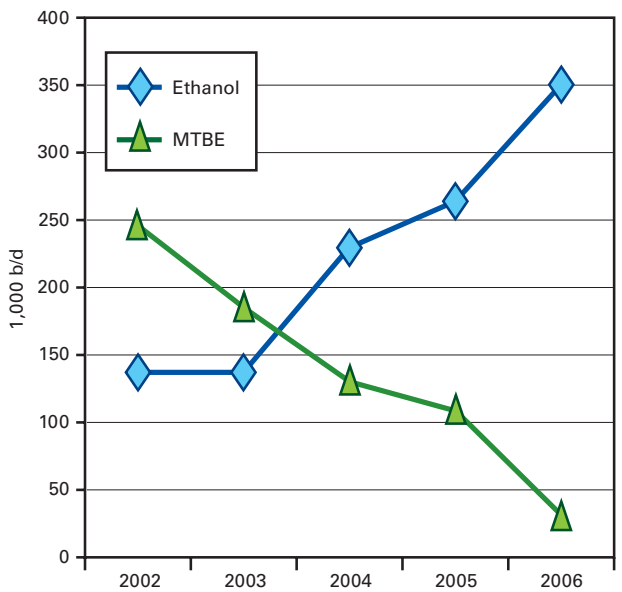
Fig. 1 shows the ramp-down of MTBE and the ramp-up of ethanol sales. Fig. 2 shows pricing phenomena that led to almost a tulip-mania style bubble for ethanol. The ethanol price peaked in the middle of summer 2006 at almost $4.50/gal, in contrast to wholesale gasoline, which also jumped last year but only to $2.25/bbl.

Ethanol's price surge certainly spurred interest in producing ethanol, which was hugely profitable. As domestic ethanol production ramped up with the opening of more and more ethanol

Adapted from a presentation at the Washington Roundtable on Science and Public Policy of the George C. Marshall Institute on July 25, 2007, in Washington, DC.

US ETHANOL, MTBE CONSUMPTION

Fig. 1



Source: EPRINC

plants, prices of ethanol and gasoline began to converge. In recent months ethanol became cheaper than gasoline as the supply increased.

US ethanol plant capacity grew, with 131 operating plants capable of meeting all US needs right now: The capacity is 7 billion gal/year or 460,000 b/d. The 72 plants now under construction will raise capacity to about 880,000 b/d, almost 10% of US gasoline consumption and well above the EPACT 2012 mandate.

Rising demand for ethanol has of course increased demand for corn, the price of which last year doubled (Fig. 3). Now ethanol producers are buying more corn and driving corn prices up as they increase output and push ethanol prices down. An ethanol oversupply has developed while corn demand remains high.

This year US corn plantings reached their highest level since 1944. Corn acreage has increased 15% at the expense of other crops, notably cotton (acreage down 20%) and soybeans (acreage down 11%). Cotton and soybean prices will be higher because of smaller plantings. Those increases will occur with corn prices already high and likely to go higher by 2008.

Not new oil

Ethanol is not the new oil; it is new but something different. Or maybe it is the same old thing but a new fashion statement.

Ethanol's energy content is only two-thirds that of the same amount of gasoline. Volumes of ethanol don't hold comparable energy values, either. Wholesale prices of ethanol currently are $1.80/gal, which translates to about $2.70/gal for wholesale gasoline—before tax, dealer mark-up, and transportation cost.

Ethanol raises widely recognized physical issues. Because it tends to separate from gasoline in the presence of water, gasoline-ethanol blends can't be shipped by pipeline. So ethanol is transported mostly by rail at up to four times the cost of oil products moved by pipeline. Because the blend has a short shelf life, ethanol and gasoline must be mixed near the point of retail sale.

Distribution limits keep ethanol blends out of some US markets. As a result, the average ethanol content of all US gasoline is below 5%, less than half the concentration that all automobiles can use.

While there has been talk about flexible-fuel vehicles able to use fuels containing 85% ethanol (E85), only 6 million of the 237 million vehicles now on the road are FFVs—and most don't burn E85. Only 1,200 retail establishments sell the fuel.

President George W. Bush has elicited a pledge from the Big Three automakers that half their 2012 output will be FFVs. Foreign automakers have not shown much interest in doing the same; they have other ways of achieving high mileage per gallon.

In 2017, when the president wants gasoline use to have been cut by 20%, there will be 280 million vehicles on the road in the US, not many of which will be FFVs. Even if Detroit meets its pledge to Bush, only 25% of the new vehicles sold in any given year will be FFVs.

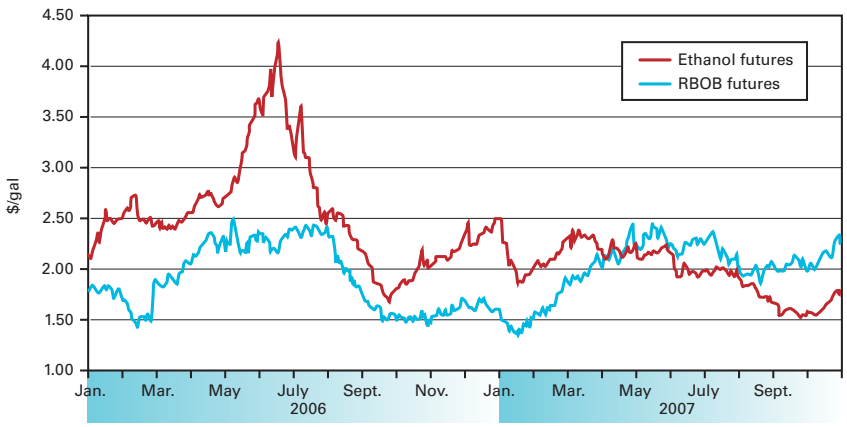
How market constraints might affect ethanol's evolution

Table 1

Ethanol concentration, %	Ethanol amount: Billion gal/year	Ethanol amount: Thousand b/d	Fundamental factor	Ethanol price implication
~5	~8	500	Necessary-complementary; the current situation; replacing MTBE	Higher than gasoline
5-8	~12	750	Enhancing gasoline performance and increasing supply volumes	Converging on gasoline price
10	~15	1,000	Max percent current vehicles can use; limited by distribution infrastructure	Price competition among ethanol producers
Much greater than 10	35	2,300	Exceeds likely auto fleet capability	Market oversupplied; serious price erosion

US ethanol and gasoline prices*

Fig. 2

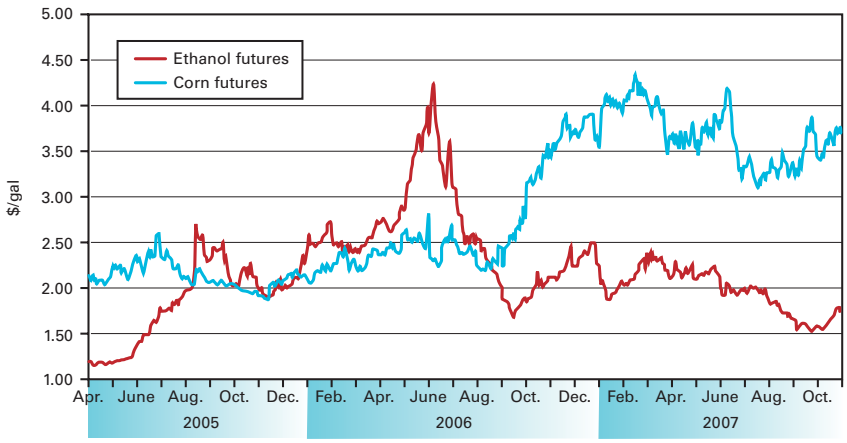


*Chicago Board of Trade futures price for ethanol and New York Mercantile Exchange futures price for reformulated blendstock for oxygenate blending (RBOB).

Source: EPRINC from CME Group/Chicago Board of Trade

THE PRICE PRESSURE ON ETHANOL MARGINS*

Fig. 3



*Chicago Board of Trade futures prices.
Source: EPRINC from CME Group/Chicago Board of Trade

Easy amount blended

What does all this mean? There is an easy amount of ethanol that can be absorbed in the gasoline pool (Table 1). That is about 5%, and that is where the market is now: about 8 billion gal/year, or 500,000 b/d.

At that level, ethanol is a necessary and complementary component of the gasoline pool. It is the current situation. It represents the replacement of MTBE in an economic environment that accommodates ethanol prices higher than gasoline prices.

But a lot of production capability is under construction and soon will be available. The additional ethanol will be hard to absorb into the gasoline pool, given the 10% effective cap and the lack of distribution facilities.

Certainly increasing volumes can be supplied, and gasoline performance can be enhanced, but at the same time, with all this capacity coming on line, ethanol prices will converge on gasoline prices on a btu-adjusted basis. If the market is oversupplied, adjusted ethanol prices will be lower than gasoline. The 10% theoretical maximum that can be used in current vehicles would be hard to achieve because of the distribution conflicts. With ethanol production capacity soon to about double, reaching 15 billion gal/year, the potential for an ethanol price slump is high, and it would result in stranded ethanol plant investment and pressure by ethanol producers for new subsidies.

For years beyond 2012, there are proposals for ethanol sales mandates that assume concentrations in gasoline above the current 10% cap. How that might be achieved is an unanswered question, given that only US automakers espouse the plan, and they account for only about half of US vehicle sales.

Proposals for sharply increased ethanol sales simply assume that auto manufacturers will warranty existing cars for fuel blends containing far more than the current 10% maximum.

Cellulosic ethanol

The role of cellulosic ethanol in the gasoline pool remains in question. Ethanol from plant wastes must transition from lab to commercial activity. That hasn't happened.

Cellulosic ethanol would be a good supplement for the corn ethanol now prevalent in and essential to the gasoline pool. It would minimize crop-cycle risk and alleviate the conflict between food and energy consumers. Additionally, it would mitigate the inflationary impact of ethanol on agricultural commodities, which is often unmeasured because most price indexes exclude food and energy, sweeping under the rug some very real price pressures in the economy.

Assuming away vehicle compatibility issues, even if cellulosic sources become commercially viable on the most optimistic schedule, consumption of ethanol still won't exceed 10% of gasoline supply without substantial changes in the stock of capital: pipeline transport and terminal facilities; retail facilities able to dispense E85; universal distribution across the country; and a change in the automobile stock to facilitate the use of higher concentrations of ethanol in gasoline.

Investors have been quick to back ethanol production, but infrastructure has attracted little interest. Financing such infrastructure as pipelines is challenging. There are special vehicles for raising capital in the pipeline and midstream segments of the industry—the master limited partnership is one—but raising capital for projects requires special efforts.

Refining vs. ethanol

Investment in refining has lagged at the same time that ethanol plant investment has been robust. Refining capacity grew by only 600,000 b/d in the past few years, while imports of oil products grew by 1 million b/d. A new energy-security issue is emerging: The US depends not only on other nations' crude oil but increasingly on other countries' refining capacity.

US refining capacity now operates at very high utilization rates; as a consequence, it has diminished ability to deal with outages and scheduled maintenance. Largely because of refinery outages, pump prices rose from $2.15/gal last January to $3.25/gal in June. Strain on refinery capacity has become its own energy security issue.

Ethanol and oil now compete for capital. They also compete for materials and services in facility construction. Ethanol may be crowding out investment in refining.

The threat of additional ethanol mandates has chilled refining and transportation investment even though the US needs new refining capacity—a need

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Policy aims

The policy aims driving ethanol expansion are sound: controlled growth and perhaps a reduction in petroleum imports; protection of the economy against oil price shocks; domestic fuel supply capacity more in line with consumption than it is now and less vulnerable to mishap.

Depending on an agricultural commodity to accomplish these goals, however, just adds the risk of the crop cycle to present instabilities. That dependency will be a concern until ethanol from cellulose becomes economic and available in large amounts.

More immediately, the ethanol industry faces the stresses of consistently high corn prices, weakening product prices, the consequent compression of margins, and the possibility of producer consolidation.

How the immediate stresses affect the ultimate shape of an industry still in its formative stages remains uncertain.

What is certain is that the modern energy economy has constraints on how much ethanol it can absorb. ✦

The author

Larry Kumins became vice-president of research and analysis at the Energy Policy Research Foundation Inc. in February 2007. Before that he was a research specialist in energy policy at the Congressional Research Service (CRS) in the US Library of Congress. He has over 30 years of research experience in a wide range of oil and natural gas policy and economic issues with special expertise in fuel supply, trends in petroleum supply and demand, natural gas regulatory policy, oil imports and exports, the Organization of Petroleum Exporting Countries, and world oil market developments. His recent work at CRS included detailed assessments of the price and supply effects of Hurricanes Rita and Katrina.

ASPO: Depletion, technology affect peak oil

Angel White
Associate Editor

The peak oil issue is essentially a race between resource depletion and the continuing development of technology, according to industry and academic experts at the third annual conference by the Association for the Study of Peak Oil (ASPO) in Houston Oct. 17-20.

Peak oil production when world supplies of crude can't meet global demand is "real and imminent [and] will occur sooner than most people expect," said Chris Skrebowski, editor of Petroleum Review. He cited falling discovery rates, fewer large discoveries, rapid depletion, companies' struggles to maintain production levels, and too few countries with real growth potential for output.

Skrebowski said these factors are combined with nongeological threats to supply flows, including "resource nationalism" in Russia, Venezuela, Bolivia, and Ecuador; tighter terms and conditions for production-sharing agreements; civil insurrection; cost inflation; ageing equipment and facilities; lack of skilled workers; and refinery constraints.

He said net depletion of 4%, or 3.3 million b/d, is now double annual demand growth. Depletion is accelerating at a rate of 0.1-0.15%/year, so "to avoid economic disaster, we need to shed lots of oil demand," said Skrebowski.

Compounding the issue even more, the rules of economics are not working, Skrebowski said. Governments of most oil-producing states outside the Organization for Economic Cooperation and Development subsidize fuel prices for their citizens while some governments of OECD countries tax fuels heavily. As a result, pump prices around the globe range from 20¢/gal to $9/gal.

Other conference speakers agreed that the economics are malfunctioning.

Matthew Simmons, chairman of Simmons & Co. International, Houston, said, "There is no sign that high prices have had any impacts on demand."

Robert L. Hirsch, senior energy advisor of Management Information Services Inc. (MISI) and coauthor of a peak oil report to the US Department of Energy, said, "The problem is [the price] shocks, where [changes] occur rapidly. Markets cannot react that fast."

Skrebowski said crude supplies may be mitigated by limited discoveries, infill and other small production projects, trimming the depletion rate, limited spare capacity among the Organization of Petroleum Exporting Countries, and the relatively small number of megaprojects.

In response to audience questions, Skrebowski was skeptical whether megaprojects in Saudi Arabia will help since it essentially would be reworking old fields.

He estimates oil production will peak in 2011-12 at 93 million b/d.

Reserves growth

Jeremy Gilbert, managing director of Barrelmore Ltd., said there are huge disparities in forecasts of future reserves. ASPO forecasts 130 billion bbl and the US Geological Survey forecasts as much as 724 billion bbl.

Gilbert contends, however, that yet-to-find oil reserves won't influence medium-term supply, even if found in 10-15 years with an average 6-7 years from discovery to production. In addition, he said, there is no agreement on how much reserves growth is to be achieved. "Reserves don't always grow," Gilbert said. Some are sustained and some are depleted. Thus, he said, most forecasts for reserves growth are overestimated.

He estimates potential reserves growth of 180 billion bbl, which he warns will "not all come at once" and "will not affect the peak." He said reserves growth occurs in existing fields,

and typically recovery by new technology is taken into account in the initial reserves estimate.

Gilbert said most growth occurs because operators were overcautious in their initial estimates of reserves, especially in the US where the US Securities and Exchange Commission's reserves reporting rules are followed. He said SEC rules for reserves growth are used by the major integrated companies but not by OPEC members. Therefore, it is used for about 23% or less of world production, he said, adding that the resources that don't fall under SEC rules will not follow US reserves growth patterns.

Gilbert said reserves growth "will help fill the gap" but cautioned that "the pace [of reserves growth] in the past [is] not a guide to pace in the future."

If oil peaks in 10-15 years, he said, "It's probably already too late for smooth transition to add alternative energy." He said problems for consumers will begin before peak is reached.

Recovery, reserves growth

Recovery growth will be a major source of future additions but is not a panacea that eliminates peak oil, said Richard Nehring, president of Nehring Associates.

He said recovery growth increases resources, but it will occur slowly and will have only modest effect on peak oil since "the modest-to-high resource levels will only be reached within 10-15 years."

Nehring's assumption is predicated on his estimate of ultimate world oil production of 3.39-5 trillion bbl or 2.275-2.785 trillion bbl. This includes cumulative production, proved reserves, recovery growth, future discoveries, and unconventionals. The difference with the two estimates represents what Nehring refers to as the delayed peakist view and that of the imminent peakist.

Nehring, who contends "we are all peakists," classifies peak oil advocates into two groups: the imminent, who see the oil peak occurring around 2005-15 and the delayed, who see the oil peak occuring around 2020-40, with a plateau of 15-30 years.

Nehring emphasized that although the dates between the delayed and imminent views may seem like a small difference, "it represents the difference between catastrophe and a difficult but manageable transition."

Variations in the estimate of ultimate world production put the occurrence of peak oil around 2007-16.

Different views of remaining world oil reserves is the essential difference between imminent peakists and delayed peakists, said Nehring.

He said, "Recovery growth is central to the delayed peakist, and it is immaterial to the imminent peakist."

Technology vs. depletion

Simmons questioned whether the world can cope with even a 4.5%/year depletion decline, as estimated by Cambridge Energy Research Associates. He said CERA's estimate requires adding 60 million b/d of production in 10 years.

He also noted that Gulf of Mexico fields are declining with just 5 years from peak to plateau.

George Baker, research director of energia.com, a publishing and consulting firm in Houston, suggested that if the Mexican upstream scenario remains the same, then that country is already in a state of peak oil. Mexico's peak oil occurred in 2004 when Cantarell oil field peaked, he said. Giant Cantarell is now in decline, and Ku-Maloob-Zaap and Chicontepec fields are suspect, he said.

He said Mexico "needs 80 oil companies instead of one oil company with 80 contractors." He said changes in Mexico's upstream rules could delay peak oil for decades in that country.

Baker asserts that Mexico's plan to drill more than 10,000 development wells through 2016 is unlikely, since about that many wells were drilled in the past 30 years.

Simmons said demand will outpace supply unless demand slows or begins to decline or crude oil production soars. He asked, "Can crude rise 2.5-4 million b/d?" He suggested that even if wellhead output can grow, infrastructure soon will shrink due to the immediate need to rebuild oil and gas facilities.

He also questioned the likelihood of planned Saudi Arabia projects to come on line, and noted that recent big discoveries, specifically Chevron Corp.'s Jack field in the Gulf of Mexico, cannot find rigs to complete further tests.

Gilbert said, "New technology will continue to add to recovery but will achieve less."

Transportation

Oil demand is not likely to slow or decline. One reason is its fundamental growth engine (transportation), which is unstoppable, said Simmons.

With a global population of 6.5 billion and a vehicle production rate of 50 million vehicles/year, it is hard to stop transportation growth, he said.

Skrebowski pointed out that 76.5-83% of the oil barrel is used for transportation. He said jet fuel and ship bunkers are difficult to substitute, but even then surface transport fuel still accounts for 50% of the barrel.

Hirsh contends that the situation is "a liquid fuels problem, not an energy problem." He said, "Windmills are not going to run our cars."

Roger Bezdez, president of MISI, says jet fuel costs have tripled in the past 4 years. Aviation fuel costs are forecast to grow to nearly half of US domestic oil production in 2030, he said.

Hirsh posed a question to the conference attendees: At what price would you stop using your vehicle? His implication is that attendees would attempt to perpetuate their way of life for as long as possible.

Change takes time

Peter Tertzakian, chief energy economist of ARC Financial Corp. and author of "A Thousand Barrels a Second," said, "Changes in the world of energy do not

happen rapidly." He noted that it took 25 years for electricity to be widely used.

Justin Ward, engineer with Toyota's Advanced Technology Vehicles Department, said it took 27 years for gas-powered vehicles to become mainstream in global markets. And it has taken 9 years for the Prius, Toyota's hybrid car, to get to 100 million sold.

In order to elicit change in consumer behavior, Tertzakian said "There must be a compelling alternative at a cheaper price."

Complicating the peak oil issue is the fact that hydrocarbons are compelling and cheap. "Only when alternatives are as compelling will consumers be compelled to buy," he said.

In addition, he proposed that the peak oil challenge is not a technological engineering issue, but a social engineering issue, involving traffic congestion, urban sprawl, and "vehicle obesity," e.g., the Hummer H6.

"We are going to the ends of the earth to find energy," Tertzakian said, referencing the Sakalin Island project and Russia's move of putting its flag on the North Pole, as well as operators' compulsion to invest $20 billion/year in the Canadian oil sands to capture bitumen—"natures unbaked oil." He concluded that the solution "will not come from energy but from changes in our lifestyle."

Policy response

John Kaufman from the US Department of Energy, suggested various responses to mitigate the peak oil challenge, including reducing oil and gas use by 50% in 25 years.

John Darnel, from the office of Congressman Roscoe Bartlett (R-Md.), said, "We can't produce ourselves out of this mess," referring to the peak oil crisis. He added, "Alternatives are not going to be there in the amount or timeframe that is needed."

He sees conservation as the fastest response to the oil peak crisis, claiming that the "cheapest, quickest source of energy is energy we have and don't use."

Darnel also said there is a need to challenge the global community towards international cooperation.

Roger Duncan, deputy general manager for Austin Energy in Austin, Tex., the nation's 10th largest community-owned electric utility, said, "Elected officials need to understand that [manmade] law does not supersede laws of physics." He said society needs to prioritize clean energy instead of trying to do everything at once, and understand that the solution is different depending on the situation.

He said the first line of defense should be efficiency and renewables.

Texas Railroad Commission Chairman Elizabeth Ames Jones said the economy needs to "stair-step up the use of renewables as well as stair-step down use of petroleum." ✦

BP plans company-wide review of operating procedures

Paula Dittrick
Senior Staff Writer

BP PLC, as part of its response to a series of accidents, plans next year to review the quality and safety of its operating procedures company-wide.

Mike Broadribb, BP's international director of process safety, told a meeting of the American Society of Safety Engineers in Houston this month that the fatal Mar. 23, 2005, blast at the 446,500 b/cd Texas City, Tex., refinery was preventable.

"It's not an easy story to tell; BP doesn't come out very well," Broadribb said. "Texas City was a preventable incident, a totally preventable process failure, a management failure, and a culture failure."

BP and others, including the US Chemical Safety Board, have studied the cause of the explosion extensively. The accident killed 15 people and injured more than 170 (OGJ, Jan. 23, 2006, p. 51).

The accident involved an isomerization unit, raffinate splitter, and blowdown drum.

Broadribb listed high tolerance of noncompliance with procedures and inadequate equipment maintenance as contributing to the explosion.

"If we learned one thing from this incident, it's the need for humility," Broadribb said. In the last 2 years, BP also has dealt with oil spills and pipeline corrosion problems in Prudhoe Bay, Alas., mishaps that have drawn criticism in Congress (OGJ, June 4, 2007, p. 30).

Based upon the Texas City accident, the company is working to implement 1,000 action items. The list includes extensive mechanical renovations, safety inspections throughout the refinery, and the removal of more than 200 temporary buildings and structures.

BP has banned occupied temporary buildings in high-risk areas. Many of the people killed at the Texas City refinery were working in a trailer that was demolished by the explosion.

BP's future plans

Starting Jan. 1, 2008, BP plans to list and review all of its operating procedures. The company also will examine its practices regarding critical safety equipment and maintenance, Broadribb said.

BP also is developing methods for measuring the competency of employees in roles critical to safety. Since 2006, the company has audited its operating performance to strengthen internal safety procedures.

At Texas City, the development of employee skills was a low priority resulting in inadequate training, Braodribb said.

"Over the years, the working envi-

ronment had eroded to one characterized by resistance to change and lacking of trust, motivation, and a sense of purpose," he said.

Consequently, training procedures are being studied company-wide, Broadribb said. Although there is a place for both face-to-face and computer-based training, Broadribb said the company favors face-to-face training.

BP's executives and operational managers receive more advanced and extensive training on process safety than they did in the past.

"Above all else, we've got to listen to our people and their concerns," Broadribb said. "When senior management says something, their actions need to mirror their words.... Whatever you do, you can just change culture a step at a time." ✦

CFTC report urges expansion of oversight to exempt markets

Nick Snow
Washington Editor

The US Commodity Futures Trading Commission has requested oversight authority over some contracts and products in unregulated electronic trading venues known as exempt commercial markets (ECMs).

The request came Oct. 24 in a report to Congress hours before the House Agriculture Committee's General Farm Commodities and Risk Management Subcommittee's scheduled hearing on reauthorization of the Commodity Exchange Act (CEA), which governs the CFTC (OGJ Online, Oct. 23, 2007).

"This report is designed to provide recommendations that strike a delicate balance between the appropriate level of market oversight and transparency while promoting market innovation and competition to ensure that these markets remain on US soil," said CFTC Acting Chairman Walt Lukken, who was scheduled to testify before the House subcommittee.

CFTC said the report's legislative recommendations include establishing the following for certain ECM contracts which serve a significant price discovery function:

- Large trader position reporting, comparable to existing reporting requirements that apply to contracts on regulated exchanges. "A large trader reporting system would enable the Commission's market surveillance staff to monitor positions on a daily basis to detect and deter possible manipulative schemes," the report said.
- Position limits or an accountability level regime, comparable to those that apply to similar contracts on regulated exchanges.
- Self-regulatory oversight to detect and prevent manipulation, price distortion, and disruptions of the delivery or cash settlement process.
- Emergency authority to prevent manipulations and disruptions of the delivery or cash settlement process. This could include emergency authority to alter or supplement contract rules, liquidate open positions, and suspend or curtail trading in any contract that serves a significant price discovery function, the report indicated.

CFTC said it also intends to establish an energy markets advisory committee to hold public meetings on issues affecting energy producers, distributors, market users, and consumers. It said it also plans to work closely with the Federal Energy Regulatory Commission to educate and develop best practices for utilities and others who use New York Mercantile Exchange settlement prices as hedging vehicles and benchmarks for pricing their own energy products.

The commission issued the recommendations after holding a day-long hearing Sept. 18 examining the statutory and regulatory structure governing ECMs, especially those with energy contracts. Witnesses included representatives from regulated and unregulated exchanges, industry associations, and consumer groups.

The Government Accountability Office also examined the CFTC's oversight authority and practices and issued its own report and recommendations Oct. 19.

In its report, CFTC said ECMs developed after the Commodity Futures Modernization Act of 2000 (CFMA) amended the CEA and replaced the existing futures trading supervisory framework with a risk-based tiered structure in which the level of regulation was tailored to the type of market and risks associated with it.

It noted that while there are small start-up ECMs, others have taken on characteristics of regulated markets. "Of particular note to [CFTC] staff is the development by the Inter-Continental Exchange (ICE) of a 'look-alike' natural gas contract with a settlement price linked to the settlement price of the [NYMEX] natural gas benchmark futures contract," it said.

Such a linkage increases the possibility that ICE's unregulated contract serves a major price discovery role and could provide an incentive to manipulate the settlement price of the regulated NYMEX contract, the CFTC report said.

Market disparities

CFTC further said that while many witnesses at the Sept. 18 hearing testified that the CFMA's tiered regulatory structure has been successful and should not be eliminated, others expressed concern over disparities between regulated and unregulated exchanges. They suggested that such disparities make markets more susceptible to manipulation and put regulated exchanges at a competitive disadvantage to ECMs, which offer virtually identical products.

WATCHING GOVERNMENT

Nick Snow, Washington Editor

A deepwater royalty storm

Many members of Congress already were upset over the absence of price thresholds from federal deepwater leases issued in 1998 and 1999 under which royalties were not paid. Then a federal district court in Louisiana triggered a fresh political storm.

The court ruled in the Kerr-McGee Corp. lawsuit challenging deepwater royalties on Oct. 30 that passage of the Outer Continental Shelf Deepwater Royalty Relief Act in 1995 eliminated the US Department of the Interior's discretion to enact a price threshold requirement that applies to volumes below the minimum volume of royalty-free production.

Officials from the administration of President George W. Bush immediately disagreed. "If the court's interpretation of Congress's action in 1995 is correct, certain leaseholders will be allowed to produce massive amounts...without paying royalties to the United States without regard to the price...perhaps amounting to one of the biggest congressional giveaways of federal resources in modern history," DOI Communications Director Tina Kreisher said.

A $60 billion matter

"The ball is in the administration's court," US Senate Energy and Natural Resources Committee Chairman Jeff Bingaman (D-NM) told reporters at a Nov. 5 briefing. Three days later, he and 42 other senators (including five Republicans and one independent) wrote Bush asking what steps the administration planned to take to recover the $60 billion that the Government Accountability Office estimated would be lost if the ruling stands.

US House members also didn't like the court's action. Natural Resources Committee Chairman Nick J. Rahall (D-W.Va.) said in a Nov. 6 letter to Bush that the ruling could result in "an unconscionable giveaway to the oil and gas companies on behalf of the American taxpayer."

He urged the administration to appeal and for Bush to withdraw his veto threat over the language in House energy bills. "With last week's court decision, and oil prices now exceeding $90/bbl, I hope you will reconsider this stance, and urge swift passage of an energy bill containing these necessary provisions," he wrote.

Cites CRS study

Rep. Edward J. Markey (D-Mass.), who chairs the House Select Committee on Energy Independence and Global Warming and is a Natural Resources Committee member, said on Nov. 9 that a new Congressional Research Service study concluded that language in the energy bill covers the 1996-2000 Gulf of Mexico deepwater leases.

He said that even if oil company lawsuits are upheld, the CRS study said the bill's language would make the tracts "covered leases," effectively requiring the leaseholders to either renegotiate or lose the right to bid on future leases.

All of this occurred before Congress recessed for Thanksgiving and members returned to their districts as retail gasoline prices broke back through the $3/gal barrier and crude oil prices remained above $90/bbl. ✦

"Generally, most witnesses believed that some changes to the ECM provisions may be appropriate, as long as they are prudently targeted and do not adversely affect the ability of established ECMs to innovate and grow," the report said.

CFTC considers the current level of regulation appropriate when an ECM trading contract's volume remains low and its prices are not relied upon to a great degree by other markets. But when such a contract matures and begins to serve a price discovery function for commodity transactions in interstate commerce, it warrants some increased oversight to deter and prevent price manipulation or other market integrity disruptions, the report continued.

The commission report said a determination that a contract serves a price discovery function should be based on its having a trading volume high enough to affect regulated markets or become a trading benchmark and either influence other markets and contracts through a linkage or be materially referenced by others in interstate commerce "on a frequent and recurring basis."

ICE Chairman Jeffrey C. Sprecher applauded the CFTC report. "The spirit of the recommendations is largely consistent with the views we have expressed in several testimonies this year. Such a solution recognizes and addresses the complexities of [over-the-counter] markets and preserves the significant economic and utility benefits of a properly functioning market," he said in an Oct. 24 statement.

ICE adopted daily position reporting in its primary OTC markets a year ago, Sprecher said. "The concept of position accountability and 'self-regulatory-like' authority would provide ICE with the ability to take action in its markets if necessary. We will continue to engage in a dialogue with regulators, the industry, and Congress and look forward to effectively resolving this long-standing matter," he said. ✦

Bush includes energy among Congress's 'unmet priorities'

Nick Snow
Washington Editor

Calling it "another priority that Congress has failed to meet," US President George W. Bush criticized federal lawmakers on Nov. 13 for failing to act on energy proposals he outlined in his State of the Union address on Jan. 23.

"When they were elected last November, majority leaders in Congress promised to pass an energy bill to reduce our dependence on oil. I consulted with members of both parties, and in my State of the Union address, I proposed a plan to reduce America's gasoline consumption by 20% over 10 years. I called this plan 20-in-10, and asked Congress to pass it by the beginning of the summer driving season," Bush said in a New Albany, Ind., speech.

"Now the summer driving season is over, the price of oil has jumped to nearly $100/bbl, and Congress has not acted. America clearly needs legislation that expands the use of ethanol and biodiesel, promotes energy conservation, [and] invests in advanced technologies like clean coal and nuclear power," he maintained. "Breaking our reliance on oil and gas is not going to happen overnight.

"Congress should also authorize environmentally responsible oil exploration offshore and in the Arctic National Wildlife Refuge. American consumers and businesses are looking to Washington for action on this issue," Bush continued. "And Congress needs to pass a bill that encourages the development of more energy and makes us less dependent on foreign sources of oil, and they need to do it now."

His criticism was part of a broader attack on congressional Democrats for not completing federal departments' annual operating budgets more quickly and increasing them beyond what the administration requested. "And they're not picky about how to raise taxes," he said. "To them, every bill on the floor is an opportunity for a tax hike. Congress has proposed tax increases in the farm bill, the energy bill, the small business bill, and the children's health bill. If you find a bill that doesn't have a tax increase, just wait a while—they'll put one in there," he said.

Noting that Bush compared Congress to "a teenager with a new credit card," US House Speaker Nancy Pelosi (D-Calif.) responded: "If President Bush applied for a credit card, any bank in America would turn him down as a bad credit risk. He has put more foreign debt on the nation's credit card than all previous presidents combined, saddling our children and grandchildren with $3.3 trillion in new debt.... Given his dismal record of maxing out America's credit card, the president is in no position to lecture Congress about fiscal responsibility or economic policy." ✦

US senators press Bush on deepwater royalties

Nick Snow
Washington Editor

Forty-three US senators, including five Republicans and one independent, asked US President George W. Bush what steps the administration will take to recover several billion dollars of apparently lost federal deepwater offshore royalties.

They sent the Nov. 8 letter following an Oct. 30 ruling by a federal district court in Louisiana that lessees on the US Outer Continental Shelf in the Gulf of Mexico do not need to pay royalties despite oil prices approaching $100/bbl.

The lawsuit, Kerr-McGee Oil & Gas Corp. vs. Allred, represents "an apparently successful attempt by the oil industry to overturn the requirement in law that they pay royalties when oil and gas prices are above certain threshold levels," the letter said.

The requirement was part of the 1995 Deepwater Royalty Relief Act, the letter continued. "Despite the clear intent of the law's chief sponsors, and the understanding they communicated to Congress that royalty-free production would not occur under the act when prices are high, the court has interpreted the law to require that oil and gas companies be given a set amount of royalty-free oil and gas without regard to price," it said.

The letter noted that the Government Accountability Office estimated last year that such a ruling could cost the US Treasury $60 billion in revenue. "That was when oil prices were about $60/bbl. At today's prices, the potential revenue loss could be even greater," it said. More than $1 billion of royalties which have been paid already would have to be refunded, it added.

"We must contemplate the real possibility that the 1995 act will be implemented in a way Congress never intended and in a way that would shock the sensibilities of most Americans," the letter said. It suggested that giving billions of dollars to producers when consumers are paying dramatically more for oil and gas "is not an acceptable outcome."

Senators signing the letter included Majority Leader Harry M. Reid (D-Nev.), Energy and Natural Resources Committee Chairman Jeff Bingaman (D-NM), Finance Committee Chairman Max Baucus (D-Mont.), Environment and Public Works Committee Chairwoman Barbara Boxer (D-Calif.), Bernard Sanders (I-Vt.) and Republicans Norm Coleman (Minn.), Susan F. Collins (Me.), Charles E. Grassley (Iowa), Olympia Snowe (Me.), and John Thune (SD). ✦

WATCHING THE WORLD

Eric Watkins, Senior Correspondent

Chavez rebuked again

If you think we are the only ones who are concerned about the negative effects that Venezuelan President Hugo Chavez is having on the oil industry, think again. Even the French, who often champion eccentric leaders, are sniffing at his actions these days.

French President Nicolas Sarkozy actually invited Chavez for a visit last week, but ahead of his arrival Le Monde newspaper issued an editorial that could not have been mistaken for the red carpet treatment.

To be sure, Le Monde did welcome Chavez in his role as an intermediary in resolving a hostage crisis between the Colombian government and a force of guerrillas in the country.

It said the Venezuelan president's involvement is welcome because "hitherto nobody and no group of countries has succeeded in negotiating with the Revolutionary Armed Forces of Colombia (FARC), the hostage takers."

Negative effects on oil

Yet hardly had the French daily issued that praise than it turned to the negative aspect of Chavez's rule in Venezuela—especially the negatives for the oil industry there.

It said that Chavez's high level of activity on the international scene, from Latin America to the Middle East, and from Russia to France, is accompanied in Venezuela by a worrying trend towards an authoritarian regime. "Erratic management of the huge oil resources, swollen by prices approaching $100/bbl, is starting to damage the social programs that have earned the head of state solid popularity," the paper said.

More to the point, it said that, "The lack of investment in the oil industry explains why Caracas is struggling to achieve the quota set by OPEC, which has just held a summit in Riyadh. Venezuela is reduced to selling crude and importing practically everything the country needs."

Nor did the paper find any consolation in Chavez's political vision, saying his ties with Cuban leader Fidel Castro and Iranian President Mahmud Ahmadinezhad are "unlikely to dispel the uncertainties concerning the 21st century socialism championed by the Venezuelan president."

King Abdullah's rebuke

Speaking of Castro, the Cuban leader was one of the few on earth who had any praise for Chavez's performance at the recent summit of the Organization of Petroleum Exporting Countries in Riyadh.

In an editorial of his own, Castro insisted that "Chavez said it very clearly in Riyadh" by proposing that "OPEC...assume the tasks the International Monetary Fund was created for, but never fulfilled."

Fortunately, saner voices in OPEC prevailed, especially that of the meeting's host, King Abdullah of Saudi Arabia. Indeed, exactly a week after Chavez was told to "shut up" by the King of Spain, King Abdullah ignored the Venezuelan leader's populist plea and deftly substituted his own: "Those who want OPEC to take advantage of its position are forgetting that OPEC has always acted moderately and wisely."

Moderation and wisdom, regrettably, are not words that ever seem to appear in a speech by Hugo Chavez. ✦

Ecuador resumes membership in OPEC

Eric Watkins
Senior Correspondent

Ecuador has resumed its membership in the Organization of Petroleum Exporting Countries, which it left in 1992, with the arrival of President Rafael Correa at a summit of the group's leaders in Saudi Arabia.

Ecuador's membership in OPEC was welcomed by Venezuela's President Hugo Chavez, who had earlier championed its return. According to Ecuadorian officials, their country's bid was backed by Venezuela, which offered to help pay the $4.7 million in outstanding dues (OGJ Online, Oct. 19, 2007).

In his opening speech at the OPEC summit, Chavez also referred to "the 13 member countries of OPEC," indicating that the previously 12-member cartel had welcomed in Ecuador as its new member.

Ecuador's president Rafael Correa wasted little time in supporting the Venezuelan leader at the summit in Riyadh, backing Chavez's calls to increase OPEC's political influence on the global stage.

At a press conference, Correa said he agreed "completely" with Chavez's position, which the Venezuelan leader outlined in a speech at the summit's opening dinner.

In his speech, Chavez said that OPEC must "change and become a much stronger player in the geopolitical and geoeconomic domains" and that "in the years ahead OPEC should set itself up as an active political agent."

In his remarks, Correas said: "OPEC must take political action because we are (making) public policy—and public policy is political." Correa also called on consuming nations to do more to "compensate" OPEC nations for the environmental and other costs of producing oil.

Ecuador is the fifth largest oil producer in South America, with output of 530,000 b/d or less. In September, Ecuador produced 517,000 b/d—less than any other member of the organization. ✦

Frontera Resources opening play in northern Kura basin, Georgia

Steve C. Nicandros
Reggie Spiller
Frontera Resources Corp.
Houston

Oil and gas industry interest in searching for additional production potential throughout the Black Sea region has been on the increase for several years.

Bringing new production supplies on line in this area presents attractive economics to exploration and production companies due to close proximity to consumption markets and could be a boon to those countries in the immediate area that currently must import a sizable quantity of their energy supply—especially natural gas—from Russia and beyond.

Recognizing the productive potential of the geology and the need for "homegrown" energy supplies in the area, Frontera Resources entered this region a decade ago to make the most of opportunities in what we refer to as the Greater Black Sea Region (Fig. 1).

Currently, we are actively pursuing what we have determined to be significant drilling opportunities in the oil-rich Kura basin, specifically in eastern Georgia where Frontera holds a 100% working interest in a 5,060 sq km license area known as Block 12, which it acquired in 1997 (Fig. 2).

Cretaceous play

Block 12 contains seven known, undeveloped oil fields along with numerous additional prospects for exploration and exploitation drilling.

As a result of extensive geological and geophysical evaluation efforts using a mix of traditional and newer, more sophisticated technologies, including AVO analysis, Frontera has identified two major geological plays within Block 12: the Tertiary Clastics Play and the Cretaceous Carbonate Play.

The focus on the Cretaceous play is relatively new in the upper Kura basin and represents an exciting new opportunity for exploration.

The Kura basin is a prolific hydrocarbon producing basin, spanning more than 400 km from the South Caspian Sea and Azerbaijan into central Georgia. The Kura basin, which actually is the onshore extension of the South Caspian basin, has been explored since the late 1800s, with the primary reservoir targets being the Pliocene and Miocene-age intervals of the Tertiary system.

The reservoir rocks typically are fluvial clastics sourced from the surrounding Lesser and Greater Caucasus Mountains. They have been such prolific producers in the basin that they are commonly referred to as the "productive series."

Much of the early drilling in the basin was based

Greater Caucasus Mountains provide backdrop as a rig drills the Lloyd-1 wildcat on Frontera Resources Corp.'s Basin Edge "C" Prospect on Block 12 in the Georgia Republic.

on the presence of oil seeps and mud volcanoes at the surface. This old-time "technology" led to an extensive search for hydrocarbons that ultimately resulted in the drilling of hundreds of exploration wells throughout this onshore basin, leading to the discovery of more than 40 oil fields, five of which have recoverable reserves potential of more than 500 million bbl each. One sizable field that offsets Block 12 has produced 250 million bbl.

Geochemical analyses indicate the Oligocene-Miocene age Maykop shale interval to be the primary source rock for the hydrocarbon deposits, with thickness of the interval in the region sometimes greater than 2,000 m and total organic carbon as high as 11%.

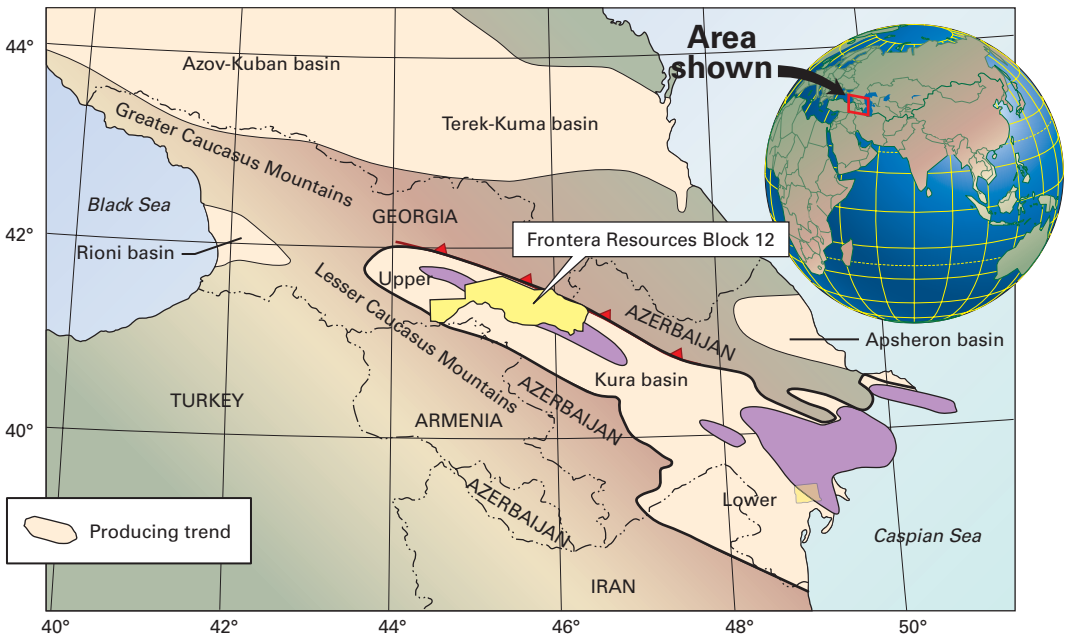
Because the Tertiary reservoirs have traditionally been excellent objectives, operators have basically ignored the potential for production from the older Mesozoic-era Jurassic and Cretaceous systems, where the rocks are believed to be predominantly fractured carbonates.

Nevertheless, speculation about the potential of these older rocks has been rife among some explorationists, and the application of 2D, 3D and associated processing technology has enabled companies such as Frontera to identify and focus on a new play to evaluate and explore these horizons within the upper Kura basin.

Even though the Kura basin is relatively narrow and quite deep--it is possible to still be in Miocene rocks at depths of 6,000-7,000 m in the central part of the basin--the new target Mesozoic interval can occur at much shallower depths below thrust sheets as-

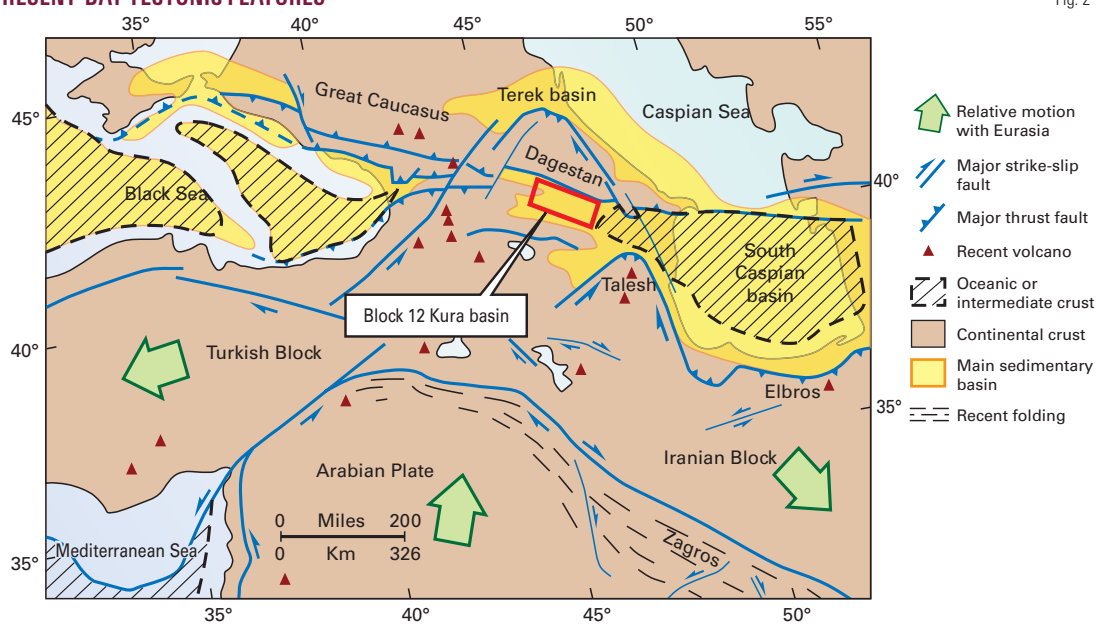
KURA BASIN LOCATION IN THE CAUCASUS

Fig. 1



PRESENT-DAY TECTONIC FEATURES

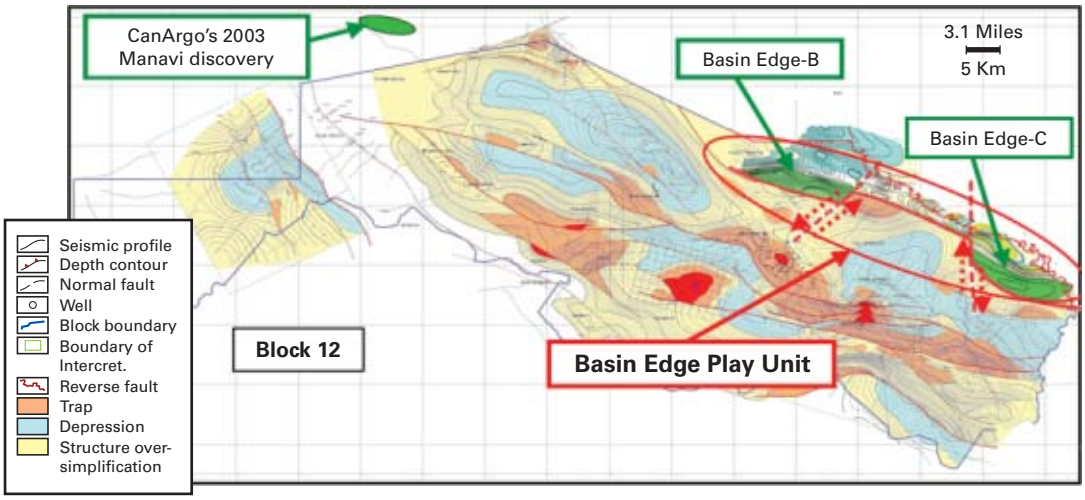
Fig. 2



Source: After Phillip et al., 1989.

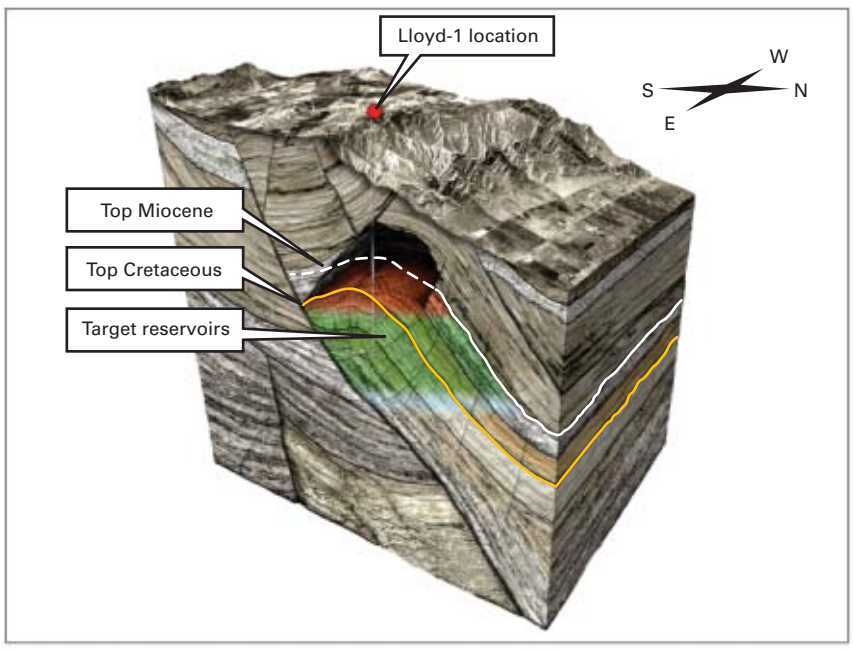
CRETACEOUS CARBONATE PLAY: BASIN EDGE PLAY UNIT

Fig. 3



BASIN EDGE "C" PROSPECT

Fig. 4



sociated with the Pliocene inversion of the Greater Caucasus Mountains.

Frontera has been able to use newly-acquired seismic data to see and evaluate the Cretaceous and Jurassic rocks along the uplifted northern rim of the Kura basin, where they can be drilled between 2,000 and 3,000 m deep. We are also able to image these objectives on the flanks of the Tertiary basin above and below thrust sheets at 4,000 to 5,000 m in depth.

A recent example of important exploration success that contributed to our confidence to pursue the technical evolution of the Mesozoic play occurred in 2003 when CanArgo Energy drilled the Manavi-11 well, based on 2D seismic and shallow well control, to a depth of about 4,500 m. The result was that, for the first time in the upper Kura basin, an important oil discovery was made in the Cretaceous carbonates sitting beneath multiple thrust sheets.

The Manavi-11 well successfully tested a feature seen on seismic that structurally juxtaposed the carbonate reservoir intervals against the Maykop source rock. This discovery was significant in that it established the presence of hydrocarbons in the Cretaceous section, thereby opening the door to further exploration of this interval in other locations within the basin.

Carbonate prospects

About 60 miles east from CanArgo's Manavi prospect, along the same structural trend but at a much shallower depth, Frontera has identified two Cretaceous carbonate drilling prospects in the upper Kura basin at our Basin Edge Play Unit on the northern border of Block 12 (Fig. 3).

The Basin Edge "B" and "C" prospects are estimated to harbor a combined total resource potential of more than 1 billion bbl of unrisked recoverable oil in the primary Cretaceous objective along with secondary targets in Jurassic, Miocene, and Pliocene rocks. This Cretaceous carbonate play represents one of the newest and potentially most prolific exploration plays in the upper Kura basin.

Frontera spudded the Lloyd-1 well on September 17, 2007 on the "C" prospect, a large surface anticline, which is estimated by Netherland, Sewell & Associates to contain unrisked resource potential in excess of 500 million bbl of recoverable oil (Fig. 4).

The well is expected to reach TD of 2,700 m in early December and has the potential to be very significant in that it would extend the play into an area of the basin where Cretaceous reservoirs

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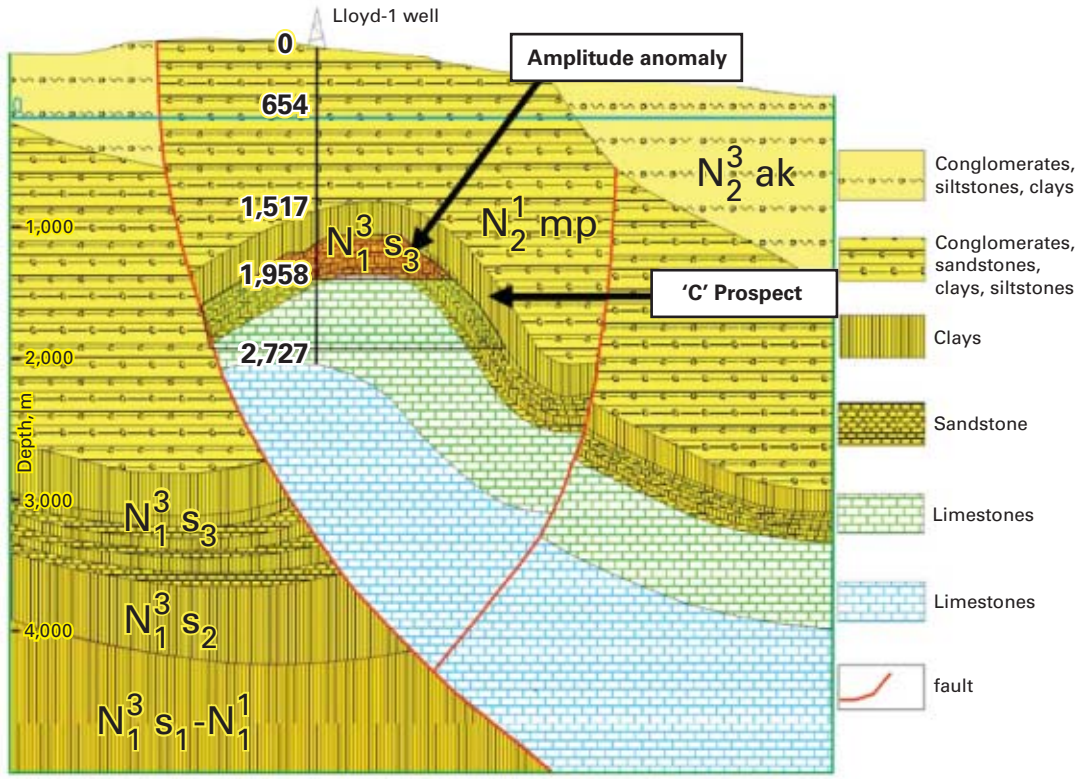
SUBSURFACE AT LLOYD-1 WELL LOCATION

Fig. 5



have never before been tested.

The structural closure at the "C" prospect as interpreted on seismic is located on the hanging wall of a large thrust sheet that sits on the north flank of a deep Tertiary basin (Fig. 5). This basin, which is known as the Didi Shiraki syncline, has three discovered fields located on its south side that produce oil from the "productive series" at depths between 800 and 1,500 m. The oil geochemistry from these fields has been tied to the Maykop source rock.

What is unique about the "C" prospect is that this feature is an anticlinal closure that harbors the potential for two objective levels—the typical clastic productive Tertiary section and the older Cretaceous carbonates—making this one of the few places in the basin where both Miocene and Cretaceous rocks can be drilled in the same structure.

In order to adequately evaluate the "B" and "C" prospects, Frontera has relied heavily on seismic data for both, having commissioned several hundred kilometers of 2D seismic over the Basin Edge "B" and "C" closures, as well as a new 80 sq km, high resolution 3D survey over the "C" prospect itself. Processing and interpretation of the 3D survey revealed the "C" prospect to be a large independent four-way structural closure of 55 sq km.

Once we processed the seismic and acquired a clear view of the "C" prospect, we could see that the structure is about 20% larger than anticipated. The 1,000 m-high structure actually spills beyond the boundaries of the 3D survey, prompting Frontera to plan for additional geophysical acquisition in the future.

Using AVO technology, we also see an amplitude anomaly in the Tertiary section, appearing as a bright event in what we believe to be a clastic section. The top of the amplitude is about 1,600 m deep and follows structural contours. The Lloyd-1 well will drill directly through this event and into what we anticipate to be the Cretaceous section, where we do not expect to see similar amplitudes.

Given the nature and size of the structure, we anticipate the Lloyd-1 to be only the first of multiple wells needed to better understand the feature and, ideally, prove it out. A second drilling location has already been selected.

The Basin Edge "B" prospect is a similar feature located to the northwest along trend. It was initially seen from an early regional 2D seismic survey that extended north from the center of the Kura basin and over the prospect along the northern flank of the basin.

The survey revealed fault closure at a structural crest. However, a thick, out-of-place limestone layer sitting above the prospect created static and velocity problems, preventing us from seeing the extent of structure prior to new 2D acquisition. The "B" prospect is a combination Tertiary-Cretaceous closure with a structural high point at 2,000 m below the surface. The prospect occurs 500 m updip of a Soviet-era well that drilled into both the Cretaceous and Jurassic sections and reportedly had hydrocarbon shows.

The presence of natural gas in many of the old shallow water wells in and around the "B" and "C" prospects provides an additional clue that hydrocarbons are located nearby. Water comes to the surface on natural gas lift from these wells and, in some cases, the local population uses the gas for cooking and

other purposes. The isotope analyses of the produced gas suggest a thermogenic source.

Frontera's Block 12 license area is equivalent in size to 225 blocks in the Gulf of Mexico or nearly one quadrant in the UK North Sea. The size of the license area has encouraged new, regionally-focused thinking in our technical work programs, leading to the identification of new plays.

The Cretaceous Carbonate Play represents a whole new opportunity in this license, where Frontera is pursuing a variety of different geologic objectives within its extensive portfolio of undeveloped fields and new prospects inventory.

Seismic acquisition on the Basin Edge "C" Prospect in the upper Kura basin in 2005-06 on Block 12 in the Georgia Republic. Photo courtesy of Frontera Resources.

Stability improving

During these times many countries are increasingly declaring their resources off-limits to outside interests. It bears mentioning that year to year Georgia has become an increasingly stable country, both economically and politically, and one that welcomes investments to develop its energy resources.

The production sharing agreement associated with Block 12 is a prime example of a fiscal regime that encourages the exploration process and the array of extensive work we continue to engage in throughout the license.

In general, we believe Georgia has become an attractive environment for economic development. Its stable, market-oriented economy is strengthened by a highly educated, motivated work force, and foreign investment is not just welcomed but encouraged. Infrastructure, banking, and legal systems have made great strides in approaching international standards, underpinned by a successful effort to eliminate the vestiges of corruption from the past.

Georgia's achievements have resulted in the World Bank recently citing the country as the world's top reformer for 2 years in a row.

According to information released by the government, Georgia expects to hold annual inflation at about 8% in 2007 and projects a record 12% rate of economic growth. Net private capital inflows reached about $1 billion in 2006 and are estimated to grow to over $2 billion this year.

Frontera itself has invested more than $100 million to date in Georgia's oil and gas exploration sector, and our investment plans remain very aggressive for the foreseeable future because of our confidence in the continually evolving environment and the considerable

The authors

Steve Nicandros is president and chief executive officer of Frontera Resources Corp. He has been president and a director of the company since it was founded in 1996. He became chief executive officer in 1997 and chairman in 2002. In 1994-96 he was president of Conoco Overseas Oil Co. responsible for Conoco's worldwide development of upstream new business and mergers and acquisitions. He began his career in the oil industry in 1982 with Conoco Inc. He has a BS in political science from Southern Methodist University.

Reginal Spiller is executive vice-president, exploration and production with Frontera Resources. He has been a senior executive of the company since May 1996 where he has been responsible for Frontera's exploration and production activities. In 1993-96 he was deputy assistant secretary for gas and petroleum technologies at the US Department of Energy. For five years prior that he was international exploration manager for Maxus Energy Corp., which held properties in Bolivia, Bulgaria, Czechoslovakia, and Indonesia. He has MS and BASS degrees in geology from Penn State University and State University of New York, respectively.

potential that our historical investments have identified.

With drilling operations currently in progress, it is noteworthy that Frontera's substantial progress in highlighting and evolving the new Cretaceous Carbonate Play during its 10-year effort in Georgia has been based on the methodology of using a best practices approach to grass roots exploration.

Old-fashioned yet essential basic field work had a prominent role in the mix of applications, including basin modeling, gravity surveys, and soil geochemistry surveys, which have been integrated with new 2D and 3D seismic data. The use of AVO technology has shown us for the first time that we have anomalies that could be hydrocarbon indicators in the basin. Once confirmed, this could open up a whole new way of exploring in the upper Kura basin.

Perhaps the most striking aspect of the array of advanced technical tools now available to the industry is that they position independent E&P companies such as Frontera to methodically uncover new plays and explore with the depth of a major. ✦

Large two-part block granted in southern Belize

Providence Energy Belize Ltd., Houston, has acquired exploration and production rights to 531 sq miles in and off southern Belize.

The award consists of a mostly offshore block in the Gulf of Honduras from Punta Gorda to New Haven and another block over and southeast of Glover Reef off Dangriga. The agreement provides for 8 years for exploration and 25 years per discovered oil field.

Nearly all of the 57 wells drilled in Belize had oil shows or are producing oil, "indicating the source rock is exceptional," said Scott Bayless, chief executive officer of Providence Energy Group.

Kyou Kim, Providence's senior geologist, noted that part of Mexico's western coast is a subduction zone where the organic-rich sedimentary Pacific basin is folding underneath the Mexican continental shelf at 5-15 cm/year.

Bayless said the lands covered by the agreement "are strategically positioned in southern Belize where we believe a major oil migration path extends from Southern Mexico and the subduction zone, through Guatemala, into Belize."

Belize began producing oil in 2006 when Belize Natural Energy Ltd. and CHX LLC, private Denver independents, found 38° gravity sweet crude near Spanish Lookout in the northern part of the country about 55 miles west-southwest of Belize City (OGJ Online, Feb. 24, 2006).

R. Ramanathan, consultant to the Belize government, said in March 2006 that he believes the next discoveries in Belize will be made in the "southern offshore basin, where it is continuous with the field of Guatemala…and also the southern basin on land near Crique Sarco, Monkey River, and the Punta Gorda Belt…and more in the southern offshore basin including Glover's Reef." Providence's lands encompass these areas. The lands contain oil seeps, gas seeps, tar balls, and oil slicks, Bayless said. They lie about 300 miles southeast of Mexico's giant Cantarell fields in the Bay of Campeche. ✦

EnCana ends Columbia River exploration

EnCana Corp., Calgary, said it concluded its Columbia River basin exploration program in south-central Washington without establishing commercial gas flow rates.

Any future activities on EnCana's acreage position will likely be funded by third-party capital under farm-out or similar arrangements, the company said in late October. EnCana, with no immediate plans for further drilling, added that the basin, which has only been partially tested, has potential for large gas accumulations.

EnCana drilled three wells, Anderville Farms Inc.-1 and Brown 7-24 in Grant County, and Anderson 11-5 in Yakima County, under an agreement with Shell's SWEPI LP unit. Exxel Energy Corp., Houston, assumed operations and ownership of the Brown well in late September and was to attempt completion but has not announced the outcome (OGJ Online, Oct. 10, 2007). ✦

New Brunswick

PetroWorth Resources Inc., Calgary, spud the Feenan-2 well in Albert County, NB, about 1 km west of Stoney Creek oil and gas field.

It is projected to 1,600 m to evaluate the Hiram Brook, Frederick Brook, and Dawson Settlement formations. Gas potential in the Hiram Brook sands at 540-670 m is the primary objective.

Nicaragua

Norwood Resources Ltd., Vancouver, BC, purchased three drilling rigs, 17,000 ft of drill pipe, and all associated yard equipment from Hoco Drilling LLC, a private Oklahoma drilling contractor.

The rigs are to be modified and shipped to Norwood's Oklanicsa block in the Sandino basin in northwestern Nicaragua (OGJ Online, Sept. 28, 2007).

One rig has a depth capacity of 11,000 ft, and the other two are rated to 6,500-7,000 ft. One of the smaller rigs will be made capable of drilling or workover use.

DRILLING MARKET FOCUS

Operators build-to-own in tight DW rig market

Nina M. Rach
Drilling Editor

Operators are building their own deepwater rigs to ensure availability for their drilling commitments.

Flush with capital, international oil companies are looking for core business investments to augment their stock buy-back programs. National oil companies are also profiting handsomely from rising crude prices and have ambitious program goals at home and abroad. Faced with a tight market for deepwater rigs and ever-increasing day rates, IOCs and NOCs are opting to build their own.

Project demand

The Tenth Biennial Simmons & Co. International Offshore Europe Energy Conference, held in Gleneagles, Scotland, in September, featured six energy industry panel discussions; four touched on the rig market.[1]

Growth in Latin America was described as "explosively strong" in the international oil service panel, with an "extraordinary revival" in Mexico's drilling activity, following 2 years of "stagnation."

The panel estimated that Petroleos Mexicanos E&P's onshore Chicontepec initiative would require 15,000 new wells to generate a production output of 1 million bo/d. In August, Pemex granted a 4-year contract to ICA Fluor, jointly owned by Fluor Corp. and Empresas ICA, to manage engineering, procurement, and construction of surface facilities at Chicontepec (OGJ Online, Aug. 14, 2007). Schlumberger has already signed a 4-year contract to oversee drilling and oil services for 500 new wells in Chicontepec II.

Bids for Chicontepec III, another 500-well project, were due in October.

Brazil's 5-year E&P budget increased 30-35%, based on recent revisions by Petrobras.

Saudi Arabia's offshore Manifa heavy oil project will require about 40 offshore rigs capable of horizontal and extended reach drilling, the panelists noted. Saudi Aramco expects the Persian Gulf field to produce 900,000 b/d of Arabian Heavy crude and 120 MMscfd of gas by 2011 (OGJ Online, Feb. 8, 2007).

The company let a front-end engineering and design (FEED) and Manifa project management services contract to two units of Foster Wheeler Ltd. (OGJ, Nov. 6, 2006, p. 8); signed a contract with Belgium dredging contractor Jan De Nul for work at Manifa (OGJ Online, Feb. 8, 2007); and let a lump-sum turnkey contract to J. Ray McDermott Inc. to design, procure, fabricate, transport, install, and connect offshore platforms for Manifa (OGJ, June 11, 2007, p. 9).

India offers a "very big exploration market" and the panel described it as "ramping [up] very hard."

Newbuilds

As of mid-November, there were 43 semisubmersibles and 24 drillships under construction, including 5 new ship orders since September (OGJ, Sept. 24, 2007, p. 41).

Representatives from Cameron International, FMC Technologies Inc., Grant Prideco Inc., and National Oilwell Varco Inc. formed the Capital Equipment panel at the September Simmons conference. They noted 83 jack ups under construction with newbuild costs for a conventional high-end jack up running about $220 million, up from $150 million in 2004.

Additionally, the panelists said 73 deepwater rigs were under construction or being upgraded, with newbuild costs for a high-end semisubmersible running $600-650 million, up from $300-400 million in 2004. High-end drillships are being built for

The compact "bully" rig drillship was designed by GustoMSC, which customized its PRD 12,000 design for Frontier Drilling ASA and Shell Offshore Ventures (Fig. 1; image from GustoMSC).

$650-700 million, with the recent GlobalSantaFe drillship estimated at $740 million (OGJ, Sept. 24, 2007, p. 41), up from $450 million in 2004. Shipyard space is limited, with 2010 delivery slots nearly gone.

The chairman of Awilco Offshore ASA, Sigurd Thorvildsen, and the chief financial officer of Seadrill Ltd., Trond Brandsrud, anchored the Simmons panel of Norwegian Offshore Drillers. Their outlook on day rates and long-term contract opportunities was essentially the same as that of the US offshore contract drillers. The Norwegians said there were good possibilities for long-term (3-5 year) contracts at $500,000/day or higher. Brandsrud said the all-in leading edge costs for a new semisub were $600-650 million, and $650-700 million for a drillship, less than GlobalSantaFe's leading edge estimates of $750-800 million for a sixth-generation semisub.

The Norwegian drillers thought operating expenses in the drilling industry would continue to increase about 10%/year, although Simmons & Co. models predict 15% annual inflation for 2007-10. Deepwater rig commissioning will be the "biggest execution hurdle" faced by the owners of new rigs.

IOC'S OFFSHORE DRILLING FLEETS*

Table 1

Company, regions	Inland barges	Platform rigs	Floaters	Total rigs
Anadarko, Gulf of Mexico	—	2	—	2
Conoco, Gulf of Mexico	—	1	—	1
ConocoPhillips, North Sea	—	7	—	7
Devon Energy, Brazil	—	1	—	1
Exxon Neftgaz, Russia	1	—	—	1
ExxonMobil, US	—	1	—	1
Forest Oil, Alaska	—	2	—	2
Royal Dutch/Shell, N. America	—	—	2	2
Shell Nigeria, Nigeria	5	—	—	5
Unocal, US	—	10	—	10
Total	**6**	**24**	**2**	**32**

*Including rigs under construction; data from Rigzone, operator reports, Oct. 30, 2007.

IOC fleets

IOCs own only a handful of inland barges, platform rigs, and floaters, and no jack ups. The 32 rigs represent only 3% of the worldwide fleet of 1,089 offshore drilling rigs (Table 1). Many other rigs are on long-term contract to IOCs but out of their direct control. There seems to be a slowly growing trend among IOCs to put capital into newbuilds. This is a financial step up from their capital investments in substantial upgrades of floaters locked into long-term contracts.

With a great number of new jack ups coming into the competitive contract market, operators recognize they are better off investing in semisubs and ships—in shorter supply—that can be used in deepwater drilling programs.

In October, Shell EP Offshore

NOC's OFFSHORE DRILLING FLEETS*

Table 2

Company	Drilling barges	Platform rigs	Jack ups	Floaters	Total rigs
Abu Dhabi National Oil Co., ADNOC (National Drilling Co., NDC)	–	–	11	–	11
Chernomornef (Chernomorneftegaz), Ukraine, Black Sea	–	8	2	–	10
CNOOC (China Oilfield Services Ltd.)	–	–	15	4	19
Egyptian General Petroleum Corp., EGPC (Egyptian Drilling Co., EDC)	–	2	5	–	7
Empresa Nacional del Petroleo (ENAP)	–	1	–	–	1
Gazflot	–	–	2	–	2
Gazprom	–	–	1	3	4
Korea National Oil Corp. (KNOC)	–	–	–	1	1
National Iranian Oil Co., NIOC (National Iranian Drilling Co.; NIDC)	–	–	7	–	7
Oil and Natural Gas Corp. (ONGC)	–	–	8	2	10
Petroleos de Venezuela (PDVSA)	22	–	2+2 tenders	–	26
Petróleos Mexicanos (Pemex)	–	16	1	–	17
Petroleo Brasileiro SA (Petrobras)	–	6	6	4	16
Saudi Aramco					
State Oil Co. of the Azerbaijani Republic (SOCAR), Caspian Sea	–	8	6	3	17
Total, NOC fleets	**22**	**40**	**68**	**17**	**147**
NOC ownership, %	**46**	**16**	**13**	**6**	**13**
Total, world offshore fleets	**48**	**253**	**486 jack ups 30 tenders**	**210 semisubs 62 drillships**	**1,089**

*Including rigs under construction; data from Rigzone and operator reports, Oct. 30, 2007.

Ventures Ltd. and Frontier Drillships Ltd. signed a joint-venture agreement to build a new drillship for deepwater and arctic work (Fig. 1). The "Bully 1" rig is a customized version of GustoMSC's pressure-riser drilling PRD 12,000 MPT-DP design drillship. The ship will have an ice-class hull and a Huisman-Itrec multipurpose tower (MPT) drilling system. The MPT is a box-like structure, instead of a lattice-derrick, containing two sets of drawworks for dual-activity work.[2]

(A month before the Shell and Frontier contract, GustoMSC announced that GlobalSantaFe Corp. selected the P10,000 drillship design, with dual lattice-type derricks, to be built by Hyundai Heavy Industries in Korea.)

The new "Bully" ship will be able to drill in 12,000 ft water with a surface BOP and 14-in. diameter, high-pressure marine riser or drill in water as deep as 7,500 ft with a traditional subsurface BOP and a 21-in. diameter, low-pressure riser (see rig spec box on p. 42). The hull length, at 188 m, is slightly longer than the 166 m of the original

PRD 12,000 design.[2]

Shell E&P Executive Vice-Pres. Matthias Bichsel said the company needs drillships in the short to medium term for its drilling programs, and the Bully rig will meet requirements "at a lower cost and with improved environmental performance."

GustoMSC designed modifications to the new drillship with assistance from Frontier Drilling and Shell. The compact design requires less steel and will operate with lower emissions due to reduced fuel use from efficient engines.

Frontier will operate the ship, which has yet to be named, after its delivery from Singapore in early 2010. It will initially work under a 5-year contract for Shell beginning in the Gulf of Mexico. Shell expects to be able to deploy it rapidly to other projects in Brazil, Nigeria, Northwest Europe, and the Far East. Bichsel said control over deployment "brings tremendous advantages for managing... drilling prospects and their sequencing."

Shell International E&P's Peter J. Sharpe, vice-president technical for wells, told OGJ that it was time for an innovative rig concept, rather than assuming that bigger is better. The "bully" rig name was coined by Shell's Mike Humphries. Sharpe said the rig's strong points are the low center of gravity, better use of space, and anticipated environmental performance, along with a "great power-to-weight ratio."

Sharpe said the new ship design, use of surface BOPs and expandable tubulars, and seabed pumping will allow Shell to exploit many different opportunities worldwide.

'Bully' rig drillship specifications

Hull length	188 m (617 ft)
Hull breadth, molded	32 m
Design draft	10 m
Transit speed	12 knots
Accommodation	150 persons
Multipurpose drilling tower:	
Static hook load	1,088 tonnes
Riser tension load	908 tonnes
Setback	957 tonnes
Drilling depth capability	40,000 ft
Power:	
Two sets of three 5,100-kw diesel generator sets	
One 400-kw emergency generator	
Total installed power, 31 Mw	
With surface BOP:	
Water depth capability	12,000 ft
High-pressure marine riser	14-in. diameter
With subsurface BOP:	
Water depth capability	7,500 ft
Low-pressure marine riser	21-in. diameter

NOC fleets

National oil companies own 16% of the world's offshore rigs, including 22 drilling barges, 40 platform rigs, 68 jack ups, and 17 floaters (Table 2). In addition to the 147 rigs they own directly, they may indirectly control others through long-term contracts.

Many NOCs are building additional land and marine rigs, and their fleets will remain more heavily capitalized than the tiny IOC fleets for the foreseeable future.

CNOOC, Gazprom, and the National Iranian Oil Co. have semisubmersibles under construction. Three of these semisubs were announced after OGJ's recent tabulation of offshore rig construction projects (OGJ, Sept. 24, 2007, p. 41). After years of delays, OAO Gazprom is building two Arctic semisubs. NOV recently signed a letter of intent to provide drilling equipment for about $250 million/rig.[1]

China National Offshore Oil Corp. (CNOOC) is building its first deepwater rig, a Friede & Goldman design that will be delivered in 2011. The $599 million semisub project is part of $2 billion plans to invest in deepwater exploration and development equipment.

According to China Daily, more than 200,000 sq km of the country's coastal waters are deeper than 300 m. The semisubmersible is under construction at Shanghai Waigaoqiao Shipbuilding Co., a subsidiary of the China State Shipbuilding Corp.[3]

Petrobras Netherlands BV (PNBV), a full subsidiary of Petrobras, has two dynamically positioned drillships under construction in Korea, to be delivered in 2009 and 2010.

SCORE

GlobalSantaFe Corp.'s Summary of Offshore Rig Economics increased 2.4% worldwide to 139 in September, up from 135.8 in August. The SCORE compares the profitability of current mobile offshore drilling rig day rates to the profitability of day rates at the 1980-81 drilling peak, when SCORE averaged 100. The 2.4%/month increase was driven by a 5.3% increase in jack up profitability; semisub activity was flat month-over-month. Worldwide SCORE is up 8.5% from a year earlier.

Regionally, the SCORE increased substantially in Southeast Asia (9.8%) and in the Gulf of Mexico (3.4%) from the previous month but increased only 0.2% in West Africa and decreased 0.5% in North Sea. Southeast Asia has also shown the highest year-over-year increase, up 41% from September 2006. ✦

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1. "Simmons & Co. International Tenth Biennial Offshore Europe Conference 2007," Energy Industry Research Report, Sept. 17, 2007, 15 pp.

2. Hendricks, Sjoerd, Westhuis, Jaap-Harm, and Ooijen, Martijn "GustoMSC drill ship designs increasing efficiency in deepwater operations," presented at 2007 Deep Offshore Technology Conf., Stavanger, Oct. 10-12, 2007.

3. "CNOOC building deepsea drilling rig," Oct. 23, 2007, www.MarineLink.com.

Method aids execution, improves subsea equipment reliability

C.S. Horan
M.G. Starkey
D.C. Lucas
S.A. Wheeler
ExxonMobil Development Co.
Houston

Consistent practical methods for defining equipment qualification and testing requirements can improve subsea equipment reliability and facilitate project execution.

ExxonMobil Development Co. (EMDC) has developed a systematic, structured approach to equipment qualification that uses failure-mode assessment (FMA) templates and product qualification sheets (PQS). The approach is based on existing industry methods that support equipment design reviews and provide for uniform information display.

To develop this subsea qualification process, the company identified and developed several principles based on lessons from recent deepwater projects, vendor input, and a review of previous standardization initiatives. By adopting this standard equipment qualification format, others in the deepwater industry can benefit by more efficiently managing operator and vendor interfaces, consistently highlighting critical design features, and taking advantage of previous component qualification programs.

This process also can facilitate execution efficiencies, reduce delivery schedules, and capture lessons learned.

Deepwater equipment

Deepwater subsea developments typically contain highly engineered equipment and involve numerous subsuppliers. These developments are often an industry step-out into deeper water and include first-time applications in which operators may expect equipment to work flawlessly for 20 or more years.

Additionally, subsea is still a continually maturing area and deepwater subsea developments remain a frontier that exposes operators to high costs due to unforeseen technical issues. The industry has experienced several subsea equipment failures for which root-cause assessments have indicated that the designs were not fully qualified, proven designs were modified, or subcomponents substituted.

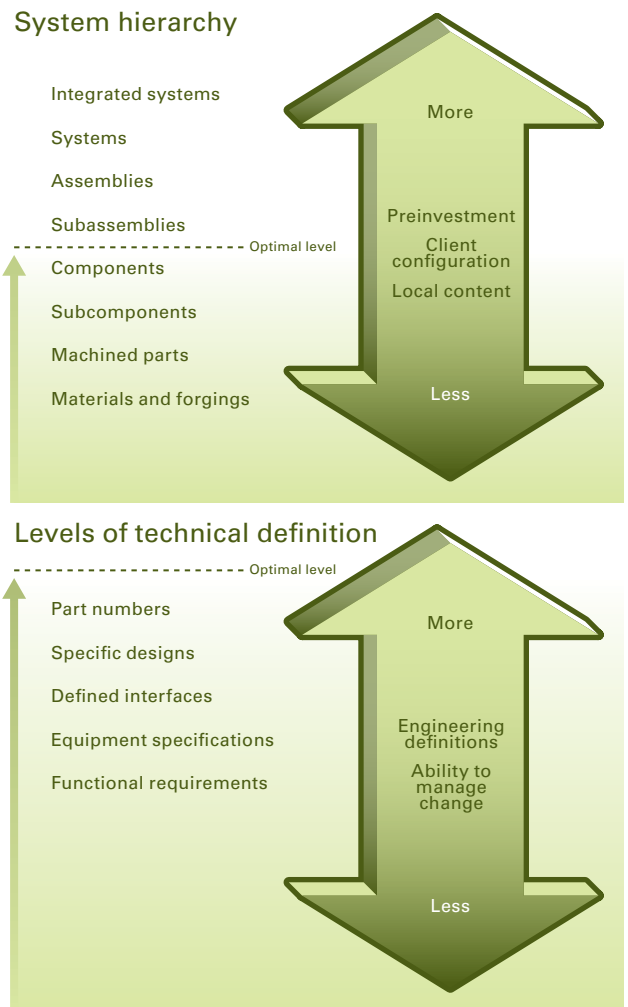
Qualification based upon specific project service conditions is critical, and equipment assessments relative to these service conditions are essential to each project. Without a consistent industry qualification approach, operators may interpret differently what it means to have qualified or field-proven equipment.

EMDC's subsea systems group is pursuing standard equipment qualification practices, tools, and documentation as a strategy for improving reliability in its future deepwater subsea projects.

Qualification complications

Because deepwater subsea developments are relatively new, companies seldom have well-defined qualification status of vendor equipment before awarding a contract and often address

QUALIFICATION APPROACH Fig. 1



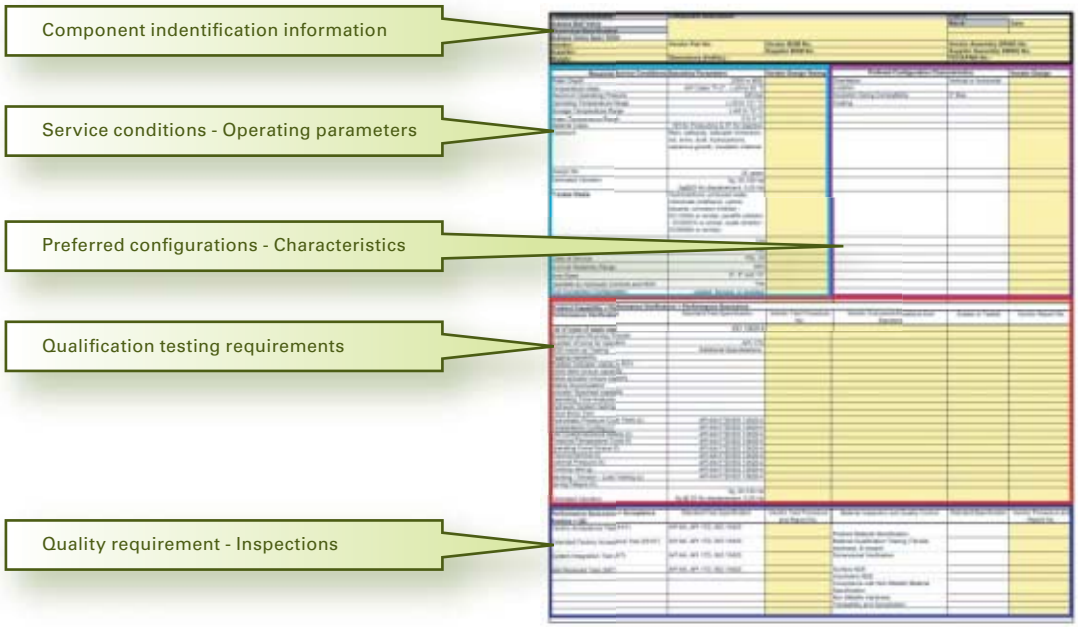
Note: Proactive qualification approach aims to optimize accountability in system hierarchy and levels of technical definitions.

this on a project-by-project basis. They frequently determine design nuances and additional required qualification after the award of the contract. Without a well-defined qualification testing program, equipment reliability can be compromised.

To ensure qualified equipment, companies need to document the qualification process and allow this documentation to be available for operator review and acceptance.

PQS ORGANIZATION STRUCTURE

Fig. 2



Qualification requirements for many subsea components, however, are not specifically governed by industry standards because the standards do not consistently cover qualification of subsea components. When this occurs, this gap is bridged with operator specifications and engineering judgment. Because these are operator specific, the challenge is to gain alignment across the deepwater subsea industry on acceptable qualification-testing standards and methods.

Technical lessons learned regarding equipment design and performance are difficult to institutionalize without a formal process directly linking design with qualification and quality requirements. Companies should capture what industry has learned to avoid repeat failures and transfer industry experience to next generation resources.

The qualification process should consistently focus on critical design features, be failure-mode based, and capture industry experience and lessons learned, including new failure mechanisms.

Companies should also link qualification of a design to quality assurance and control of the product. Critical features may need potentially tighter acceptance testing based on operator service conditions.

A successful qualification approach must also establish a better mechanism to document and communicate functional requirements and potential failure mechanisms with vendors and their growing supply chain, particularly second and third-tier suppliers who may unknowingly provide critical subcomponents for subsea service.

In heated market conditions, qualification processes should accommodate the realities of supply-chain management and provide features to incorporate new suppliers efficiently. Additionally, "operator tinkering" needs to be rationalized because this may result in misalignment with vendors' standard product lines, which may in turn lead to new qualification requirements and unforeseen risk due to manufacturing changes.

Qualification methods

Similar to industry job-safety analyses or hazard-identification programs, companies should actively pursue subsea equipment qualification and reliability. Rather than only focusing efforts on reactive numeric failure analysis, EMDC employs a qualification methodology objectively to evaluate the adequacy of the equipment qualification and quality programs.

EMDC believes its qualification approach can be optimized by applying the following strategies (Fig. 1):

- Focus the evaluation at the component level within the system hierarchy.
- Reference vendor part numbers to lock down technical definition and associated manufacturing-quality processes.

This method allows operators to identify and track—in terms of technical definition, qualification, and quality assurance—a set number of common components that can be optimized in various system configurations across a number of projects.

Management at the component level also minimizes the cost of prestocking strategies (for both the vendor and operator) as client configuration preferences remain relatively low at this level. Local-content directives also may

require assembling larger equipment packages in country. It also enables robust management of change and communication processes between the operator and vendor.

This approach has three key underlying processes that promote its success:

1. Breaking down components into primary "building-blocks."
2. Implementing generic failure-mode assessment (FMA.)
3. Implementing generic product qualification sheets (PQS).

Component-level breakdown is consistent with API categories. A comprehensive component-level breakdown can cater to wide flexibility for field-specific configurations. EMDC based the FMA approach on a simplified version of a failure-mode effects and criticality analysis, often used as a design tool within the industry. For example, this is recommended as a technology qualification tool in DNV-RP-A203.[1]

The FMA highlights component-specific failure mechanisms and critical design features. The PQS approach involves developing generic datasheets, similar to topsides-proven instrumentation, systems, and automation society (ISA) data sheet processes.

This part number-datasheet approach improves qualification because it supports a structured process that improves visibility of technical information and fits well with the vendors' internal tracking systems. This approach enables improved management of detailed design changes, as well as facilitates procurement, contracting, and tracking of lessons learned.

Additionally, this process is applicable readily to proven field-tested components, increasing efficiency of the qualification process and reducing the need continually to redefine qualified or field-proven equipment.

Component breakdown

Because the focus of EMDC's qualification approach is on the inherent value of the use of component-specific datasheets, an important first step of this process involves identifying components used in typical deepwater subsea development operations. Using API standards and experience, EMDC has identified 11 component categories and about 75 components based on functionality and classes of equipment.

The component categories include valves, hydraulic-chemical controls, electric controls, coatings, and insulation, while the components for valves include such types as ball, gate, and needle and for electric control of such equipment as flow meters and wet-mate connectors.

Once EMDC identifies and categorizes subsea components, the components are consistently documented in individual PQS.

Failure-mode assessment

The FMA process provides a system-

EXCERPT FROM FMA FOR THERMOPLASTIC HYDRAULIC FLYING LEAD (HFL) COMPONENTS

Table 1

ID No.	Item	Functional requirement	Failure mode	Failure mechanism	Keyword	Qualification method	Acceptance criteria
HFL-01-01-01-001	Head	Lock HFL to respective mating plate	Actuator is not strong enough to counteract internal pressure and no seal is achievable	Insufficient lock down-antirotation	Mating/interfacing	Conduct make and break tests under full pressure at head manufacturing facility	No pressure loss after makeup and no pressure loss after breakout
HFL-01-01-01-003	Head	Lock HFL to respective mating plate	Shear pin break	Excessive torque	Mating/Interfacing	Destructively test shear pins by over torqueing head	Measured breaking loads are within expectations
HFL-01-01-01-005	Head	Withstand initial loads	Head breaks	Tensile failure	Strength dynamic	Load test each load path	No visible deformation, no pressure loss during test, and no theoretical violation of yield stress plus safety factor
HFL-01-01-01-007	Couplers	Hold pressure	Seal failure causes leak to or from environment	Unprotected-exposed seal face	Impact	Systems integration tests to confirm that alignment keys and protective covers function adequately	No pressure loss after makeup and no pressure loss after breakout
HFL-01-01-01-015	Couplers	Withstand maximum flow rate	High fluid velocities erode coupler	Velocity	Erosion	Flow test couples with actual fluid	No visible deformation, or loss of pressure during pressure test
HFL-01-01-01-024	Hose	Hold pressure	Kevlar failure causes leak to or from environment	Degradation (fluid chemically reacts with kevlar and reduces kevlar strength	Material compatibility	Material evaluation and fluid compatibility test	Acceptable level for burst pressure
HFL-01-01-01-042	Hose bundle	Withstand initial loads	Bundle or hose breaks due to excessive tension	Tensile failure	Strength dynamic	Load test each load path	No visible deformation, no pressure loss during test, and no theoretical violation of yield stress plus safety factor
HFL-01-01-01-045	Final assembly	Hold pressure	Loss of pressure	Failure of pressure containing member	Strength static	Perform pressure test on final assembly	No pressure loss during pressure test
HFL-01-01-01-047	Final assembly	Withstand initial loads	Loss of pressure	Tensile failure (pressure containing member in load path fails from excessive load)	Unexpected load combination	Load test each load path under design pressure	No visible deformation, or pressure loss during test, and no theoretical violation of yield stress plus safety factor.

Note: The FMA identifies 51 potential failure mechanisms but narrows qualifianction time by identifying nine acceptance criteria.

atic way to identify component failure modes and mechanisms and the tests needed to qualify a component relative to its intended function.

EMDC derived the basis for the FMA templates from DNV RP-A203, which applies specifically to components and equipment for offshore developments. The templates' objective is to ensure systematically the technology functions reliably within specified limits. This aspect of the process is important particularly because it allows operators to identify failure risks and to test components and equipment before project execution.

The strength of the FMA process is that it allows operators to identify critical qualification tests and acceptance criteria that encompass testing of potential failure mechanisms. For example, EMDC completed an FMA on a thermoplastic hydraulic flying lead (HFL) component and identified 51 potential failure mechanisms (Table 1). A regrouping of the FMA data, however, identified only nine unique qualification tests for evaluating all potential failure mechanisms.

Narrowing the qualification into these nine tests optimizes the time spent on the testing and analysis of the HFL.

The FMA process allows for increased visibility of failure modes and acceptance criteria, which in turn allows for improved qualification testing as full life-cycle requirements are better understood.

Product qualification sheets

EMDC uses the PQS based on ISA-TR20.00.01.[2] Almost all oil and gas operators and vendors throughout the topsides industry use these ISA datasheets, originally published in 1956. ISA says the purpose of these standard forms is to:

- Assist in preparation of a complete specification by listing and providing principal descriptive attributes.
- Facilitate quoting, bid reviews, purchasing, receiving, inspection, design audit, accounting, and procurement by uniform display of information.
- Improve efficiency of activities from initial concept to final commissioning and any subsequent review and revisions.

Operators incorporate new datasheets based on industry need. The basis of the EMDC subsea systems process is to establish a similar standard that aligns the operators and vendors for deepwater development projects, with additional emphasis on the uniform display of qualification information.

Currently, EMDC has identified 75 generic component datasheets specific to deepwater subsea development. It will also generate a unique PQS for each vendor of that component.

The PQS (Fig. 2) helps achieve qualification, quality, and reliability objectives by providing a standardized way to present the following fives types of information:

1. Component identification information, including:
   - Type of component or assembly and description.
   - Vendors and subsuppliers.
   - Part and bill of material (BOM) numbers.
   - Drawing number.
   - Assembly procedure number.
2. Service conditions and operating parameters, including:
   - Water depth.
   - Operating pressures and temperatures.
   - Material class and requirements.
   - Design life.
3. Preferred configurations and characteristics, including:
   - Operational equipment selection.
   - Location and orientation of elements.
   - Preferred coatings.
   - Labeling and markings.
4. Qualification testing requirements, including:
   - Applicable industry standards and codes.
   - Acceptance requirements.
   - Performance verification information.
5. Quality requirements and inspections, including:
   - Inspection and testing requirements, for example for a factory acceptance test (FAT) and a site integration test (SIT).
   - Dimensional verification requirements.
   - Documentation requirements.
   - Material identification and traceability.

Improved reliability

The process improves reliability by migrating toward standard documentation and components for which a company can establish continuous improvement programs. Poor equipment performances or field failures are often vendor specific and cannot be managed or enhanced in a generic database approach.

The performance-failure issue will likely have a root-cause associated with a component's design, manufacture-assembly procedure, or quality assurance-quality control (QA-QC) programs. By referencing the vendor's part number, the PQS provides a direct link back to specific vendors' internal tracking systems and interfaces with manufacturing and quality systems.

The FMA templates used in this approach also facilitate permanent capture of design lessons learned associated with poor equipment performances or field failures.

Original qualification becomes highly leveraged as the deepwater subsea industry continues to evolve. Companies routinely optimize or improve subsea product lines based on development complexities, operating experience, and lessons learned. The detailed documentation supports a structured management-of-change program, ensuring increased reliability with modifications to proven designs.

Broadening the PQS approach on an industry basis will accelerate reliability improvement as a common communication mechanism will enable more effective documentation of field failures. Additionally, companies can use the qualification documentation as training and reference tool for less experienced personnel, as the captured

lessons learned provide information to maximize efficiency, reliability, and resources.

Streamlined PQS

Streamlined PQS documentation facilitates successful project execution for both vendors and operators. Using PQS data sheets, vendors also can communicate to subsuppliers the detailed requirements for components and equipment and other critical information.

The PQS process has the potential to maximize vendor efficiencies and facilitate tendering, bid evaluation, and project execution for proven common components. With increased efficiency on managing vendor resources, a project team can focus more on project-specific issues, thereby reducing time spent during early project life on equipment qualification reviews.

Operators gain increased project oversight on purchasing, offering the potential to minimize engineering costs and reduce contingencies. As resources are constrained by short schedules, this standardized process allows vendors and operators to quickly access information and efficiently address issues, which increases the likelihood of delivering on time.

The standardized approach also provides higher visibility of qualification using clear documentation, which facilitates operators' fit-for-service determinations. Additionally, it provides a structured starting point for management of design changes, upgrades to new service conditions, and qualification gaps.

Operators can also use the documentation created from this approach to help leverage qualification information across many projects. For adaptability to different field configurations, the component breakdown feature is ideal, particularly because it migrates toward using standard components throughout the deepwater subsea industry.

Local content

The systematic qualification process may also facilitate local content capabilities. The qualification process not only allows established vendors and suppliers to participate on proven goods, but also provides a better mechanism for adding new vendors and suppliers.

Companies also use the datasheets and assessments as training and reference tools to benefit local content by allowing local contributors to understand the requirements for successfully providing reliable components and equipment.

Dynamic framework

EMDC believes that this subsea qualification approach provides a reliability-enhancement framework that objectively evaluates vendor qualification programs.

EMDC offers its approach to equipment qualification for consideration as a new recommended practice for the rapidly evolving deepwater subsea industry; however, the principles, processes, and tools generated through this initiative also can apply broadly to other functional areas where equipment reliability is critical. ✦

References

1. Qualification Procedures for New Technology, Det Norske Veritas Recommended Practice. DNV-RP-A203, 2001.

2. Specification Forms for Process Measurement and Control Instruments Part 1: General Considerations; Updated with 27 new specification forms in 2004-2006. Instrumentation, Systems, and Automation Society, ISA TR20.00.01, reprinted 2006.

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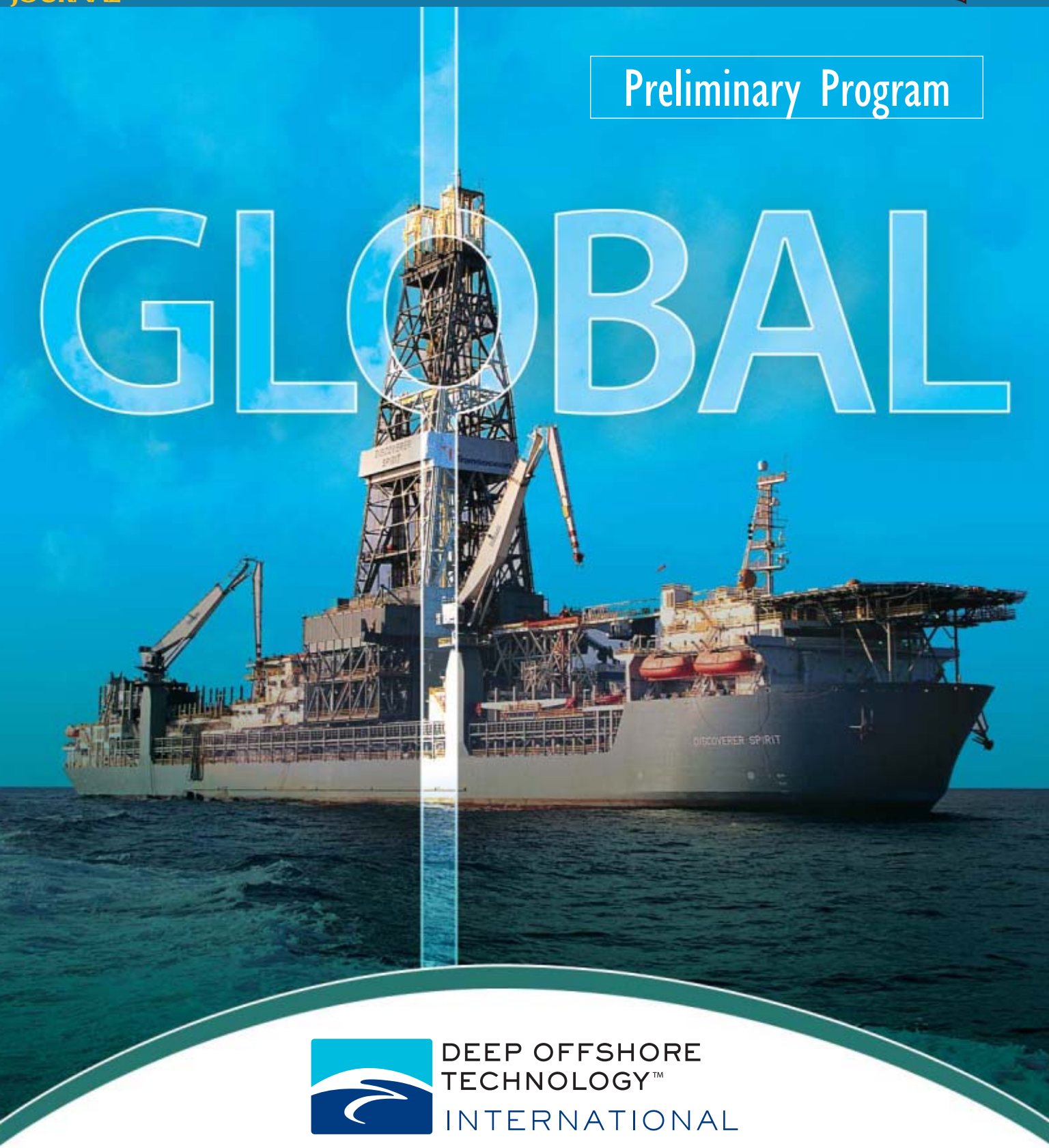
Preliminary Program

GLOBAL



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DOT is vital to industry leaders who seek information and emerging technology with which to plan future deep offshore operations. DOT has a multi-national audience that provides a professional setting for making contacts and other business arrangements. DOT exhibitors have consistently recognized this conference as having the highest caliber of professionals in attendance. Exhibitors are exposed to technical specialists, key department managers, operating vice presidents, and leaders who influence purchasing decisions and bid lists.

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The DOT International Conference & Exhibition is the most significant deepwater event in the world. This event offers:

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- A renewed focus on subsea tieback technology and equipment, viewed at the strategic level with case studies and reports on application technologies.
- Geopolitical and economic evaluations of the future of deep offshore technology around the globe with input from major, independent, and state-owned operators.

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- Lessons Learned – Field Development
- Lessons Learned in Deepwater Operations
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- Redeployment of DW Assets
- Changing Market Dynamics
- Metocean (Hurricanes, Geotechnical)
- Riser Technology/Riser Fatigue
- Well Construction/Petroleum Technology
- Field Architecture and Economics
- Flowlines and Pipelines
- Completion Design in Deepwater
- Flow Assurance
- Station Keeping
- Project Execution and Management
- Model Testing
- Risk and Reliability
- Subsea Technology
- Advanced Materials
- Integrated Operations (e-Field)
- Seabed Boosting and Processing
- Construction/Installation
- Technology Qualification and Implementation
- Floating Facilities
- Long Distance Tiebacks
- Intervention

DEEP OFFSHORE TECHNOLOGY INTERNATIONAL 2008 PRELIMINARY CONFERENCE PROGRAM

TUESDAY, FEBRUARY 12, 2008

08:30 a.m. - 10:00 a.m. **WELCOME & INTRODUCTION**

HOUSTON WELCOME

CHAIRMAN'S REMARKS

KEYNOTE ADDRESS

DRILLING CONTRACTOR PERSPECTIVE

CONSTRUCTION CONTRACTOR PERSPECTIVE

10:00 a.m. - 10:30 a.m. **COFFEE BREAK**

TUESDAY, FEBRUARY 12, 2008

10:30 a.m. - Noon SESSION 1:

TRACK 1 Floating Facilities • Lessons Learned • Integrated Operations Sponsored by: DNV

FLOATING FACILITIES 1 – Chair: John Murray – *FloaTEC* / Co-Chair: Pete Strake – *Hydro*

10:30 a.m. – 11:00 a.m. Application of Response Based Analysis Methods to a Turret Moored FPSO
Iwan Aryawan – *LR EMEA*

Modeling FPSO responses is important for predicting the loads on the structure and the operational envelope. The modeling must represent the interaction of the FPSO response characteristics and the environmental conditions.

11:00 a.m. – 11:30 a.m. Confidence in Global Response Design Verification of Ultra-Deepwater Floating Systems
Dr Wei Ma – *Chevron*

This paper investigates limits and uncertainties in the prediction and verification of global responses for ultra-deepwater floating facilities. Current model test basins can only model floaters with complete moorings and risers in prototype water depths.

11:30 a.m. - Noon Use of Innovative Concepts & Technologies to Reduce Cost of FPSO for Deepwater Developments
Vu Van-khoi – *TOTAL EP*

The current design of FPSO's leads to expensive projects for deepwater developments. This paper examines ways to reduce costs.

TRACK 2 Subsea Technology • Riser Technology

SUBSEA TECHNOLOGY 1 – Chair: Paul Hansen – *Chevron* / Co-Chair: Bill Boyle – *Subsea 7*

10:30 a.m. – 11:00 a.m. 3D Modeling Improves Deepwater Umbilical Design Dependability
Mark Dixon – *DeepSea Engineering & Management*

Until recently, interactions between internal components of an umbilical have been more or less neglected in modeling for fatigue prediction. In deeper waters, and with larger umbilicals, such interactions can contribute significantly.

11:00 a.m. – 11:30 a.m. Development, Qualification and Implementation of the All Electric Subsea Production System – The Future is All-Electric; and it is Here
Robert Lopez – *Cameron*

Implementation of the world's first all electric subsea production system has created interest from operators.

11:30 a.m. – Noon 200 - 500+ km TieBack in Deepwater
Marc Fullenbaum – *Alcatel Submarine Networks*

There is a growing need to effect remote subsea offshore connectivity in real time.

TRACK 3 Flow Assurance • Well Construction • Field Development

FLOW ASSURANCE 2 – Chair: Steve Bledsoe – *MCS* / Co-Chair: Steve Whitaker – *HESS Corp.*

10:30 a.m. – 11:00 a.m. Prediction of Hydrate Deposition Formed by Restrictions
Majed Abdi – *Memorial University of Newfoundland*

Hydrates can pose a major risk in all high pressure natural gas transport lines including connecting lines and manifold systems in all offshore production facilities.

11:00 a.m. – 11:30 a.m. Innovative Subsea Loop Configuration for Longer TieBacks
Boris Carlier – *Saipem S.A.*

This paper presents an innovative loop configuration as an alternate to the conventional production loop configuration that is often used for deepwater oilfields, especially offshore West Africa.

11:30 a.m. – Noon Temperature Retention during Long-Term Wellbore Shut-In: Deepwater Case History of an Insulating Packer Fluid
Paul Javora – *BJ Services Company*

Thermal insulating packer fluids are widely used in deepwater completions. Undesired heat loss to surrounding environments accelerates the formation of gas hydrate, paraffin and asphaltene deposition, which creates significant flow assurance concerns.

Noon - 1:30 p.m. LUNCH

TUESDAY, FEBRUARY 12, 2008

1:30 p.m. - 3:00 p.m. SESSION 2:

TRACK 1 Floating Facilities • Lessons Learned • Integrated Operations Sponsored by: DNV

FLOATING FACILITIES 2 – Chair: Baljit Singh – *Repsol YPF E&P* / Co-Chair: Richard D'Souza – *KBR/Granherne Americas*

1:30 p.m. – 2:00 p.m. Sensitivity Analysis of Deepwater Floaters to the New GoM Environmental Criteria
John Murray – *FloaTEC*

In view of the recent hurricane conditions that have passed through the Gulf of Mexico, the American Petroleum Institute is making recommendations to assess the behavior of existing installations of deepwater floaters.

2:00 p.m. – 2:30 p.m. Environmental and Design Challenges in an Arctic Environment for Production Facility – Offshore Sakhalin Deepwater
Nagan Srinivasan – *NOV*

The Arctic Ocean has the potential to produce oil and gas economically. Although it is a challenging environment, fields could be developed to produce hydrocarbons economically.

2:30 p.m. – 3:00 p.m. Optimization of a Floating Platform to Transfer GTL Technology Offshore
Jim Lye – *BPP Technical Services*

Significant volumes of oil-associated gas have been produced offshore without a viable market or nearby effective use. In addition, there are even larger volumes of condensate-associated and dry gases known to exist in remote deepwater locations.

TRACK 2 Subsea Technology • Riser Technology

SUBSEA TECHNOLOGY 2 – Chair: Jeff Schrull – *ADDAX Petroleum – OPE Inc* / Co-Chair: Nico Vandenworm

1:30 p.m. – 2:00 p.m. Dual Subsea Chokes with HIPPS for High Pressure Reserve Development
Weihong Meng – *Fluor Corporation*

As more deepwater high pressure reservoirs are discovered in the North Sea and in the Gulf of Mexico, usually associated with high reservoir temperature, significant challenges are presented in material selection, design, and installation methods.

2:00 p.m. – 2:30 p.m. All Electric Subsea Systems – Delivering the Electrical Power
Svend Rocke – *VetcoGray Scandinavia*

There is a new resolve in the subsea industry, both from the operators and suppliers, to qualify and install all-electric subsea production systems. The motivation for the change to all-electric is due to the environmental pressures now in place.

2:30 p.m. – 3:00 p.m. Long Arctic Subsea TieBack Control Buoy
Brendan Campbell – *Force Technology*

One of the major challenges of arctic development is the remote location coupled with the risk of ice collisions. TOTAL has reviewed the various options for production facilities for these artic conditions.

TRACK 3 Flow Assurance • Well Construction • Field Development

FLOWLINES & PIPELINES 1 – Chair: Lee Noris – *Scandpower* / Co-Chair: Todd Stevens – *ExxonMobil*

1:30 p.m. – 2:00 p.m. Multiphase Flow Assurance Design for Long Gas-Condensate Pipelines – Field Experience and Uncertainty Assessment
Gunnar Flaten – *Statoil ASA*

The design of long gas-condensate pipelines aims to optimize the transport of the produced fluids to a processing plant. The design process involves balancing hydraulic capacity and multiphase flow assurance issues, such as liquid management and hydrate condensates.

2:00 p.m. – 2:30 p.m. Evaluation of Landslide Impact on Deepwater Submarine Pipelines
Chiara M. Traverso – *D'Appolonia S.p.A.*

The push of the petroleum industry into ever greater water depths has led to a tangible increase in project geohazards. One of the most significant hazards on the continental shelf is submarine landslides.

2:30 p.m. – 3:00 p.m. Techniques for Detection of Water Intrusion in Pipelines and Hydrates Using Radioisotopes
Scott Vidrine – *Tracerco*

The paper will discuss the use of radioisotopes in detecting the presence of water intrusion into new pipelines, the intrusion of water into the outer jacket of a pipe-in-pipe design, and hydrate detection.

3:00 p.m. - 3:30 p.m. COFFEE BREAK

TUESDAY, FEBRUARY 12, 2008

3:30 p.m. - 5:00 p.m. SESSION 3:

TRACK 1 Floating Facilities • Lessons Learned • Integrated Operations Sponsored by: DNV

FLOATING FACILITIES 3 – Chair: Bob Lewis – *Devon Energy* / Co-Chair: Uri Nooteboom – *INTEC Engineering*

3:30 p.m. – 4:00 p.m. Dynamic Positioned FPSO for use in Ultra Deepwaters and or Hurricane Areas
Stig B. – *FPS Ocean AS*

During the last decade the exploration and production of oil and gas reserves has been directed into remote areas without infrastructure, deeper waters and hurricane areas. Although solutions for development of these fields exist, they are costly.

4:00 p.m. – 4:30 p.m. A Dynamically Positioned Loading Terminal
Tor Kvillum – *Grenland Group Technology AS*

The HiLoad DP is a new system for offshore loading, where off-loading will be effected by means of a dynamically positioned loading terminal. The loading terminal will be capable of docking onto a standard oil tanker.

4:30 p.m. – 5:00 p.m. Connection Hull–Topsides: Principles, Designs and Returns of Experience
Guillaume Gourdet – *Bureau Veritas*

In the seven last years, several findings have highlighted the importance of the system connecting the topsides structure to the hull. This area at the border between hull design and topsides design is of utmost importance for the production integrity.

TRACK 2 Subsea Technology • Riser Technology

SUBSEA TECHNOLOGY 3 – Chair: Joel Sanden – *Anadarko Petroleum Corp.* / Co-Chair: David Walters – *2H Offshore*

3:30 p.m. – 4:00 p.m. Leaking Subsea Valves; Identification, Quantification and Monitoring by Using Ultrasonic Systems
Hans A. Wagner – *ClampOn Inc.*

This paper will discuss the challenges in the oil and gas industry regarding leak identification, quantification and monitoring of critical subsea valves. In today's subsea installations, not many monitoring systems are in place.

4:00 p.m. – 4:30 p.m. Synergies Between Injection Network Design and Virtual Flow Metering
John Friedemann – *VetcoGray Scandinavia*

Virtual flow metering systems are dependent upon a reliable and well designed valve and instrumentation system, which should then consider all of the operational conditions for the application.

4:30 p.m. – 5:00 p.m. The New Generation of Deepwater Umbilical Designs – Challenges, Issues and Solutions
Mark Dixon – *DeepSea Engineering & Management*

Umbilicals are traditionally robust subsea components, which is valid to water depths of around 4,500-6,000 ft. Beyond this, depending on project specifics such as vessel type, umbilical size/weight, harshness of environment, etc, umbilicals require special attention.

TRACK 3 Flow Assurance • Well Construction • Field Development

FLOWLINES & PIPELINES 2 – Chair: Steve Whitaker – *HESS Corp.* / Co-Chair: Bob Kipp – *WorleyParsons Sea*

3:30 p.m. – 4:00 p.m. Thermal Expansion Management of Deep Water Flowlines: Design Concepts
Philip Cooper – *KW Ltd*

Current deepwater projects typically require insulated flowlines operating at high temperature, presenting a range of design challenges related to thermal expansion. This paper describes the development of design solutions to mitigate lateral buckling.

4:00 p.m. – 4:30 p.m. Single Production Flowline Concepts Applicable to Marginal Field Development
Michel Vaché – *DORIS/ADC*

In West Africa, most hydrocarbon assets exceeding 600 million barrels of estimated oil recovery have been developed with a subsea architecture based on production loops. Such subsea loop arrangements are associated with hydrate management relying on production flowline concepts.

4:30 p.m. – 5:00 p.m. Deepwater Pipeline Repair – Lessons Learned and New Advances
Bo Povloski – *Oil States Industries, Inc.*

As the offshore oil industry goes deeper and deeper, the need to repair deepwater pipeline components has become more frequent. Since the Hurricane Season of 2006 in the Gulf of Mexico, there has been a high focus for many companies to have a system in place.

5:00 p.m. - 6:30 p.m. EXHIBITION HALL NETWORKING RECEPTION

WEDNESDAY, FEBRUARY 13, 2008

08:30 a.m. - 10:00 a.m. SESSION 4:

TRACK 1 Floating Facilities • Lessons Learned • Integrated Operations Sponsored by: DNV

RISK & RELIABILITY – Chair: Jeff Schrull – *ADDAX Petroleum* / Co-Chair: Lee Noris – *Scandpower*

08:30 a.m. – 09:00 a.m. Deepwater Asset Protection – Terrorism at Sea
Stephan Kroecker – *SeaAway*

All offshore companies, consortiums and associated funding institutions, have a vested interest in the physical protection of rigs, workers and fields. This trend will only increase over the coming decades as the commodity becomes more valuable.

09:00 a.m. – 09:30 a.m. Cost-Risk Re-Assessment with Interim API Bull-EX
Peter Marshall – *Moonshine Hill Proprietary*

New met-ocean criteria for the Gulf of Mexico are being implemented in API Interim Bulletins and MMS emergency regulations. Design wave heights in the Central "hot spot" region are being increased by up to 30%, forces by up to 60%.

09:30 a.m. – 10:00 a.m. A New Subsea Integrity Management Strategy with Novel Inspection Techniques for Reliable Operation of Subsea Facilities
Henning Arnoy – *FORCE Technology*

A safe and reliable operation of subsea equipment and related facilities is increasingly important for the future development of oil and gas fields in deepwater areas. Subsea equipment is generally designed with high safety margins (robust) for normal operations.

TRACK 2 Subsea Technology • Riser Technology

SUBSEA BOOSTING & PROCESSING – Chair: Joel Sanden – *Anadarko Petroleum Corp.* / Co-Chair: Mark Dixon – *DeepSea Engineering*

08:30 a.m. – 09:00 a.m. Subsea Boosting Technologies for Deepwater Reserve Development
Weihong Meng – *Fluor*

This presentation reviews the applicability of traditional wellbore artificial lift methods, and the new subsea boosting technologies: gas lift, ESP, and hydraulic pumps, comments on the newly-developed subsea multiphase pump systems and subsea processing.

09:00 a.m. – 09:30 a.m. Wet Gas Compressor Technology has Matured and is Ready for Pilot Installation
Nils Arne Solvik – *Framo Engineering AS*

Subsea multiphase booster pumps are now recognized as proven technology. More than 50 pumps are delivered by Framo Engineering and units are in commercial operation both subsea and topside in China, Australia, the North Sea and outside West Africa.

09:30 a.m. – 10:00 a.m. 1,200 Horsepower ESP Subsea System Offshore Brazil Enhances Production at Jubarte Field
Ignacio Martinez – *Baker Hughes Centrilift*

As ultra deepwater discoveries enter the production phase, new technologies are required to economically bring these reserves to market.

TRACK 3 Flow Assurance • Well Construction • Field Development

WELL CONSTRUCTION / DRILLING TECHNOLOGY I – Chair: Bob Lewis – *Devon Energy* / Co-Chair: Richard D'Souza – *KBR/Granherne Americas*

08:30 a.m. – 09:00 a.m. Long Term Integrity of Subsea Wells
Lars Tore Haug – *DNV*

Is the structural integrity of subsea wells taken into account when increased oil recovery programs are initiated? DNV has developed a methodology for evaluation of long term integrity of subsea wellheads.

09:00 a.m. – 09:30 a.m. 2,000,000 lb. Landing String Development Extends the Limits of Tubular Manufacturing and Handling Technologies
James Brock – *Grant Prideco, L.P.*

Operators are setting larger OD and heavier casing to depths in excess of 22,000 feet. These heavier casing strings require landing strings with setting capacity approaching 2,000,000 lbs.

09:30 a.m. – 10:00 a.m. Wired Pipe Applications for Deepwater Well Construction
Maximo Hernandez – *IntelliServ Inc.*

Wired drill Pipe provides the drilling industry with the only high speed telemetry system that in its short existence has already generated major milestones for the Industry.

10:00 a.m. - 10:30 a.m. COFFEE BREAK

WEDNESDAY, FEBRUARY 13, 2008

10:30 a.m. - Noon SESSION 5:

TRACK 1 Floating Facilities • Lessons Learned • Integrated Operations Sponsored by: DNV

LESSONS LEARNED 1 – Chair: Steve Whitaker – *HESS Corp.* / Co-Chair: Derek Disney – *KBR Energy & Chemicals*

10:30 a.m. – 11:00 a.m. Deepwater Advancements – Technology and Operational Needs and Development in the Past and for the Future
Baljit Singh – *Repsol YPF E&P*

Over the past few decades technology advancements have been made for water depths in excess of six to eight times of that envisaged in the early/late 1990s.

11:00 a.m. – 11:30 a.m. Integrity Management and Life Extension of Flexible Pipe
Tim O'Sullivan – *MCS*

During 2002, MCS authored: "Monitoring Methods & Integrity Assurance for Unbonded Flexible Pipe" for UKOOA. Since 2002 lessons have been learnt in terms of the management and operation of flexible pipes.

11:30 a.m. – Noon Pipeline Inspection at 7,000 ft.
Leith McDonald – *Lloyds Register*

In 2006 BP US Pipelines and Logistics commissioned a baseline ROV survey of the Mardi Gras Pipelines, with many techniques and technologies being utilized for the first time in the Gulf of Mexico.

TRACK 2 Subsea Technology • Riser Technology

RISER TECHNOLOGY 1 – Chair: Steve Bledsoe – *MCS* / Co-Chair: Todd Stevens – *ExxonMobil*

10:30 a.m. – 11:00 a.m. Taking SCR's Deeper – Qualification of Nickel-Based Welds for Deepwater Steel Catenary Risers
Mark Crawford – *ExxonMobil Development Company*

Steel catenary risers and offloading lines have limited lifetime expectancies due to fatigue critical regions containing girth welds. If girth weld fatigue performance is improved to combat the deleterious effects of fatigue, enhanced girth welds can be improved.

11:00 a.m. – 11:30 a.m. Qualification of High Strength Solutions to Improve Fatigue Performance of Deepwater Steel Catenary Risers
Rajiv Aggarwal – *Granherne, Inc.*

This paper presents the design development and qualification work undertaken in a JIP during 2004 to 2007, for two out of total four fatigue design solutions for Steel Catenary Riser (SCR) Touch Down Zone (TDZ).

11:30 a.m. – Noon Carbon Fiber and High-Strength Steels: Future Directions for Material Selections in Deepwater Risers and Flowlines
Neal Prescott – *Fluor Corporation*

As more oil and gas reservoirs are discovered in deepwater in all parts of the world, significant challenges are presented in material selection, design, and installation methods of subsea pipelines and risers with respect to thermal insulation.

TRACK 3 Flow Assurance • Well Construction • Field Development

WELL CONSTRUCTION / DRILLING TECHNOLOGY 2 – Chair: Paul Hansen – *Chevron* / Co-Chair: Bill Boyle – *Subsea 7*

10:30 a.m. – 11:00 a.m. Surface BOP Operations from a Multi-Service Vessel
Colin Johnston – *Helix Energy Solutions Group*

The Q4000 multi-service vessel is converted to accommodate surface BOP, high pressure riser and subsea shut off device for drilling and completion operations. The system incorporates a 16" high pressure riser system to enable slimbore completion.

11:00 a.m. – 11:30 a.m. Development of a New Carrier-Conveyed Sampler with Improved Reliability and Safety In HPHT Environments
Cyrus Irani – *Halliburton*

A significant aspect of any well test operation is the recovery of representative bottomhole samples. This can be done in an openhole environment using wireline formation tester tools or in a cased-hole environment using tubing-conveyed samplers.

11:30 a.m. – Noon Solid Expandable Tubulars Help Turn Marginal Wells into Significant Producers
Cameron Radtke – *Enventure Global Technology*

Originally thought primarily as a contingency technology to mitigate downhole challenges, solid expandable tubulars are now being applied as enabling systems in wellbore construction, in field development, and for well and field revitalization.

Noon – 1:30 p.m. LUNCH

WEDNESDAY, FEBRUARY 13, 2008

1:30 p.m. – 3:00 p.m. SESSION 6:

TRACK 1 Floating Facilities • Lessons Learned • Integrated Operations

Sponsored by: DNV

LESSONS LEARNED 2 – Chair: Todd Stevens – *ExxonMobil* / Co-Chair: David Walters – *2H Offshore*

1:30 p.m. – 2:00 p.m. Simultaneous Operations During the Atlantis Field Development
Geir Karlsen – *BP America*

Atlantis is located in 7000-ft water-depth in Green Canyon block 743. BP operates the field with BHP as partner. The sixteen producers and five injectors, at the main well center, tie back to the production quarters (PQ), 2 miles to the south.

2:00 p.m. – 2:30 p.m. Evolution of Hybrid Riser Towers for Ultra Deepwater in the Gulf of Mexico
Jean-Francois Saint-Marcoux – *Acergy*

There is a rapidly increasing interest within the O&G industry for field development in ultra deep waters of the Gulf of Mexico (3000 m or more). For a number of the discoveries, the produced fluid is at high pressure and temperature.

2:30 p.m. – 3:00 p.m. Optimized Materials Selection for High Integrity Subsea Systems
E. J. Wright – *ExxonMobil Development Company*

Key to the success of many offshore project developments is the design, fabrication and installation of optimized subsea systems. The systems include wellheads and trees, well tubulars, manifolds, jumpers, flowlines and pipelines.

TRACK 2 Subsea Technology • Riser Technology

RISER TECHNOLOGY 2 – Chair: Majid Al-Sharif – *Helix Energy Solutions Group* / Co-Chair: Bob Kipp – *WorleyParsons Sea*

1:30 p.m. – 2:00 p.m. A Hybrid Fairing System for Suppressing Vibration and Drag Loads of Marine Risers
Li Lee – *Shell Global Solutions (US) Inc.*

Marine risers used in offshore drilling and production operations may experience vortex-induced vibration (VIV) in ocean currents. VIV is detrimental to the risers as it can cause rapid fatigue damage.

2:00 p.m. – 2:30 p.m. Practical Experience from Retrofitting Fairings on Deepwater Risers and Pipelines
Christopher West – *Shell Global Solutions (US), Inc.*

This paper presents lessons learned from numerous projects where vortex-induced vibration (VIV) suppression fairings were installed, in-situ, on deepwater tubulars by a remotely-operated vehicle (ROV).

2:30 p.m. – 3:00 p.m. Benchmarking of Two Classes Of VIV Suppression Device Based on High Reynolds Number and High-Mode Number Tests
Kenneth J. Schaudt – *Oceanic Consulting, AIMS, MIT, MIt*

Strakes and flow-splitters have been proven to be highly effective at reducing vortex induced vibration. Extensive tests were run on two configurations, a 15D pitch strake and a 2D aspect ratio flow splitter using a 0.325 m diameter by 6 m long rigid cylinder.

TRACK 3 Flow Assurance • Well Construction • Field Development

COMPLETION DESIGN IN DEEPWATER – Chair: Dave Walters – 2H Offshore / Co-Chair: Pete Stracke – *Hydro*

1:30 p.m. – 2:00 p.m. Key Completion Strategies Meet Completion Goals In Chevron's BBLT Offshore Angola Development
Kenneth Johnson – *Halliburton*

The Chevron Benguela Belize Lobito Tomboco (BBLT) development project, located 50 miles offshore Cabinda, Angola, is a major project from which 200,000 BOPD are expected.

2:00 p.m. – 2:30 p.m. Inflow Control Devices (ICD) – Past, Present, & Future
Danny Turick – *BJ Services Co.*

Since their inception in Norway, ICDs have been used in wells around the world with very good success and they have evolved into different types to address different oilfields needs.

2:30 p.m. – 3:00 p.m. Use of Swellable Elastomers to Enhance Cementation in Deepwater Applications
Tim Davis – *TAM International, Inc.*

A lot of time is invested in developing a truly integrated approach that can shorten the planning and study timeframe and reduce uncertainty for drilling in the deepwater arena. Few opportunities present themselves as candidates to implement new technology.

3:00 p.m. - 3:30 p.m. COFFEE BREAK

WEDNESDAY, FEBRUARY 13, 2008

3:30 p.m. – 5:00 p.m. SESSION 7:

TRACK 1 Floating Facilities • Lessons Learned • Integrated Operations Sponsored by: DNV

LESSONS LEARNED 3 – Chair: Majid Al Sharif – *Helix Energy* Solutions Group / Co-Chair: Derek Disney – *KBR Energy & Chemicals*

3:30 p.m. – 4:00 p.m. Offshore Heavy Oil Processing and Planned De-Bottlenecking: A Successful Enterprise Case
Roberto Oliveira – *Petrobras*

As the offshore exploration activities expand, looking for new crude oil reserves presents two different challenges: the primary processing of heavy oil; and the maintenance of the current oil production on the existing mature fields.

4:00 p.m. – 4:30 p.m. Saipem Group Experience on the Development of Optimised Design Procedures for Subsea Tie-In System
Abed El-Chayeb – *Saipem SA*

The Saipem Group has been deeply involved in the design, construction and installation of deepwater subsea systems, down to 1400 m w.d. In most of the cases, the verification of the subsea tie-in system represented a critical element of the project execution.

4:30 p.m. – 5:00 p.m. Hydrate Inhibition in Ormen Lange Subsea Gas Compressions Station Pilot
Geir Elseth – *Hydro*

Hydrate inhibition in the Ormen Lange Subsea Gas Compression Station pilot will provide some 20% of the UK's gas consumption in the years to come.

TRACK 2 Subsea Technology • Riser Technology

RISER TECHNOLOGY 3 – Chair: Richard D'Souza – *KBR/Granherne Americas* / Co-Chair: Jeff Schrull – *ADDAX Petroleum*

3:30 p.m. – 4:00 p.m. Standardization of Deepwater Riser Systems
Tim Eyles – *2H Offshore Engineering Ltd*

Across the multitude of current deepwater and ultra deepwater developments there is little commonality in the selected riser designs, even between those with similar environmental and process conditions.

4:00 – 4:30 p.m. Advanced Design Methodologies for SCRs
Frank Grealish – *MCS*

For South Atlantic projects the riser system is delivered as part of a large SURF EPCI contract. The design procedure and methodologies used for the risers/SCRs therefore must be compatible with the schedule constraints within the EPCI contract.

4:30 p.m. – 5:00 p.m. Riser Systems for Ultra Deepwater: Status and Challenges
Hervй Quintin – *Acergy*

As production is moving into deeper waters, standard riser system concepts are reaching some limits and have to be improved in order to extend, in a safe, reliable and cost effective manner, to ultra deep waters (2,000m – 3,000m).

TRACK 3 Flow Assurance • Well Construction • Field Development

CONSTRUCTION / INSTALLATION 1 – Chair: Nico Vandenworm – *OPE Inc.* / Co-Chair: Bob Lewis – *Devon Energy*

3:30 p.m. – 4:00 p.m. Changing Market Dynamics
Robert Duffin – *Acergy*

The problem of servicing today's buoyant market and at the same time protecting yourself for the next downturn – An Offshore Contractors View. Recent years have seen a transformational change within the offshore construction sector.

4:00 p.m. – 4:30 p.m. Next Generation Crane Vessel
Alain Wassink – *GustoMSC*

A monohull heavy lift vessel has always been a compromise between the required stability during a heavy lift of the maximum capacity, the motion characteristics of the vessel when performing routine lifts during preparation, and execution of an installation.

4:30 p.m. – 5:00 p.m. Offshore Platforms Sizing Optimization Through Genetic Algorithms
Mauro Costa de Oliveira – *Petrobras*

The definition of the main dimensions of an offshore production platform is usually a complex problem due to the several variables that have influence over the behavior of the unit.

5:00 p.m. – 7:30 p.m. EXHIBITION HALL NETWORKING RECEPTION

THURSDAY, FEBRUARY 14, 2008

08:30 a.m. – 10:00 a.m. SESSION 8:

TRACK 1 Floating Facilities • Lessons Learned • Integrated Operations Sponsored by: DNV

INTEGRATED OPERATIONS – Chair: Baljit Singh – *Repsol YPF E&P* / Co-Chair: Lee Noris – *Scandpower*

08:30 a.m. – 09:00 a.m. Distributed Fiber Optic Temperature Sensing System for Buried Subsea Arctic Pipelines
Benjamin Eisler – *INTEC Engineering*

Offshore arctic conditions pose many design challenges to the safe operation of subsea pipelines. The pipeline route may be exposed to ice gouging and permafrost thaw settlement.

09:00 a.m. – 09:30 a.m. Embedded Sensor for Offshore Component Life Extension
Nate Ames – *Edison Welding*

The offshore oil and gas industry is actively seeking methodologies for moving into deeper water. One technique under investigation is to embed reactive sensor materials/devices (for crack detection, corrosion monitoring, vortex induced acceleration/motion).

09:30 a.m. – 10:00 a.m. Real-Time Dynamic E-Field Solution Brings Flow Assurance Technology to Operations Offshore West Africa
Javier Canon – *SPT Group Inc.*

This paper describes experiences gained implementing a dynamic e-field software solution in an oil-dominant subsea development offshore West Africa. The solution combines a rigorous transient multiphase flow and thermal simulation model together with real-time technology.

TRACK 2 Subsea Technology • Riser Technology

RISER TECHNOLOGY 4 – Chair: Nico Vandenworm – *OPE Inc.* / Co-Chair: Mark Dickson – *DeepSea Engineering*

08:30 a.m. – 09:00 a.m. "Plug and Play" Deepwater Minimum Production Riser System
Jean-Luc Legras – *Acergy*

As operators progress in deepwater reservoirs, smaller isolated zones are identified. Contractors need solutions for this inevitable refinement process.

09:00 a.m. – 09:30 a.m. Developments in Riser Technology for the Next Generation Ultra-Deep HPHT Wells
Roy Shiling – *BP America*

BP is currently looking at the next generation of development projects in the US GoM deepwater operating region. These wells will involve HPHT requirements together with requirements for sour service compliant materials.

09:30 a.m. – 10:00 a.m. Design Options of Top Tensioned Risers for XHPHT Development in Ultra-Deepwater
Lixin Xu – *Technip*

Dry tree risers have been successfully used with floating production systems in a wide range of deepwater applications (up to 8,000 ft.), in particular, in the Gulf of Mexico (GoM).

TRACK 3 Flow Assurance • Well Construction • Field Development

CONSTRUCTION / INSTALLATION 2 – Chair: John Murray – *FloaTEC* / Co-Chair: Pete Strake – *Hydro*

08:30 a.m. – 09:00 a.m. Corrosion Protection -– Robust Retrofit of a Gravity Based Production Structure in Frozen Artic High Scour Conditions
Michael Surkein – *ExxonMobil Development Company*

Cathodic protection retrofit of a gravity based structure located in Russian waters was completed using a uniquely designed (one of a kind) impressed current system consisting of semi-remote anode sleds.

09:00 a.m. – 09:30 a.m. FPSO Hull Refurbishment: Theoretical and Practical Execution
Taco Terpstra – *Gusto*

These last months have seen an important increase of FPSO conversions due to two circumstances: new-building shipyards slots un-availability, and fast-track project needs linked to the relatively high price of oil barrel.

09:30 a.m. – 10:00 a.m. Going into 2000 m+ Waters: Are Pipe-in-Pipes Getting too Heavy for Installation?
Christian Geersten – *ITP Interpipe*

The typical pipe-in-pipe consisting of an inner pipe designed for the wellhead shut-in pressure and an outer pipe designed for hydrostatic pressure is running into installation capacity limits as water-depths increase beyond 2000-2500m.

10:00 a.m. – 10:30 a.m. COFFEE BREAK

WEDNESDAY, FEBRUARY 13, 2008

10:30 a.m. – Noon SESSION 9:

TRACK 1 Floating Facilities • Lessons Learned • Integrated Operations Sponsored by: DNV

STATION KEEPING & MOORING – Chair: Richard D'Souza – *KBR/Granherne Americas* / Co-Chair: Majid Al-Sharif – *Helix Energy Solutions Group*

10:30 a.m. – 11:00 a.m. Bending Effects on the Fatigue Performance of Mooring Line Chains; Author TBD – *Saipem SA*

Since the unexpected rupture of chains in the chain hawse of the Girassol buoy, industry attention has been paid to the bending fatigue phenomena. Understanding of the involved mechanism has now been improved.

11:00 a.m. – 11:30 a.m. Acoustic Frequency Management in the Atlantis Field; Geir Karlsen – *BP America*

BP Atlantis is located in 7000-ft water-depth in Green Canyon block 743.The producers and the injectors tie back to the Production Quarters (PQ), two miles south of the well center. A comprehensive SIMOPS Plan handles the acoustic frequency management.

11:30 a.m. – Noon Development and Construction Status for a Novel Dynamically Positioned Offshore Loading Terminal; Claes Olsen – *Remora ASA*

As oil is discovered in increasingly deeper waters, Remora has identified a need for a more suitable offshore loading system than the traditional moored buoy system. A novel technology including a DP based loading vessel has been developed to meet this need.

TRACK 2 Subsea Technology • Riser Technology

FLOW ASSURANCE 1 – Chair: Lee Noris – *Scandpower* / Co-Chair: Jeff Schrull – *ADDAX Petroleum*

10:30 a.m. – 11:00 a.m. Synergies between Injection Network Design and Virtual Flow Metering; John Friedemann – *VetcoGray Scandinavia*

It is well known that virtual flow metering systems are dependent upon a reliable and well designed valve and instrumentation system. A well designed system should then consider all of the operational conditions for the application.

11:00 a.m. – 11:30 a.m. Stabilization of Gas Coning in Horizontal Wells Using Automatic Feedback Control
Vidar Alstad – *Hydro Oil & Energy Research Centre Porsgrunn*

The daily production optimization of wells on Grane depends on keeping the desired stable flow rates from the wells in order to fully utilize the available topside processing capacity.

11:30 a.m. – Noon Long-Distance Step-Out – How Far Can We Go? Christian Geersten – *ITP Interpipe*

Recent advances in subsea power distribution such as implemented by Statoil have changed perspectives on extremely long tie-backs. For fluids other than dry gas, long tie-backs were mostly academic.

TRACK 3 Flow Assurance • Well Construction • Field Development

FIELD DEVELOPMENT – Chair: Paul Hansen – *Chevron* / Co-Chair: Uri Nooteboom – *INTEC Engineering*

10:30 a.m. – 11:00 a.m. MARS (Multiple Application Re-injection System): an Investment in Future Field Productivity and Flexibility; Ian Donald – *DES Operations*

Historically, intervention on subsea wellheads is a high risk/high cost activity. Routine field shutdowns for maintenance or simple service activities are cost prohibitive due to lost production revenues and intervention costs.

11:00 a.m. – 11:30 a.m. Fiscal Metering Solution for Subsea TieBacks; Hans Olav Hide – *MPM*

A metering system to perform multiphase measurements at fiscal standards provides new alternatives for subsea tiebacks..

11:30 a.m. – Noon Remote Power Generation for Deployment of New Subsea Technologies` onto Deepwater Marginal Fields
Christian Cermelli – *Marine Innovation & Technology*

A power generation platform is a viable solution to marginal and remote fields developments. Many deepwater marginal fields can be produced economically if they are tied back to a nearby production facility.

THURSDAY, FEBRUARY 14, 2008

Noon – 1:30 p.m. **LUNCH**

CHAIRMAN'S CLOSING REMARKS

INDUSTRY CLOSING PRESENTATION

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Common errors can cause mol-sieve desiccant deterioration

Ahmed S. Ghazal
Saudi Aramco
Dhahran

This article describes the Yanbu gas plant's dehydration facility and the plant's encounter with solid-desiccant deterioration in October 2006.

Identified are the main contributing factors that have resulted in acceleration of bed decomposition. The article also provides a list of the most common operational mistakes that eventually wind up as adopted practices for operating dehydration units.

Finally it illustrates the proper configuration for loading different layers in dehydrator beds.

Based on a presentation to Gulf Cooperation Council Chapter of Gas Processors Association 15th Technical Meeting, May 9, 2007.

Bed deterioration

Molecular sieve dehydration removes entrained water from treated propane and butane to produce on-specification LPG with water levels of less than 10 ppm.

The Yanbu gas plant consists of four dehydration units: Two serve the stream coming off the depropanizer columns, while the other two units process butane.

A single dehydration facility consists of two identical beds that work interchangeably; during normal operation one of the dehydrators is put online to dry the wet hydrocarbon steam, while the other bed is being regenerated.

The dryers run on automatic cycles controlled by a preset water load that is normally obtained from annual breakthrough testing. Fig. 1 shows a simplified diagram of the dehydra-

Saudi Aramco's Yanbu natural gas processing plant, shown here in 1998, was the site in 2006 of work to solve solid-desiccant deterioration. (Photo from Saudi Aramco)

tion unit.

A water-breakthrough test (dehydrator performance) on the butane dehydration train in 2006 revealed a total adsorptive capacity of the desiccant bed to be about 9.5 (lb H_2O/100 lb desiccant), which corresponds to nearly 44% activity. Furthermore, the maximum ΔP across the bed was recorded at 9 psi, which is fairly high compared to design values of 6 psi. (Differential pressures normally range 2-6 psi but could reach as high as 12 psi without affecting the bed integrity.)

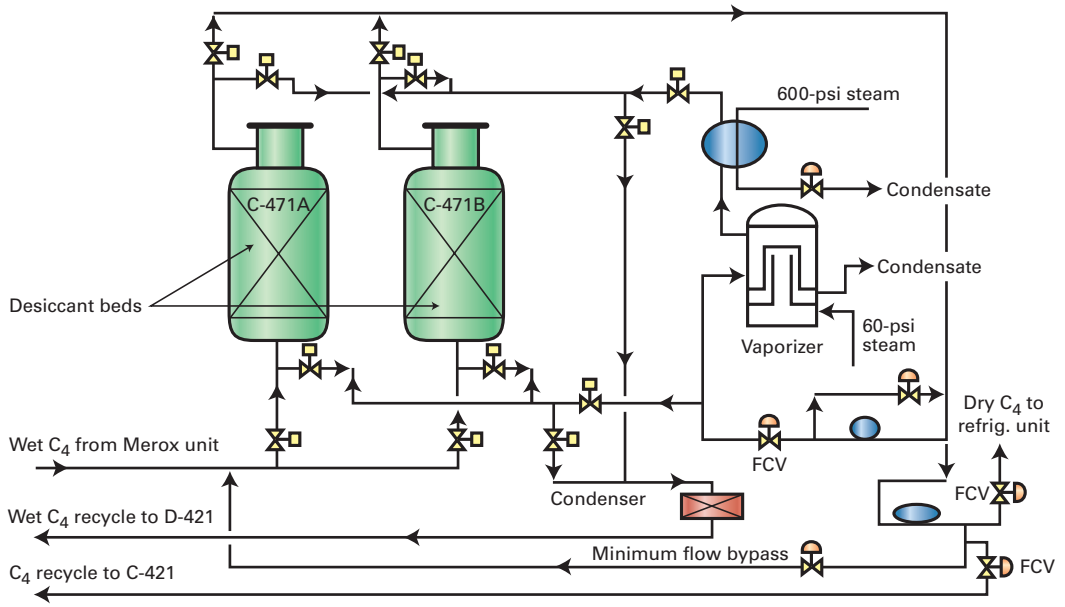
Seeing the reported ΔP was unusually high, plant operations decided to carry out scheduled test and inspection 3 months ahead of plan. The initial inspection of the dehydrator vessels revealed excessive decomposition of the old desiccant. About 60% of the bed was transformed to powder-like particles as opposed to a typical transformation rate of 30%, at similar service periods and operating conditions.

The plant's process engineer conducted a thorough study subsequently to determine the cause of high-powder formation in the system. A detailed review of historic data revealed that these particular beds contained desiccant batches from two different vendors, which were loaded during the previous test and inspection.

The fact of having loaded the dehydrator with two different brands of molecular sieves instigated the process of ion leaching during regeneration between the different binder additives which eventually weakened the desiccant and accelerated its deterioration.

Dehydration plant*

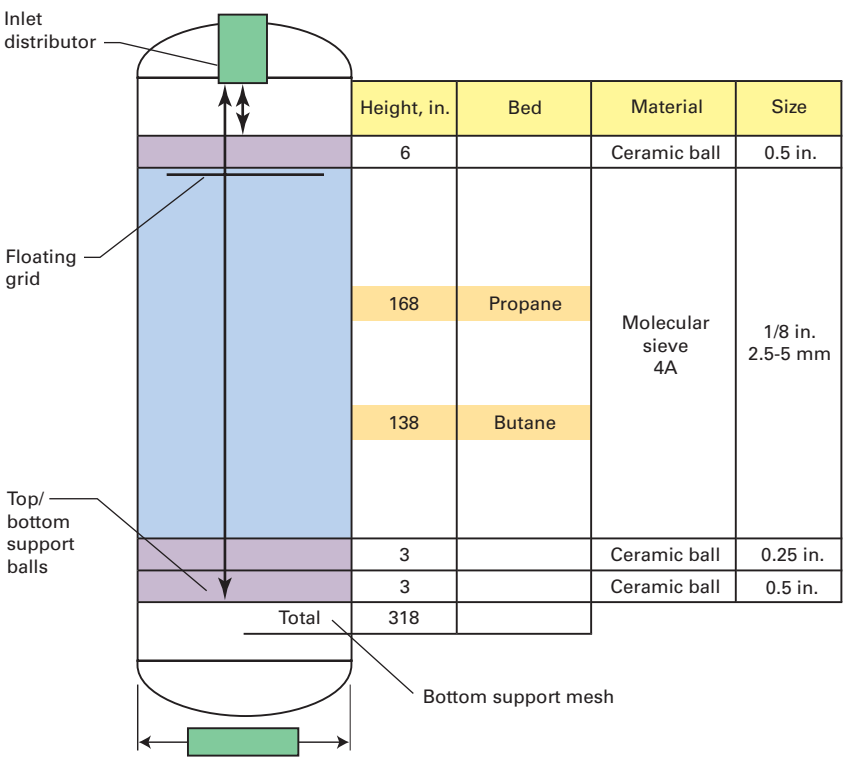
Fig. 1



*FCV = flow control valve.

Loading configuration plan

Fig. 2



Height, in.	Bed	Material	Size
6		Ceramic ball	0.5 in.
168	Propane	Molecular sieve 4A	1/8 in. 2.5-5 mm
138	Butane		
3		Ceramic ball	0.25 in.
3		Ceramic ball	0.5 in.
318			

Corrective actions

In light of YGP's encounter with desiccant failure, the plant initiated several

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preventive measures to eliminate any possibility of recurrence.

- Old desiccant batches can only be reused in an emergency situation after being analyzed for capacity and crush strength.
- Mixing of desiccant from different vendors is no longer permitted.
- Water breakthrough tests shall be conducted annually to monitor performance of desiccant beds.

Common errors

There are many operational factors that could accelerate desiccant aging; some have been adopted industry wide with little regard and understanding of long-term consequences.

- Introducing inlet feed velocities lower than 3 fpm or higher than 5 fpm.
- Operating the dehydrator units at high differential pressures.
- In the process of topping off desiccant beds, placing the old batch at the bottom of the bed.
- Mixing desiccant obtained from different manufacturers in the same dehydrator.
- Applying inaccurate loading configuration procedures.

Proper loading

Each manufacturer might have its own plan of loading configuration for different layers within the bed. The following method, however, reflects the general setup based on engineering standards and international codes.

- A 2-3 in. layer of 0.5-in. ceramic balls is placed at the bottom to provide required bed support and improve flow distribution during adsorption.
- An additional 2-3 in. of 0.25-in. layer is placed atop the previous one to prevent adsorbent nesting in the free space between support balls.
- A 6-in. layer of 0.5-in. ceramic balls is inserted at the top of adsorbent bed to prevent bed movement and improve flow distribution during regeneration.

Fig. 2 shows correct loading configuration. ✦

The author

Ahmed S. Ghazal joined Saudi Aramco in 2002 and has been working at the Yanbu gas plant since. For the past 6 years he has assumed responsibilities of process engineer at several operating areas, mainly the utilities unit, product handling unit, and the fractionation and treating facility, where he now serves as lead engineer. Ghazal holds a BS (2001) in chemical engineering from King Fahd University of Petroleum and Minerals.

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CORROSION MODELING—1

Model predicts internal pitting corrosion of oil, gas pipelines

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Laboratory experiments and observation of pit growth rates in six operating fields have yielded a model to predict internal pitting corrosion of oil and gas pipelines. The experiments occurred in a simulated high-pressure, high-temperature environment, while field observations took place for 4 years. The model works for transmission pipelines and sour or sweet production lines.

This first part of two articles examines the pitting corrosion mechanism as well as problems in predicting internal pitting corrosion of oil and gas pipelines, before beginning an assessment of the parameters that influence internal pitting corrosion.

The second, concluding article (OGJ, Dec. 3, 2007) will continue this assessment and discuss both the predicting model and its validating observations.

Background

Pipeline design requires calculation of a minimum required WT based on appropriate standards.[1-3] This minimum calculated wall thickness includes two parts: pressure containment and corrosion allowance. Corrosion allowance normally accounts for the part of the pipe wall thickness required to compensate for loss due to corrosion. Either the predicted corrosion rate and design life of the pipeline or experience set the corrosion allowance.

Prediction models incorporate the effects of factors that influence corrosion inside a pipe. A true industry standard approach to predicting pipeline internal corrosion does not exist, although there are aspects of commonality between the models offered by a number of operators, research organizations, and academic establishments. A previous publication presents an overview of various corrosivity models.[4]

Most of the internal corrosion of oil and gas pipelines occurs through localized attack, characterized by loss of metal at discrete areas of the surface with surrounding areas essentially unaffected or subject to general corrosion.

These discrete areas may take various geometrical shapes. Circular depressions, usually with tapered and smooth sides, are pits. Stepped depressions with a flat bottom and vertical sides are

Based on presentation to the NACE Corrosion 2007 Conference, Nashville, Mar. 11-15, 2007.

mesa attack. Other geometrical forms of localized corrosion include silts (sometimes referred to as knife line) and grooves.

In flowing conditions, localized attack may take the form of parallel grooves extending in the flow direction. This phenomenon is known as flow-induced localized corrosion.[5]

Corrosivity models have contributed to our understanding of the effects of chemical, physical, mechanical, and other forces on the corrosion conditions inside the pipe, but they do not predict localized pitting corrosion, the main failure mechanism of oil and gas production and transportation equipment.

This article presents a practical model to predict internal pitting corrosion of oil and gas pipelines and uses data obtained from an operating field to validate the model.

Mechanism

The penetration of a pipe wall by a pit consists of three stages:

- Formation of surface layers on the steel surface.
- Initiation of pits at localized regions on the steel surface where layer breakdown occurs.
- Pit propagation and eventual penetration of the pipe wall.

Surface layers generally form as bilayers, with a compact layer adjacent to the metal and an outer layer consisting of a precipitated phase that may incorporate anions or cations from the solution (salt film).

Much debate concerns the initiation of pitting corrosion. One approach places emphasis on inherent microscopic defects of the metal surface: inclusions, grain boundaries, and scratches, with the other typical approach holding that nonuniformity on the surface layer occurs after its formation by solution species.[6]

Propagation pits make up the final stage of pitting corrosion. When pits become sufficiently large they continue to grow until failure occurs, although the growth rate will sometimes accelerate (autocatalytic process) or decelerate (dormant pits).

Pitting corrosion, therefore, does not occur as a continuous process but rather in various steps; the process is stochastic or random.[7]

The depth of a corrosion pit depends on the pit's growth rate and the timing of its initiation.

Prediction problems

The problems in developing an internal pitting corrosion model for oil and gas pipelines are twofold:

- Development of a scientifically reliable pitting corrosion model to predict the performance of the pipes.
- Availability of inputs from the operating pipelines to use in the scientific model.

Field operating conditions should predict pipeline performance. An apparent trade off exists, however, between the scientific accuracy and ease of use of a model and the availability, reliability of details, and accuracy of input data. The main purpose of any model is to predict logically, scientifically, and, from the perspective of the field operators, in a user-friendly way, the probability of internal pitting corrosion under the operational conditions as defined by the inputs.

Only parameters considered essential in the design of pipelines and that are readily available from the operating conditions should be used as inputs to the model.

These parameters include:

- OD.
- WT.
- Steel composition.
- Pipe orientation.
- Oil chemistry and production.
- Water chemistry and production.
- Gas chemistry and production.
- Presence of solids.
- Temperature.
- Pressure.
- Partial pressures of acid gases (CO_2 and H_2S).
- Pipe operating schedule.

Pitting parameters

Laboratory and field experiments developed a model to predict internal pitting corrosion under pipeline operating conditions. The laboratory experiments used realistic pressure and temperature conditions of oil and gas producing pipelines, gathering the oil and water samples required for this purpose from the field. Field experiments also occurred in six operating pipelines.

Previous publications described details of the experimental procedure and analysis of laboratory and field experiments.[8-18] The following paragraphs present salient features.

The internal surface of a pipeline is susceptible to corrosion. Dissolving the products of corrosion in the environment leads to a uniform corrosion rate; i.e., general corrosion will occur. If the corrosion product forms intact layers that cover the surface (commonly known as surface layers), the corrosion rate will decrease to a minimum.

Neither of the two extreme conditions—uniform corrosion or formation of an intact, compact, and protective layer—generally occurs. In practice, the following sequence of events leaves the pipe susceptible to pitting corrosion:

- Surface layers (single or multi) form due to corrosion of metal exposed to the environment.
- In the event of a breakage of the surface layer, corrosion reactions taking place at the steel surface continuously reinforce the surface layer.
- Under operating conditions of oil and gas pipelines, a combination of any or all of the three following surface layers is possible: iron oxide, iron carbonate, and iron sulfide.
- Surface layers are removed at localized areas of the steel surface but left on the rest of the surface.
- Areas where the protective layer is removed become anodic (with respect to the rest of the pipe).
- The surrounding areas become cathodic.
- The corrosion reaction taking place at the localized anodic areas is insufficient for complete reformation of

surface layer.

Once this sequence of events occurs, pits initiate, propagate, and failure eventually occurs. The probability and rate of pitting corrosion depend on the stability of the local anode and bulk cathode and their relative areas. Complete removal of the surface layer may be beneficial because the anode and cathode ratio become uniformly distributed, resulting in uniform corrosion (as opposed to pitting corrosion).

OIL WETTABILITY EFFECT Table 1

Production rate	Wettability	Pit growth rate, µin./year
0	Any	50
>0	Water wet	60
>0	Neutral wet	10
>0	Oil wet	5

Parameters influencing the preceding sequence are extensive but fall within the following three categories:

- Construction.
- Operational.
- Computable.

Construction parameters

Construction parameters include steel grade, pipe diameter, initial pipe thickness (ID and OD of the pipe), and pipe orientation. Construction parameters do not vary with time.

- ***Steel.*** Minor alloying elements can profoundly affect the susceptibility of a metal or alloy to localized corrosion, including pitting. The most important element is molybdenum, which, when added at a concentration of a few percent, causes a significant decrease in the breakdown of passive layer.

Not all minor alloying elements, however, are beneficial. For example, adding sulfur to carbon steels, particularly those containing manganese, increases the susceptibility of the resulting matrix to localized attack.

In general, the presence of a micro-alloying element anodic to carbon steel on the steel surface increases the possibility that the passive layer formed on top of the micro-alloying element is unstable, producing a pit-initiation susceptible area (an area susceptible to the initiation of an anodic site, leading to the stabilization of smaller local anodic areas surrounded by larger cathodic areas.) Although carbon steels (iron with <1% carbon and varying amounts of Mn, S, P, Si, Cu, Mn, Si, Ni, and Cr) differ in composition, their corrosion performance is similar.[19]

WATER EFFECT Table 2

Emulsion	µin./year
Oil-water	60
None	50
Water-oil	5

FLOW REGIME TYPE Table 3

Flow regime type	µin./year
High	100
Low	50
Zero	50

• ***WT.*** The industry has established nominal thicknesses for various steels and pipe diameters. Conditions in which the risk of or effect of failure is high call for pipes with increased WT to be used.

• ***Pipe orientation.*** Topography causes pipes to be laid at various orientations, with angles of 0-90°. Laying the pipes at various orientations does not increase or decrease the probability of pitting. But pipe orientation does affect the flow pattern and deposition of solids, thus indirectly influencing the location of pitting corrosion.

Operational parameters

Operational parameters include production rates of oil, water, gas, and solids, temperature, pressure, partial pressures of acid gases (CO_2 and H_2S), and concentrations of sulfate, bicarbonate, and chloride.

SOLIDS EFFECT Table 4

Solids	µin./year
Yes	75
No	50

• ***Oil.*** Wet corrosion is an electrochemical process requiring a conductive phase. The low conductivity of oil prevents corrosion from occurring on the surface wetted by oil.

The corrosivity of a crude oil depends on its chemical characteristics. In general, inorganic salts, sulfur content, organic acids, dissolved gases and water, solids, and paraffins determine crude's corrosivity.

The degree of oil's affinity to carbon steel yields three categories:

Oil-wet surface: The oil has a strong affinity to be in contact with carbon steel.

Water-wet surface: The oil has no affinity to be in contact with carbon steel. The oil may not be in contact with carbon steel at all, even when it is the only phase.

TEMPERATURE EFFECT Table 5

Temperature, °F.	µin./year
>50	80
≤50	50
≤25	10

Mixed-wet surface: The oil has no affinity to be in contact with carbon steel. The oil may be in contact with the carbon steel surface as long as there is no competing phase present.

Previous publications describe methods to determine wettability.[17-18]

An oil-wet surface physically isolates the pipe from the corrosive environment. This condition makes establishing a low anodic localized area surrounded by larger cathodic areas difficult, decreasing the probability of pitting corrosion.

A mixed-wet surface physically isolates the pipe from the corrosive environment as long as the oil-to-water ratio is high. This condition makes establishing a low anodic localized area surrounded by larger cathodic areas less difficult, when compared to oil-wet surface, but the probability of pitting corrosion remains low. Susceptibility to pitting corrosion increases at the inversion point, when the water-in-oil emulsion becomes oil-in-water.

A water-wet surface (in the presence of oil) is highly susceptible to pitting corrosion. This condition makes establishment of a low anodic localized area surrounded by larger cathodic areas relatively easy, increasing the probability of pitting corrosion. The engulfing oil layer above the water layer facilitates localization and stabilization of smaller anodes surrounded by larger cathodes, increasing the probability beyond what is seen in the absence of oil.

Table 1 shows the experimentally determined variation in pit growth rates with oil types, holding all other factors equal.

• ***Water.*** There are two kinds of emulsion, oil-in-water and water-in-oil.

W-O emulsion has low conductivity and high resistance, making it less corrosive, while O-W has high conductivity and low resistance, making it more corrosive. The ratio of water-oil at which W-O converts to O-W is called the inversion point. Previous publications describe the methods used to determine inversion point.[17-18]

The higher conductivity of water means that the entry of any amount of water increases the probability of pitting corrosion, unless the oil emulsifies the water, creating a water-in-oil phase of low conductivity. Table 2 shows the experimentally determined variation in pit growth rates with water and oil emulsion, when all other factors are equal.

• ***Gas (flow).*** Introduction of gases can increase pitting corrosion by increasing turbulent flow. At the same time flow rate enables the gas to dissolve in the liquid (water). Acid gases such as CO_2 and H_2S are corrosive when dissolved in water.

Table 3 shows the experimentally determined variation in pit growth rates with flow, when all other factors are equal.

• ***Solids.*** Solids have two detrimental effects.

In a low-flow regime, deposits may form on the surface and produce conditions for under-deposit corrosion. They also help establishment of areas conducive to the development of small anode-large cathode regions. In moderate flow conditions, solids may abrade the surface removing any protective build-up and leading to a surface profile conducive for pitting. Solids in higher-flow regimes also produce erosion-corrosion through abrasion.

Table 4 shows the experimentally determined variation in pit growth rates with the presence and absence of solids.

• ***Temperature.*** Higher temperatures generally increase the corrosion rate by accelerating the electrochemical and chemical reactions. The rate of precipitation, however, also increases with temperature, reducing the corrosion rate when protective films are formed.

The influence of temperature on protective film formation is quite complex. For layers that physically adsorb into the metal surface, protection decreases with increasing temperature because elevated temperature facilitates desorption. For layers that chemisorb onto the metal surface, the chemical bond strength and the resulting protection increase with temperature up to a certain point, at which the thermal degradation of the layer occurs.

Increased temperature similarly increases the diffusivity of both pitting (e.g., chloride ions) and inhibitive (e.g., corrosion inhibitors, sulphate ions) species.

Table 5 shows the experimentally determined variation in pit growth rates with temperature.

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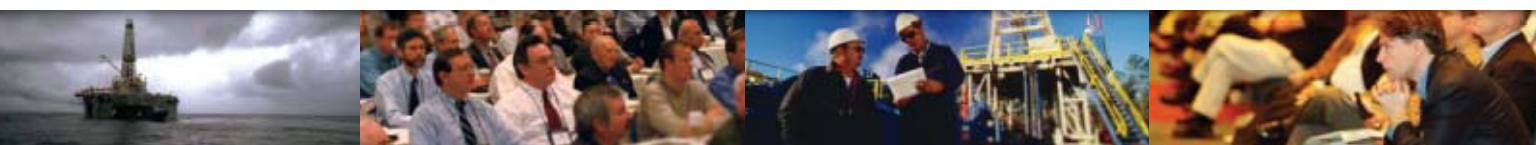

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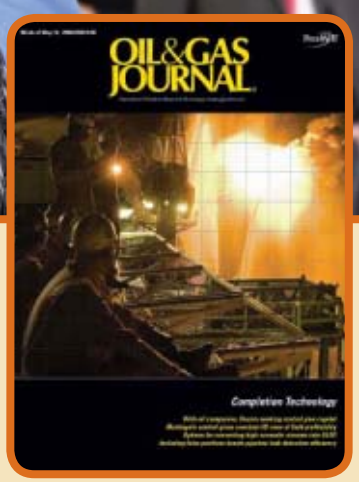

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[1] *Signet Readership Survey (February 2007)*

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Pipeline JV risks require preagreement planning

Mark K. Lewis
D. Kirk Morgan II
Paul, Hastings, Janofsky & Walker LLP
Washington

Risks and burdens of joint-venture pipeline projects need to be managed and mitigated with fully termed project agreements addressing the potential problems involved in pursuing a project with partners. Reaching such agreements may require additional time on the front end, but this investment will pay off in greater internal efficiency as the project proceeds.

Background

JVs have emerged as the most recent trend for development of new pipeline projects. Companies pursue JVs because the benefits of shared risks and combined resources are attractive. These benefits often cannot be replicated by a company pursuing a pipeline project on its own.

JVs have submitted the majority of greenfield pipeline projects currently pending before the Federal Energy Regulatory Commission. Rockies Express Pipeline, for example, is a JV among Kinder Morgan Energy Partners LP, Sempra Pipelines & Storage, and ConocoPhillips to construct a project from the Rocky Mountains east. It is awaiting FERC approval for another phase (Fig. 1).

Southeast Supply Header LLC, a JV between subsidiaries of CenterPoint Energy Inc. and Spectra Energy, is awaiting approval of a 270 mile, 36-in. and 42-in. OD pipeline extending from the Perryville hub in northeastern Louisiana to the Gulfstream Natural Gas System LLC pipeline.

The JV of Kinder Morgan Energy Partners LP and Energy Transfer Partners LP, formed to construct and operate the Midcontinent Express Pipeline, a 500-mile natural gas pipeline from the southeast corner of Oklahoma, across northeast Texas, northern Louisiana, central Mississippi, and into Alabama, is another example of such an arrangement.

All indications point toward additional proposals from other JVs. On Aug. 6, 2007, for example, a newly formed JV between TransCanada Corp. and Northwest Natural Gas Co. announced a proposal to build and operate a natural gas pipeline of about 220 miles from northwestern Oregon to north-central Oregon.

The emergence of JVs pursuing pipeline construction projects is not limited to natural gas. ONEOK Partners LP and a subsidiary of Williams Companies Inc. have formed a JV to construct and operate a 750-mile NGL pipeline from Wyoming to Kansas.

Table 1 summarizes these projects.

JV and consortium projects have long been the norm in international cross-border pipeline projects, often following the consortium model from the upstream. In the past, however, major pipeline companies typically developed US pipelines on their own, and in many cases, in competition with alternative projects proposed by other major pipeline companies.

Examples of this traditional approach remain, with Spectra Energy, the Williams Cos. Inc., and El Paso Corp. each having announced individual projects extending from the terminus

ROCKIES EXPRESS PIPELINE

Fig. 1

Source: Bentek Energy LLC.

RECENT JOINT-VENTURE PIPELINE PROJECTS

Table 1

Project	Participants	Cost, $ billion	Route	Projected in-service timing
Rockies Express Pipeline	Kinder Morgan Energy Partners, LP; Sempra Energy; ConocoPhillips	2.2	Rio Blanco County, Colo. to Monroe County, Ohio	June 2009
Midcontinent Express Pipeline	Kinder Morgan Energy Partners, LP; Energy Transfer Partners, LP	1.25	Southeast corner of Oklahoma, across northeast Texas, northern Louisiana, central Mississippi, and into Alabama	March 2009
Southeast Supply Header	CenterPoint Energy Gas Transmission Co.; Sempra Energy	0.840	Northeastern Louisiana to Mobile County, Ala.	Summer 2008
Palomar Gas Transmission	TransCanada Corp.; Northwest Natural Gas Co.	0.700	North-central Oregon to northwestern Oregon	November 2011
Overland Pass Pipeline	ONEOK Partners, LP; Williams	0.433	Opal, Wyo., to Conway, Kan.	Early 2008
High Plains Pipeline	Colorado Interstate Gas; Xcel Energy	0.196	Weld County, Colo., to Adams County, Colo.	Fall 2008

of the Rockies Express Pipeline into the northeastern US. Greenfield projects, however, are increasingly being sponsored by JVs. The tremendous costs and commercial risks associated with pipeline development make development through JVs increasingly attractive.

At the same time, however, prospective participants in JV pipeline projects must give special attention to the risks and unique issues associated with JVs. This is especially true for companies that traditionally have developed projects without partners. The success of a JV pipeline project depends on the participants being aware of, and allotting time to address, risks and issues created by capital intensive infrastructure development projects with partners.

Advantages, disadvantages

One of the primary advantages of a JV in any context lies in the participants' ability to share costs and commercial risks, particularly appealing in the context of capital intensive pipeline projects. The costs associated with a major pipeline project can easily exceed $1 billion. Cost estimates for the Midcontinent Express Pipeline and the Rockies Express Pipeline projects total $1.25 billion and $4.4 billion, respectively.

The commercial risks are also significant, especially the possibility that there will not be adequate gas reserves or gas demand for the lifetime of the project (or even the lifetime of project debt). A JV can mitigate the commercial risks associated with a pipeline project by spreading the risks, both through shared capital contributions and partnering with entities that bring unique skill sets or market positions to the project.

A JV involving some combination of local gas distribution company, pipeline company, and producer, for example, may be able to address certain commercial risks that each entity, working alone, would be unable to mitigate. An LDC may lack the resources and specialized staff required to pursue a pipeline project, but an LDC with an ownership interest in a JV pipeline may be able to guarantee the pipeline adequate market support.

A pipeline company, meanwhile, may be unable to guarantee market support for a project but could well have access to the diverse resources, staff, experience, and technology needed for a pipeline project to move forward. A producer may have access to gas reserves but lack the experience and specialized knowledge needed to build the infrastructure required to bring the gas to market. By combining unique skill sets, participants in a JV can achieve project elements not within the control of a single entity.

At the same time, the JV model does have problems. Unique skill sets often bring with them unique corporate cultures with varied commercial and regulatory objectives and philosophies. An LDC with expenditures and commitments routinely scrutinized by a state regulatory commission, for example, will likely have a commercial and regulatory philosophy that differs greatly from the commercial and regulatory philosophy of a producer that operates in a part of the industry subject to less regulatory oversight.

Although the differences may not be as pronounced, even a JV between entities in the same segment of an industry, such as a JV between two pipeline companies, will likely involve the meshing of different corporate cultures. The JV requirement that distinct companies act as one creates complexities that would be absent if the distinct companies acted alone.

Participants in a JV have less flexibility and control over a project than they would if they acted alone. The decision-making process in a JV often takes more time and may require a degree of consensus building. This reality follows from the fact that each JV participant essentially serves two or more masters.

Although any potential participant in a JV pipeline project should be aware of the risks and issues associated with the JV model, participants should also be aware that many of the risks and issues can be addressed with careful planning begun at the earliest conception phases of the pipeline project.

JV issues

The first task of any JV is to define clearly its objectives and participants. This may seem obvious and self-explanatory but is often neglected. Just as a pipeline company, LDC, and producer

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each bring value to a JV, each may also bring a different commercial objective.

A pipeline company's objective may center on providing service to an underserved market or accessing a market to optimize the value of what might be an underutilized part of its existing system. An LDC, on the other hand, may focus on introducing a competitive supply alternative, while a producer may seek sufficient capacity to vacate production from a field and increase the price at the wellhead.

Each entity may be seeking to relieve a bottleneck, but the ultimate commercial objective of the producer or LDC may be to affect commodity price-cost while the pipeline company's objective may be to maximize return on its pipeline investment.

Such circumstances do not present insurmountable problems. The key lies in communicating objectives and adopting a JV structure that satisfies the objectives of each participant. If the objectives of the respective participants are at fundamental odds, the likelihood of a successful venture is low.

In the late 1990s, Portland Natural Gas Transmission System and Maritimes and Northeast Pipeline were pressured to create a JV to construct and operate a shared segment of what was first proposed to be two distinct, competing pipelines. Development of what came to be referred to as the joint facilities occurred despite the competing commercial objectives of PNGTS and Maritimes. This has resulted in a steady stream of disputes and litigation, not surprising when entities pursue a JV without understanding and accepting each other's objectives.

Structuring a JV requires addressing numerous governance issues. The decision-making process of the JV must receive immediate and ongoing attention. If each of two participants owns 24% of a JV and another participant owns 52%, the participants with the minority interests in the JV likely will want to ensure they have a role in decision making and management, while the 52% interest owner may want to structure the JV so that a simple majority carries decision-making power.

Participants should also consider the merits of crafting a voting structure that protects against a tyranny of the minority, where one small interest owner can hold a project hostage. The governing structure of the JV will have to address issues that will require unanimity, issues that will require only two of three interest owners, and issues that can be resolved by a simple majority.

Participants also may want to consider whether there should be limits on the transferability of ownership interests and management responsibilities. Some participants may be uncomfortable with the idea that they could end up managing a JV with another participant's undetermined assignee. Rights of first refusal limit transferability or at least provide existing owners with the ability to keep a project among themselves rather than be forced into business with an undesirable or unknown successor-in-interest. At the same time, however, parties should take care to structure the right of first refusal to minimize its negative impact on interest value in the marketplace.

In addition to establishing protocols for JV governance, participants in a JV must have a clear understanding of the role they will have in the JV. Issues that must be resolved include determining which company will manage the development and construction of the project and which will operate the pipeline. Planning must also address how each party will be compensated.

In making these determinations, JV participants should consider not only which of them has the most experience and expertise in operating a pipeline, but also the overall operating philosophy of the pipeline. They must, further, determine the restrictions and guidelines that will guide transactions between the operator and its affiliates.

The issue of affiliate transactions between energy industry participants has received increased scrutiny from both federal and state regulators, and accordingly any JV pipeline project must take steps to ensure the pipeline's eventual operator will comply with relevant federal and state restrictions on affiliate transactions, both with respect to arrangements with affiliates as shippers and with respect to shared services and support relationships with affiliates.

Failure to comply with affiliate standards can be costly. In 2003, FERC approved a settlement between its Division of Enforcement and Transcontinental Gas Pipe Line Corp. under which Transco agreed to pay a $20 million civil penalty to resolve a range of affiliate abuses.[1]

Since 2003, FERC has acquired even greater authority to impose civil penalties for affiliate violations (or any other violations of FERC's natural gas rules and regulations). Under the Energy Policy Act of 2005, FERC has the authority to impose civil penalties of up to $1 million/day/violation.[2]

Although many companies are aware of the restrictions on affiliate transactions, some companies interpret the restrictions in a more permissive manner than others. Participants in a JV must be comfortable with how the pipeline's operator will handle affiliate transactions.

The likelihood that any pipeline project may be subject to regulatory oversight of local, state, and often federal agencies, requires that participants share a common regulatory strategy and philosophy. Participants should also consider how the JV will communicate and work with landowners who may be directly affected by the construction of pipeline.

Participants should likewise consider how the JV will interact with regulators. For instance, FERC has a prefiling process in which applicants seeking approval of an interstate gas pipeline construction project may work with FERC staff and other interested parties to identify and address issues related to the project before it is formally submitted for FERC approval. Some JV participants may see the FERC prefiling process as an opportunity to increase the likelihood of a project obtaining FERC approval,

while others may see it as creating an opportunity for a regulator or other interested party to insist on certain conditions that might not be mandated in a less collaborative process.

The prevailing view, shared by the authors, holds that project developers are well-advised to participate in the prefiling process and to engage early, often, and candidly with all affected parties.

Just as participants in a JV pipeline must agree on an approach to regulatory issues, so must they agree on an approach to commercial issues. One common issue that requires resolution is whether anchor shippers (shippers with large capacity commitments at the project's outset that have financially supported its initial stages) will be treated more favorably than shippers not committed at the outset to take capacity on a new project to support its development.

Although regulatory agencies such as FERC have some restrictions on the advantages that a pipeline company may give to its anchor shippers, participants in a JV pipeline project should consider whether to provide their anchor shippers with rates or other benefits commensurate with their commitments. Each participant must be comfortable with how commercial issues such as the treatment of anchor shippers will be handled. ✦

References

1. Transcontinental Gas Pipe Line Corp., Enforcement Settlement 102 FERC, Par. 61,302, 2003.

2. Natural Gas Act, Sec. 22(a), 15 U.S.C., Sec. 717t-1(a), 2005.

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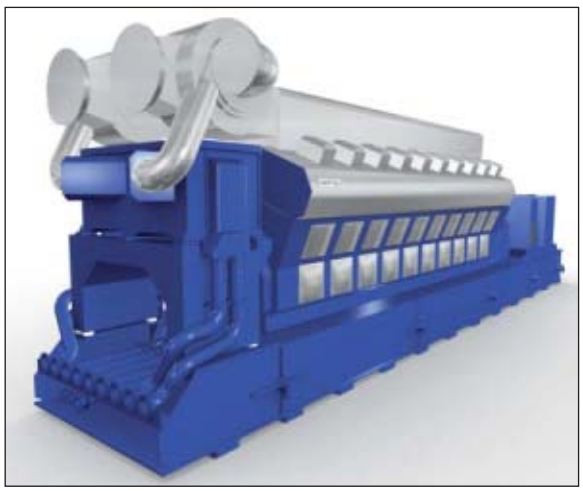
Equipment/Software/Literature

New power plant engine burns heavy oil



Here's the new 20-cylinder 46F engine for power plant installations burning heavy fuel oil.

The new engine develops 23,000 kW at 600 rpm, suitable for 50 and 60 Hz electricity generation. It offers more power and less emissions than the firm's existing 18-cylinder Model 46 engine, while maintaining high energy efficiency.

The new 20V46F engine develops 1,150 kW/cylinder compared with 975 kW/cylinder from the 18V46, at 600 rpm (50/60 Hz) as opposed to 500 rpm (50 Hz) and 514 rpm (60 Hz), respectively.

The 46F is especially environmentally friendly. It has low NOx emissions, down to 710 ppm NOx at 15% oxygen, which is the required level in India today, for example. The 20V46F will also be able to comply with the World Bank environmental requirements, the company notes. However, because reducing NOx emissions has an adverse effect on fuel consumption, the 20V46F incorporates design features that enable optimizing the fuel consumption while meeting the required NOx emission levels. Additionally, the engine can minimize the fuel consumption adaptively according to prevailing ambient conditions.

The new unit features twin injection pump and scalable control for high performance and low exhaust emissions, regardless of fuel quality. It is suited to applications that place a premium on savings in operating and maintenance costs, superior environmental performance, and fuel adaptability.

The complete 20V46F diesel generating set measures 21 m long with a width of 6.275 m and height of 6.2 m above the underside of the base frame and has a total weight of 413 tonnes. It is designed to be dismantled to three discrete units, namely the engine with base frame, generator with base frame, and the turbocharger module for separate transport to site. The elements are designed for easy assembly on site with minimum installation time, the company points out.

Source: **Wartsila Corp.,** John Stenbergin ranta 2, Box 196, FI-00531, Helsinki, Finland.

Services/Suppliers

Rockwell Automation Inc.

Milwaukee, has announced its acquisition of Pavilion Technologies Inc., a leading provider of advanced process control, production optimization, and environmental compliance solutions for process and hybrid industries. Pavilion is headquartered in Austin, Tex., and has offices in Europe and the Asia Pacific region.

Rockwell Automation Inc. is a leading global provider of industrial automation power, control, and information solutions. The company employs about 19,000 people, and serves customers in more than 80 countries.

Trident Offshore Ltd.

Aberdeen, has announced the appointment of Kevin McBarron as business development manager, navigation and positioning. McBarron has 15 years of experience in hydrographic surveying, navigation and seismic exploration. His new responsibilities include focus on expanding Trident's navigation and positioning capabilities subsea with a new emphasis on acoustic positioning.

Trident Offshore Ltd., an Acteon company, is a marine contracting and consulting firm. The company provides specialized technical services for the installation of mobile drilling rigs and floating production units.

Fugro Seismic Imaging

Houston, has acquired California-based 4th Wave Imaging, an advanced seismic imaging technology company specializing in time-lapse 4D reservoir monitoring, rock and fluid property estimation, and multi-component seismic analysis.

Fugro offers advanced geotechnical, surveying, seismic, oceanographic, meteorological, and positioning services globally, with offices in more than 50 countries.

China Classification Society and Det Norske Veritas

Shanghai, have announced a joint venture, establishing the CCS-DNV Technology Institute to support both the maritime and offshore industries on various laboratory and research challenges. The institute is the first of its kind in China. Initial focus of the institute is on coating testing.

Samson AG

Frankfurt, has announced the appointment of Ludwig Wiesner as chairman of the board upon the recent retirement of Gernot Frank.

Wiesner joined Samson in 1972, and most recently served as head of the production div.

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Imports of crude and products

	Districts 1-4		District 5		Total US		
	11-9 2007	11-2 2007	11-9 2007	11-2 2007	11-9 2007	11-2 2007	*11-10 2006
	1,000 b/d						
Total motor gasoline	960	1,063	54	68	1,014	1,131	1,088
Mo. gas. blending comp.	558	591	54	20	612	611	631
Distillate	209	259	1	11	210	270	328
Residual	239	309	—	75	239	384	283
Jet fuel-kerosine	38	101	114	90	152	191	78
Propane-propylene	107	136	26	24	133	160	205
Other	752	824	48	96	800	920	343
Total products	**2,863**	**3,283**	**297**	**384**	**3,160**	**3,667**	**2,956**
Total crude	**9,368**	**8,954**	**1,119**	**702**	**10,487**	**9,656**	**9,450**
Total imports	**12,231**	**12,237**	**1,416**	**1,086**	**13,647**	**13,323**	**12,406**

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

Purvin & Gertz LNG netbacks—Nov. 16, 2007

Receiving terminal	Liquefaction plant					
	Algeria	Malaysia	Nigeria	Austr. NW Shelf	Qatar	Trinidad
	$/MMbtu					
Barcelona	7.30	5.05	6.39	4.93	5.71	6.36
Everett	6.37	4.17	5.94	4.26	4.70	6.70
Isle of Grain	9.67	7.31	9.13	7.28	7.90	9.00
Lake Charles	5.12	3.32	4.84	3.47	3.68	5.82
Sodegaura	5.12	7.45	5.31	7.13	6.39	4.50
Zeebrugge	6.80	4.60	6.11	4.53	5.13	6.13

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

Crude and product stocks

District	Crude oil	Motor gasoline		Jet fuel, kerosine	Fuel oils		Propane-propylene
		Total	Blending comp.[1]		Distillate	Residual	
	1,000 bbl						
PADD 1	16,564	49,126	22,756	10,912	60,595	13,919	5,180
PADD 2	61,676	47,087	15,802	7,577	27,618	1,357	23,128
PADD 3	164,953	64,177	28,161	12,839	31,391	17,864	30,323
PADD 4	15,653	5,268	1,521	482	2,414	325	[1]2,932
PADD 5	55,830	29,369	22,407	9,123	11,394	5,829	—
Nov. 9, 2007	**314,676**	**195,027**	**90,647**	**40,933**	**133,412**	**39,294**	**61,563**
Nov. 2, 2007	**311,862**	**194,313**	**89,772**	**41,505**	**135,377**	**38,471**	**61,489**
Nov. 10, 2006[2]	**335,973**	**200,252**	**89,704**	**38,814**	**135,018**	**42,720**	**71,357**

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

Refinery report—Nov. 9, 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	1,416	1,423	1,694	71	502	124	79
PADD 2	3,140	3,122	2,130	220	927	54	184
PADD 3	7,465	7,308	3,197	727	2,090	284	666
PADD 4	520	516	276	20	150	13	[1]139
PADD 5	2,754	2,679	1,598	401	548	196	—
Nov. 9, 2007	**15,295**	**15,048**	**8,895**	**1,439**	**4,217**	**671**	**1,068**
Nov. 2, 2007	**15,046**	**14,884**	**8,893**	**1,454**	**4,170**	**660**	**1,183**
Nov. 10, 2006[2]	**15,182**	**14,932**	**8,679**	**1,354**	**4,013**	**603**	**1,054**
	17,448 operable capacity		**87.7% 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

	*11-16-07	*11-17-06	Change	Change, %
	$/bbl			
SPOT PRICES				
Product value	103.02	66.76	36.26	54.3
Brent crude	91.46	57.79	33.67	58.3
Crack spread	11.57	8.98	2.59	28.8
FUTURES MARKET PRICES				
One month				
Product value	102.57	67.30	35.27	52.4
Light sweet crude	93.68	57.54	36.14	62.8
Crack spread	8.89	9.76	–0.88	–9.0
Six month				
Product value	103.58	75.56	28.02	37.1
Light sweet crude	89.35	63.82	25.53	40.0
Crack spread	14.23	11.74	2.49	21.2

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

OGJ GASOLINE PRICES

	Price ex tax 11-14-07	Pump price* 11-14-07	Pump price 11-15-06
		¢/gal	
(Approx. prices for self-service unleaded gasoline)			
Atlanta	271.1	310.8	214.3
Baltimore	259.7	301.6	215.2
Boston	257.4	299.3	217.4
Buffalo	262.2	322.3	240.2
Miami	275.0	325.3	237.4
Newark	258.0	290.9	208.5
New York	246.2	306.3	231.4
Norfolk	256.4	294.0	209.8
Philadelphia	258.6	309.3	233.1
Pittsburgh	257.9	308.6	222.3
Wash., DC	269.2	307.6	226.3
PAD I avg.	261.1	306.9	223.3
Chicago	289.2	340.1	258.5
Cleveland	266.0	312.4	220.0
Des Moines	260.9	301.3	208.1
Detroit	273.2	322.4	226.6
Indianapolis	266.7	311.7	222.8
Kansas City	261.9	297.9	209.9
Louisville	269.5	306.4	217.6
Memphis	261.1	300.9	210.9
Milwaukee	262.7	314.0	233.4
Minn.-St. Paul	265.0	305.4	220.8
Oklahoma City	268.3	303.7	207.9
Omaha	264.8	311.2	223.5
St. Louis	263.8	299.8	215.0
Tulsa	262.3	297.7	209.3
Wichita	253.8	297.2	216.5
PAD II avg.	265.9	308.1	220.0
Albuquerque	269.7	306.1	217.1
Birmingham	263.8	302.5	213.6
Dallas-Fort Worth	258.6	297.0	213.0
Houston	252.0	290.4	207.2
Little Rock	261.8	302.0	212.1
New Orleans	256.7	295.1	213.3
San Antonio	252.8	291.2	209.3
PAD III avg.	259.3	297.8	212.3
Cheyenne	264.8	297.2	216.4
Denver	266.3	306.7	212.5
Salt Lake City	258.5	301.4	227.1
PAD IV avg.	263.2	301.8	218.6
Los Angeles	273.1	331.6	247.5
Phoenix	255.8	293.2	223.8
Portland	272.9	316.2	250.0
San Diego	283.1	341.6	252.0
San Francisco	299.6	358.1	270.1
Seattle	277.3	329.7	260.0
PAD V avg.	277.0	328.4	250.6
Week's avg.	**264.9**	**308.5**	**223.9**
Oct. avg.	**237.3**	**280.9**	**228.0**
Sept. avg.	**236.3**	**280.4**	**253.3**
2007 to date	**231.7**	**275.3**	—
2006 to date	**216.0**	**259.6**	—

*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

	11-9-07 ¢/gal		11-9-07 ¢/gal
Spot market product prices			
Motor gasoline (Conventional-regular)		Heating oil No. 2	
New York Harbor	250.75	New York Harbor	259.47
Gulf Coast	245.63	Gulf Coast	257.22
Los Angeles	265.25	Gas oil	
Amsterdam-Rotterdam-Antwerp (ARA)	239.94	ARA	264.10
Singapore	239.14	Singapore	255.00
Motor gasoline (Reformulated-regular)		Residual fuel oil	
New York Harbor	249.38	New York Harbor	175.90
Gulf Coast	245.23	Gulf Coast	186.90
Los Angeles	267.25	Los Angeles	197.88
		ARA	182.23
		Singapore	194.29

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

BAKER HUGHES RIG COUNT

	11-16-07	11-17-06
Alabama	4	5
Alaska	9	6
Arkansas	47	25
California	41	35
Land	39	31
Offshore	2	4
Colorado	111	83
Florida	0	0
Illinois	0	0
Indiana	2	0
Kansas	15	14
Kentucky	8	11
Louisiana	165	193
N. Land	62	56
S. Inland waters	25	19
S. Land	27	46
Offshore	51	72
Maryland	1	0
Michigan	1	2
Mississippi	8	14
Montana	11	17
Nebraska	0	0
New Mexico	73	92
New York	6	12
North Dakota	48	39
Ohio	14	8
Oklahoma	196	178
Pennsylvania	18	15
South Dakota	0	1
Texas	857	771
Offshore	9	9
Inland waters	2	3
Dist. 1	20	16
Dist. 2	36	24
Dist. 3	64	60
Dist. 4	88	93
Dist. 5	175	140
Dist. 6	113	120
Dist. 7B	41	37
Dist. 7C	63	41
Dist. 8	119	107
Dist. 8A	20	24
Dist. 9	41	38
Dist. 10	66	59
Utah	42	47
West Virginia	33	29
Wyoming	75	91
Others—NV-3; TN-6; VA-3	12	8
Total US	**1,797**	**1,696**
Total Canada	**356**	**452**
Grand total	**2,153**	**2,148**
Oil rigs	337	289
Gas rigs	1,455	1,402
Total offshore	64	86
Total cum. avg. YTD	**1,763**	**1,641**

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	Rig count	11-16-07 Percent footage*	Rig count	11-17-06 Percent footage*
0-2,500	59	5.0	50	2.0
2,501-5,000	103	57.2	95	50.5
5,001-7,500	225	25.3	226	21.6
7,501-10,000	446	1.1	421	3.0
10,001-12,500	448	3.3	433	1.3
12,501-15,000	286	—	247	0.8
15,001-17,500	114	—	120	—
17,501-20,000	63	—	72	—
20,001-over	34	—	33	—
Total	**1,778**	**7.8**	**1,697**	**7.0**
INLAND	38		37	
LAND	1,689		1,601	
OFFSHORE	51		59	

*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]11-16-07	[2]11-17-06
	1,000 b/d	
(Crude oil and lease condensate)		
Alabama	14	20
Alaska	660	670
California	645	682
Colorado	50	63
Florida	6	6
Illinois	31	28
Kansas	96	100
Louisiana	1,388	1,372
Michigan	15	15
Mississippi	51	47
Montana	97	95
New Mexico	174	158
North Dakota	109	115
Oklahoma	170	172
Texas	1,372	1,351
Utah	45	50
Wyoming	144	144
All others	61	67
Total	**5,128**	**5,155**

[1]OGJ estimate. [2]Revised.

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

US CRUDE PRICES

$/bbl*	11-16-07
Alaska-North Slope 27°	71.17
South Louisiana Sweet	95.25
California-Kern River 13°	82.90
Lost Hills 30°	90.65
Southwest Wyoming Sweet	87.10
East Texas Sweet	91.00
West Texas Sour 34°	85.00
West Texas Intermediate	91.50
Oklahoma Sweet	91.50
Texas Upper Gulf Coast	88.00
Michigan Sour	84.50
Kansas Common	90.50
North Dakota Sweet	83.25

*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]	11-9-07
United Kingdom-Brent 38°	93.52
Russia-Urals 32°	91.10
Saudi Light 34°	85.81
Dubai Fateh 32°	83.22
Algeria Saharan 44°	91.12
Nigeria-Bonny Light 37°	91.42
Indonesia-Minas 34°	92.34
Venezuela-Tia Juana Light 31°	84.66
Mexico-Isthmus 33°	88.30
OPEC basket	88.12
Total OPEC[2]	86.47
Total non-OPEC[2]	85.48
Total world[2]	86.02
US imports[3]	83.03

[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]

	11-9-07	11-2-07	11-9-06	Change, %
		bcf		
Producing region	1,063	1,063	1,014	4.8
Consuming region east	2,002	2,017	1,963	2.0
Consuming region west	471	465	472	–0.2
Total US	**3,536**	**3,545**	**3,449**	**2.5**
	Aug. 07	**Aug. 06**	**Change, %**	
Total US[2]	**3,017**	**2,969**	**1.6**	

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

Statistics

WORLD OIL BALANCE

	2007 2nd qtr.	2007 1st qtr.	2006 4th qtr.	2006 3rd qtr.	2006 2nd qtr.	2006 1st qtr.
	Million b/d					
DEMAND						
OECD						
US & Territories	20.97	21.07	21.09	21.25	20.91	20.91
Canada	2.30	2.34	2.26	2.26	2.20	2.26
Mexico	2.07	2.05	2.00	1.96	1.98	2.05
Japan	4.61	5.39	5.29	4.75	4.72	5.89
South Korea	2.12	2.35	2.32	2.04	2.04	2.29
France	1.85	1.97	1.95	1.93	1.87	2.09
Italy	1.67	1.69	1.71	1.68	1.65	1.89
United Kingdom	1.78	1.80	1.81	1.78	1.82	1.91
Germany	2.42	2.42	2.71	2.75	2.59	2.60
Other OECD Europe	7.21	7.37	7.46	7.43	7.21	7.40
Australia & New Zealand	1.07	1.09	1.10	1.07	1.06	1.06
Total OECD	**48.07**	**49.54**	**49.70**	**48.90**	**48.05**	**50.35**
NON-OECD						
China	7.62	7.43	7.53	7.24	7.30	7.02
FSU	4.40	4.54	4.43	4.23	4.25	4.41
Non-OECD Europe	0.72	0.77	0.72	0.67	0.72	0.76
Other Asia	8.71	8.62	8.73	8.45	8.62	8.53
Other non-OECD	14.95	14.68	14.53	14.76	14.49	14.27
Total non-OECD	**36.40**	**36.04**	**35.94**	**35.35**	**35.38**	**34.99**
TOTAL DEMAND	**84.47**	**85.58**	**85.64**	**84.25**	**83.43**	**85.34**
SUPPLY						
OECD						
US	8.53	8.43	8.40	8.38	8.34	8.20
Canada	3.33	3.42	3.39	3.31	3.16	3.29
Mexico	3.61	3.59	3.52	3.71	3.79	3.81
North Sea	4.48	4.80	4.76	4.51	4.71	5.11
Other OECD	1.55	1.50	1.55	1.55	1.44	1.43
Total OECD	**21.50**	**21.74**	**21.62**	**21.46**	**21.44**	**21.84**
NON-OECD						
FSU	12.60	12.61	12.48	12.26	12.07	11.81
China	3.96	3.87	3.86	3.85	3.87	3.85
Other non-OECD	11.84	11.43	11.71	11.90	11.70	11.52
Total non-OECD, non-OPEC	**28.40**	**27.91**	**28.05**	**28.01**	**27.64**	**27.18**
OPEC*	**34.58**	**34.51**	**34.97**	**35.66**	**35.19**	**35.36**
TOTAL SUPPLY	**84.48**	**84.16**	**84.64**	**85.13**	**84.27**	**84.38**
Stock change	**0.01**	**–1.42**	**–1.00**	**0.88**	**0.84**	**–0.96**

*Includes Angola.
Source: DOE International Petroleum Monthly
Data available in OGJ Online Research Center.

OECD TOTAL NET OIL IMPORTS

	July 2007	June 2007	May 2007	July 2006	Chg. vs. previous year Volume	Chg. vs. previous year %
	Million b/d					
Canada	–1,116	–1,039	–1,213	–1,053	–63	6.0
US	12,173	12,180	12,784	12,441	–268	–2.2
Mexico	–1,609	–1,501	–1,560	–1,719	110	–6.4
France	1,790	1,685	1,659	2,041	–251	–12.3
Germany	2,098	2,085	1,999	2,368	–270	–11.4
Italy	1,655	1,688	1,489	1,543	112	7.3
Netherlands	1,027	903	1,157	1,112	–85	–7.6
Spain	1,621	1,476	1,566	1,726	–105	–6.1
Other importers	3,845	3,746	3,867	3,878	–33	–0.9
Norway	–2,138	–1,955	–2,440	–2,547	409	–16.1
United Kingdom	–6	–206	155	86	–92	–107.0
Total OECD Europe	**9,892**	**9,422**	**9,452**	**10,207**	**–315**	**–3.1**
Japan	4,921	4,849	4,331	5,117	–196	–3.8
South Korea	2,270	2,125	2,444	1,954	316	16.2
Other OECD	877	954	1,005	858	19	2.2
Total OECD	**27,408**	**26,990**	**27,243**	**27,805**	**–397**	**–1.4**

Source: DOE International Petroleum Monthly
Data available in OGJ Online Research Center.

OECD* TOTAL GROSS IMPORTS FROM OPEC

	July 2007	June 2007	May 2007	July 2006	Chg. vs. previous year Volume	Chg. vs. previous year %
	Million b/d					
Canada	439	435	401	447	–8	–1.8
US	5,727	6,119	6,187	6,200	–473	–7.6
Mexico	10	21	20	—	10	—
France	815	786	779	1,035	–220	–21.3
Germany	567	499	397	525	42	8.0
Italy	1,237	1,265	1,114	1,376	–139	–10.1
Netherlands	759	491	513	604	155	25.7
Spain	629	770	721	844	–215	–25.5
Other importers	1,099	978	1,295	1,444	–345	–23.9
United Kingdom	310	247	221	212	98	46.2
Total OECD Europe	**5,416**	**5,036**	**5,040**	**6,040**	**–624**	**–10.3**
Japan	4,233	4,023	3,774	4,484	–251	–5.6
South Korea	2,363	2,364	2,441	2,340	23	1.0
Other OECD	705	735	670	695	10	1.4
Total OECD	**18,893**	**18,733**	**18,533**	**20,206**	**–1,313**	**–6.5**

*Organization for Economic Cooperation and Development.
Source: DOE International Petroleum Monthly
Data available in OGJ Online Research Center.

US PETROLEUM IMPORTS FROM SOURCE COUNTRY

	July 2007	June 2007	Average YTD 2007	Average YTD 2006	Chg. vs. previous year Volume	Chg. vs. previous year %
	1,000 b/d					
Algeria	730	709	722	620	102	16.5
Angola	404	514	556	502	54	10.8
Kuwait	202	263	202	167	35	21.0
Nigeria	906	968	1,053	1,162	–109	–9.4
Saudi Arabia	1,436	1,534	1,443	1,443	—	—
Venezuela	1,386	1,364	1,360	1,471	–111	–7.5
Other OPEC	663	767	635	162	473	292.0
Total OPEC	**5,727**	**6,119**	**5,971**	**5,527**	**444**	**8.0**
Canada	2,360	2,375	2,414	2,310	104	4.5
Mexico	1,611	1,529	1,595	1,786	–191	–10.7
Norway	137	183	165	199	–34	–17.1
United Kingdom	369	345	321	300	21	7.0
Virgin Islands	372	218	327	306	21	6.9
Other non-OPEC	3,101	2,732	2,786	3,324	–538	–16.2
Total non-OPEC	**7,950**	**7,382**	**7,608**	**8,225**	**–617**	**–7.5**
TOTAL IMPORTS	**13,677**	**13,501**	**13,579**	**13,752**	**–173**	**–1.3**

Source: DOE Monthly Energy Review
Data available in OGJ Online Research Center.

OIL STOCKS IN OECD COUNTRIES*

	July 2007	June 2007	May 2007	July 2006	Chg. vs. previous year Volume	Chg. vs. previous year %
	Million bbl					
France	187	186	189	192	–5	–2.6
Germany	282	286	288	284	–2	–0.7
Italy	132	133	132	131	1	0.8
United Kingdom	100	101	106	99	1	1.0
Other OECD Europe	669	661	670	671	–2	–0.3
Total OECD Europe	**1,370**	**1,367**	**1,385**	**1,377**	**–7**	**–0.5**
Canada	191	187	185	173	18	10.4
US	1,735	1,729	1,719	1,743	–8	–0.5
Japan	627	618	611	631	–4	–0.6
South Korea	165	158	159	158	7	4.4
Other OECD	107	112	109	112	–5	–4.5
Total OECD	**4,195**	**4,171**	**4,168**	**4,194**	**1**	**—**

*End of period.
Source: DOE International Petroleum Monthly Report
Data available in OGJ Online Research Center.

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Condensate coming into its own

Condensate, one of the two groups defined as Natural Gas Liquids (NGLs), is finally coming of age in world trade, marketing, refining and petrochemicals. Condensate sales are moving from a niche marketing specialty to a mainstream segment of crude and products trade, and nowhere is this more evident than in the Mideast Gulf and Asia Pacific.

This report explains how the protean nature of condensate allows it to be used in a wide range of sectors: as a refinery slate component; in specialized distillation towers called condensate splitters; in direct feed to ethylene crackers; in gasoline blending and as a substitute for gas in turbine power generation. It can be defined as a base material, a blending component, a feedstock or a boiler feed.

See website for Table of Contents and sample tables, charts and graphs.

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Cost study plus math should doom US energy bills

The oil and gas industry should welcome an important study projecting the costs of energy bills under consideration in Congress. But it should not let an impressive modeling exercise obscure simple mathematics.

Forecasts about economic effects are difficult to make and easy to nitpick. Flawed details and disputed assumptions can discredit whole studies that reach otherwise valid conclusions.

The Editor's Perspective

by Bob Tippee, Editor

Energy bill supporters will treat the new cost study by Charles Rivers Associates that way if they don't try simply to ignore it.

Commissioned by the American Petroleum Institute, the study says the legislation would lower US gross domestic product by 1.7% against baseline projections in 2020 and by 4% in 2030 (OGJ Online, Nov. 14, 2007).

By 2030, the study says, the legislation would lower employment by 4.9 million jobs and average annual purchasing power of US households by $1,700.

And it would trim production of oil against baseline projections by an average of 4%/year and gas by 2%/year during 2010-20. Demand for oil would be about 18% lower than expectations in 2020 and 33% in 2030 due to "significantly higher costs faced by end-users."

These things happen when a government raises taxes on and in other ways punishes the industry that produces commodities representing almost two thirds of US energy supply. They are strong reasons not to impose the taxes or inflict the punishment.

If backers of the energy bills pay the study any attention at all, they'll assault details and insist questionable tidbits discredit everything. Or they might dismiss the study on sight because of API's role in it, arguing that anything touched by an oil group bears ineffaceable tarnish.

These days, US energy policy-making repels facts about energy, especially facts from an industry that knows something about the subject.

Even if industry opponents manage to sweep aside an important study, though, the energy bills still won't bear up to math.

It's mathematically impossible to lower energy costs by replacing oil and gas with costlier substitutes.

It also should be mathematically impossible for anyone who argues otherwise to hold elective office, but politics follows its own weird rules.

(Online Nov. 16, 2007; author's e-mail: bobt@ogjonline.com)

Market Journal

by Sam Fletcher, Senior Writer

Crude price waffles above $90/bbl

The front-month crude futures contract fell $3.45 to $91.17/bbl Nov. 13 on the New York Mercantile Exchange, the lowest level in nearly 2 weeks, after the International Energy Agency (IEA) in Paris reduced its estimates of global oil demand for the fourth quarter through 2008.

Citing higher prices and weaker-than-expected economic data from the US and the former Soviet Union, IEA reduced its projected fourth-quarter demand for crude by 500,000 b/d. The organization also reduced its 2008 demand estimate by 300,000 b/d. IEA estimates world demand for crude will average 85.7 million b/d in 2007, up 1.2% from 2006 levels. It's projecting demand of 87.7 million b/d in 2008, up 2.3% from 2007.

Crude futures prices rebounded Nov. 14 as the market worried about a possible counter-seasonal draw of US oil inventories. But the December contract for benchmark US light, sweet crudes dropped 66¢ to $93.43/bbl Nov. 15 in New York after the Energy Information Administration (EIA) reported the first build in US crude inventories in 4 weeks and the Organization of Petroleum Exporting Countries reduced its forecast for oil demand growth.

Citing higher energy prices and warmer winter weather, OPEC reduced its estimate of fourth-quarter growth in global oil demand by 100,000 b/d to 1.7 million b/d, for a growth rate of 1.97%, down from 2.1% in its previous monthly report. OPEC said demand for crude in 2007 will grow only 1.4%, not 1.5% as previously estimated, but its outlook for the first quarter of 2008 remains unchanged at 1.8% growth, or 1.5 million b/d.

US crude inventories jumped 2.8 million bbl to 314.7 million bbl in the week ended Nov. 9. Consensus of Wall Street analysts was for a decline of 400,000 bbl. US gasoline stocks increased 700,000 bbl to 195 million bbl vs. an expected drop of 200,000 bbl. Distillate fuel inventories fell 2 million bbl to 133.4 million bbl during the same period instead of the expected decline of 100,000 bbl. However, most of that crude build was in the isolated Petroleum Administration for Defense District (PADD) 5, including the West Coast, Alaska, and Hawaii. Crude inventories in PADD 2—the Midwest, including the Cushing, Okla., pipeline distribution point—remained unchanged, said Olivier Jakob, managing director of Petromatrix GMBH, Zug, Switzerland.

"Following a sharp rise in imports, crude oil inventories rose by just 900,000 bbl east of the Rockies and were flat at Cushing," said Paul Horsnell at Barclays Capital Inc., London. "Like crude oil, the rise in gasoline inventories was concentrated on the West Coast, and the required seasonal build before yearend still looks far too anemic to us." Horsnell also noted that US gasoline demand appears to have been down only 0.4% from year-ago levels in the first 8 days of November despite a 39.4% jump in retail prices.

Few things have the potential to be more corrosive to energy prices "than a sudden cholera-like outbreak" of pessimism over crude demands of the US and other members of the Organization for Economic Cooperation and Development, Horsnell said. "The sense of the IEA's comments is that they believe that the speeding up in oil demand growth would have been greater if prices had not risen. In our view that is precisely the reason why prices had to rise because we believe that demand growth rates as high as the IEA's original forecasts could have led to some significant degree of stress within the system," he said.

Major market change

The most significant change in oil markets over the last 10 years "is the increased length of time required for markets to rebalance in the aftermath of both supply and demand shocks," said Adam Sieminski, chief energy economist for Deutsche Bank AG, Washington, DC. "We still believe that oil prices are going to come down from today's levels but that the time frame required to do that has been stretched out," he said. "We still believe that oil prices should eventually fall toward the mid-$60/bbl."

At $95/bbl the real price of crude is "back to levels reached in early 1980s that were associated with a global recession," Sieminski said. "Relative to gross domestic product, however, it would take $125-150/bbl oil to achieve the same peak, because incomes have grown faster than the oil price. There is also good evidence that what causes oil recessions is war-related fears of not getting oil at any price. The slow boil on prices that we have had for the last 7 years is less destructive to consumer psychology. In short, there is no obvious tipping point, and that is why the price keeps going up."

(Online Nov. 19, 2007; author's e-mail: samf@ogjonline.com)

Is cathodic protection worthless?

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

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

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

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

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

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

NACE Standard RP0169-2002 states: *"Materials....that create electrical shielding should not be used on the pipeline"* [1].

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

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

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

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

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

1. NACE Standard RP0169-2002 *"Control of External Corrosion on Underground or Submergeed Metallic Piping Systems"*.
2. 49 CFR Ch.1 (§192.461 see also §195.559)

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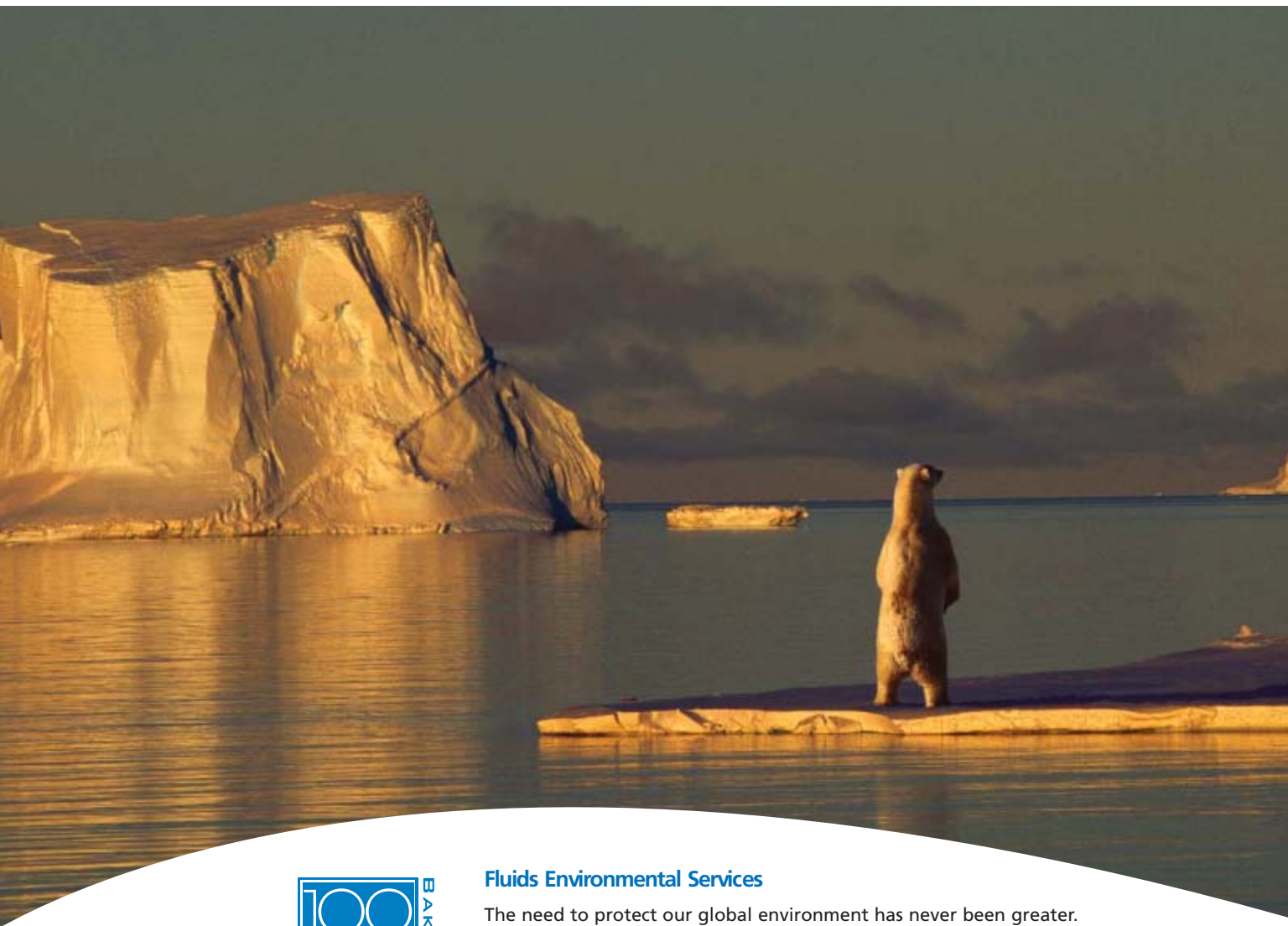

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