Comprehensive Energy Industry Directories

Electronic Directories that Always Remain Current

Energy industry Directories that provide valuable company location and contact information for thousands of companies in the worldwide and US energy industry. The most comprehensive and current directories now available for the energy industry. An annual subscription provides the user with frequent updates so that the directories always remain current.

These are electronic directories that reside on your PC desktop for easy access and use (sorry no Macs). The directory information is searchable and printable, and there are links available to company web sites. The directories use unique software that enable the information to be displayed much like a print directory. Contact information at your fingerprints, but not exportable to spreadsheet or database.

For most companies the

ELECTRONIC DIGITAL DIRECTORIES INCLUDE:

Company locations, phone and fax,
Key personnel with phone and email
Company operating & finance descriptions
Company Links to websites

Operating Companies
Engineers, Contractors & Service Co's
Equipment Manufacturers & Suppliers
Trade Associations & Regulatory Agencies

- Gas Utility Industry – Worldwide
- Electric Utility Industry - Worldwide
- Pipeline Industry - Worldwide
- Refining & Gas Processing Industry - Worldwide
- Petrochemical Industry - Worldwide
- Liquid Terminals Industry - Worldwide
- Drilling & Well Servicing Industry - Worldwide

- United States & Canada E&P
- Texas E&P
- Houston & Gulf Coast E&P
- Mid Continent & Eastern US E&P
- Rocky Mountain & Western US E&P
- Offshore E&P
- International E&P (outside North America)

Directory Numbers (latest counts)

Directory	Listings	HQ Offices	Personnel	Emails	Phone	Fax	Website
Pipeline	22,584	7,955	67,162	52,951	46,409	21,868	6,328
Refining & Gas Processing	20,873	8,726	58,369	45,344	39,455	20,031	6,462
Petrochemical	18,882	8,264	50,755	38,598	35,863	19,268	5,911
Liquid Terminals	8,457	2,983	28,325	22,693	19,142	8,933	2,637
Gas Utility	13,768	6,645	47,288	37,118	31,035	15,903	4,873
Electric Utility	27,586	13,117	81,906	62,193	49,642	25,432	9,160
Drilling & Well Servicing	15,275	6,745	37,279	28,303	23,639	12,974	3,691
Offshore E&P	9,197	3,842	30,382	25,032	16,240	8,518	3,313
International E&P	10,796	4,647	25,495	16,684	16,869	7,459	2,818
United States & Canada E&P	38,595	23,500	81,713	51,098	54,145	27,242	6,758
Texas E&P	11,760	7,820	31,857	22,614	19,578	9,921	3,101
Houston & Gulf Coast E&P	10,403	6,307	32,722	24,387	18,347	9,409	3,626
Mid Continent & Eastern US E&P	12,370	8,407	29,854	18,954	20,142	8,900	2,576
Rocky MTN & Western US E&P	9,539	6,256	21,603	13,119	13,860	6,710	1,647

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Worldwide Construction Update

Geochemical innovations point to vast Lodgepole oil

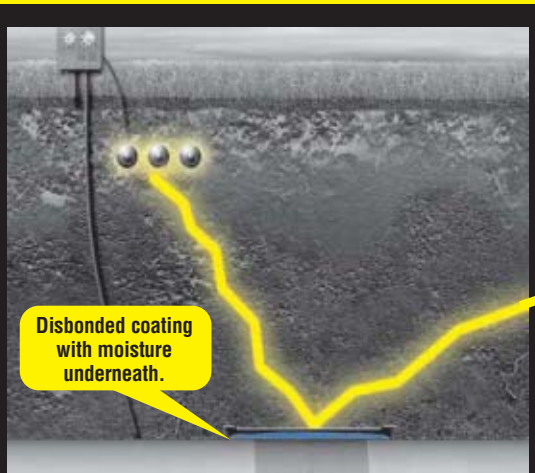
CO_2 compressors, pumps remove bottleneck at Weyburn

Report refines, forecasts cyber-security issues

Offshore pipelay vessels grow in strength, number

CATHODIC SHIELDING BY DISBONDED COATINGS

Why you need Polyguard RD-6



Graphic Illustration of Shielding

Extracted from NACE document "Coating Failure Definitions in Relation to CP"

Definition of "Shielding With No Holiday"

"A substantial diversion of cathodic current away from its intended target (i.e.steel substrate) due to a disbonded coating with a high dielectric characteristic and no holidays on the disbonded coating. Steel substrate is deprived of protective current and corrosion can continue undetected and unchecked, including MIC activity, until failure occurs. Traditional diagnostic techniques such as CIS and DCVG cannot identify the existence of such anomalies."

DISBONDMENT
Even the best coatings can disbond in areas over time. Disbondment risk is greatest with girth weld coatings which are application sensitive and subject to soil stress.

HIGH DIELECTRIC
Corrosion coatings with solid film backing have this high dielectric characteristic.

INSIDIOUS #1
We at Polyguard believe that the problem of shielding disbonded coatings is one of the most serious in the pipeline industry. Our belief is reinforced as large operators who discover the shielding problem convert to our RD-6 coating system.

INSIDIOUS #2
Shielding hides corrosion not only from CP, but also from common diagnostic techniques. Shielding is truly an insidious phenomenon.

Two corrosion coatings are proven to be non-shielding, that is to allow passage of protective CP current into disbonded areas. One of these is FBE. The other is the Polyguard RD-6 coating system. After 21 years, and thousands of installations, there has been no significant metal loss found under the Polyguard RD-6 coating system.

Polyguard

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N° 180576

Polyguard has been ISO 9000 certified since 1996.
Current certifications are:
- American Natl. Standards Institute
- Dutch Council for Certification
- Deutscher Akkreditierungs Rat

Visit www.polyguardproducts.com/flash.htm to review the dozens of technical papers published on the subject of shielding since the mid 1980's, and to see an animated graphical explanation of CP shielding.

OIL&GAS JOURNAL®

Nov. 16, 2009
Volume 107.43

WORLDWIDE CONSTRUCTION UPDATE

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COVER

Motiva Enterprises LLC's expanded Port Arthur, Tex., refinery will be the largest in the US when completed in 2011. Motiva, a joint venture of Shell Oil Co. and Saudi Refining Inc., originally planned to complete the $7 billion expansion in late 2010. The project will add a 325,000-b/d, single-train crude distillation unit among other units, including an 85,000-b/d catalytic reformer with associated isomerization and hydrotreating units, a sulfur recovery facility, a 75,000-b/d hydrocracker integrated with a new 60,000-b/d diesel hydrotreater, a 50,000-b/d hydrotreater for feed to the existing catalytic cracker, and a 95,000-b/d coker. Photo from Bechtel Corp. Above: The Ethylene Cracker Complex, part of the Shell Eastern Petrochemicals Complex, is a world-scale facility that will produce 800,000 tonnes/year of ethylene, along with propylene, benzene, and butadiene. The cracker is being constructed on Pulau Bukom Island off Singapore, with process unit start-up expected in first-quarter 2010. The project is being executed by CB&I Lummus in a joint venture with Toyo Engineering Corp. Photo from CB&I.

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OGJ Newsletter

Nov. 16, 2009

International news for oil and gas professionals
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General Interest — Quick Takes

EPA directs Texaco to resume Superfund cleanup

The US Environmental Protection Agency has ordered Texaco Inc., which Chevron Corp. acquired in 2001, to assess soil and ground water contamination and evaluate cleanup options for the Pacific Coast Pipeline Superfund site in Fillmore, Calif.

Texaco operated the 52-acre site northwest of Los Angeles as a refinery from 1920 to 1951, contaminating soil and ground water with heavy metals and volatile organic compounds, EPA said on Nov. 4. It said the company cleaned up on-site waste disposal pits in 1986 and, in 1993 under the chemical waste Superfund program, pumped and treated the ground water under EPA's direction.

Benzene is the primary contaminant in the ground water, the federal environmental regulator said in a unilateral administrative order. The benzene plume, which extends 100 yards off the site, does not threaten drinking water wells but concentrations remain above drinking water standards, it added.

The soil has low levels of lead and semivolatile chemicals, such as naphthalene, which also need to be addressed, according to EPA. It said it is updating the Pacific Coast Pipeline Community Involvement Plan to identify opportunities for communication with the public about upcoming activities at the site.

Industry extends funding for marine life research

Oil and gas producers have agreed to extend funding of a joint industry program (JIP) to support research into learning more about how sounds generated by upstream oil and gas activities affect marine life.

Much of the research has focused upon how various types of whales react to sounds and vibrations created by seismic survey equipment.

The JIP on Sound and Marine Life started with a 1-year scoping phase in 2005 followed by a 3-year phase that started in May 2006. The International Association of Oil & Gas Producers announced a 3-year funding extension on Nov. 11. OGP is based in London.

John Campbell, OGP technical director, said the extension will "enable us to continue supporting key research that assists regulatory and technical organizations in understanding the complex marine environment."

A core of 10 of the original JIP participants agreed to extend the fund. They are BG Group, BHP Billiton, Chevron Corp., ConocoPhillips, Eni SPA, ExxonMobil Corp., the International Association of Geophysical Contractors, Santos Ltd., Statoil ASA, and Woodside Petroleum Ltd.

One of the first JIP projects led to developing acoustic-monitoring software that helps operators detect the presence of marine mammals within exploration and development areas.

Since May 2006, the JIP has funded 62 projects, and various government groups worldwide have helped funded many of these projects. JIP research addresses:

- Sound source characterization and propagation in the ocean.
- Physical, physiological, and hearing effects of sound on marine life.
- Behavioral reactions and their biological significance to sound in the marine environmental.
- Mitigation, monitoring, data analysis, and management.

Oil and gas group forms in Greenland

Responding to "a continuously increasing focus on the possibilities for oil and gas production in Greenland," seven operators have formed a trade association anticipating industry development in the country.

Founding members of the Greenland Oil Industry Association are DONG E&P Greenland AS, Esso Exploration Greenland Ltd., Chevron Greenland Exploration AS, Husky Oil Operations Ltd., Capricorn Greenland Exploration Ltd. (a subsidiary of Cairn Energy PLC), PA Resources AB, and Nunaoil AS.

All the companies have interests in exploration licenses off western and southern Greenland (see map, OGJ, Aug. 24, 2009, p. 38). At present, Greenland produces no oil or gas.

In a press statement, DONG Energy said members of the group will pursue safety and environmental stewardship, knowledge sharing, public and governmental communications, and development of a competitive industry. ✦

Exploration & Development — Quick Takes

New Zealand's Maari-Manaia tops 100 million bbl

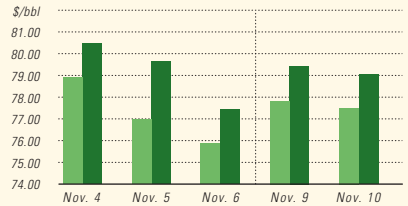
Estimated ultimate recovery of more than 100 million bbl of oil has been confirmed for OMV AG-operated Maari field and adjacent Manaia field in the offshore portion of New Zealand's Taranaki basin, two of the field's partners said.

OMV, which declined comment on reserves and production until a full evaluation is complete, plans to place on production an extended reach well that at 26,250 ft is New Zealand's longest penetration. That well, Manaia-1, penetrated a Mangahewa formation reservoir on the Manaia structure.

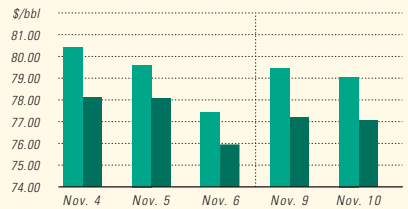
The new recovery figure is twice the volume initially estimated for the main Moki sands reservoir at Maari. New Zealand's next

Industry Scoreboard

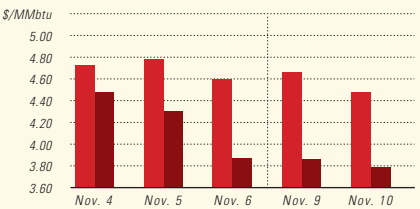
IPE BRENT / NYMEX LIGHT SWEET CRUDE



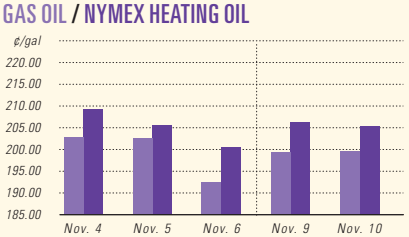
WTI CUSHING / BRENT SPOT



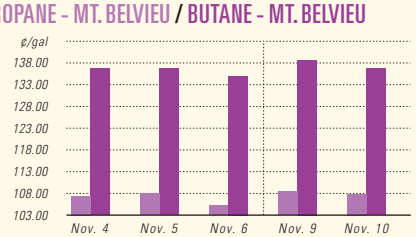
NYMEX NATURAL GAS / SPOT GAS - HENRY HUB



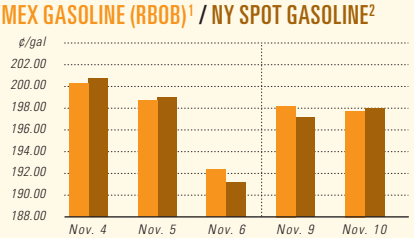
IPE GAS OIL / NYMEX HEATING OIL



PROPANE - MT. BELVIEU / BUTANE - MT. BELVIEU



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



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

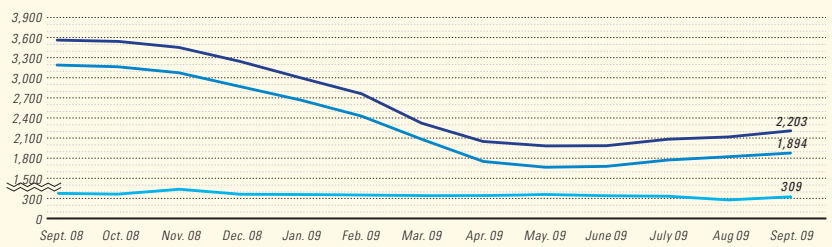
US INDUSTRY SCOREBOARD — 11/16

Latest week 10/30	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	9,020	9,024	0.0	9,024	9,004	0.2
Distillate	3,563	4,182	–14.8	3,598	3,968	–9.3
Jet fuel	1,373	1,417	–3.1	1,410	1,564	–9.8
Residual	613	597	2.7	548	619	–11.5
Other products	4,249	4,478	–5.1	4,148	4,422	–6.2
TOTAL DEMAND	18,818	19,698	–4.5	18,728	19,577	–4.3
Supply, 1,000 b/d						
Crude production	5,374	4,669	15.1	5,253	4,934	6.5
NGL production[2]	1,958	1,891	3.5	2,002	2,097	-4.5
Crude imports	8,612	10,086	–14.6	9,183	9,779	-6.1
Product imports	2,518	3,116	–19.2	2,764	3,145	-12.1
Other supply[3]	1,536	1,807	–15.0	1,672	1,576	6.1
TOTAL SUPPLY	19,998	21,569	–7.3	20,874	21,531	-3.1
Refining, 1,000 b/d						
Crude runs to stills	14,341	15,038	–4.6	14,473	14,683	-1.4
Input to crude stills	14,641	15,036	–2.6	14,822	15,038	-1.4
% utilization	82.9	85.3	—	84.0	85.4	—

Latest week 10/30	Latest week	Previous week[1]	Change	Same week year ago[1]	Change	Change, %
Stocks, 1,000 bbl						
Crude oil	335,914	339,850	–3,936	311,927	23,987	7.7
Motor gasoline	208,277	208,564	–287	196,113	12,164	6.2
Distillate	167,376	167,754	–378	127,835	39,541	30.9
Jet fuel–kerosine	45,183	45,852	–669	36,652	8,531	23.3
Residual	35,054	34,318	736	38,842	–3,788	–9.8
Stock cover (days)[4]			Change, %		Change, %	
Crude	23.8	23.9	–0.4	21.5	10.7	
Motor gasoline	23.1	23.0	0.4	21.7	6.5	
Distillate	47.0	47.2	–0.4	31.9	47.3	
Propane	55.6	58.8	–5.4	50.7	9.7	
Futures prices[5] **11/6**			Change		Change	%
Light sweet crude ($/bbl)	79.04	78.51	0.53	65.44	13.60	20.8
Natural gas, $/MMbtu	4.77	4.69	0.08	6.40	–1.63	–25.4

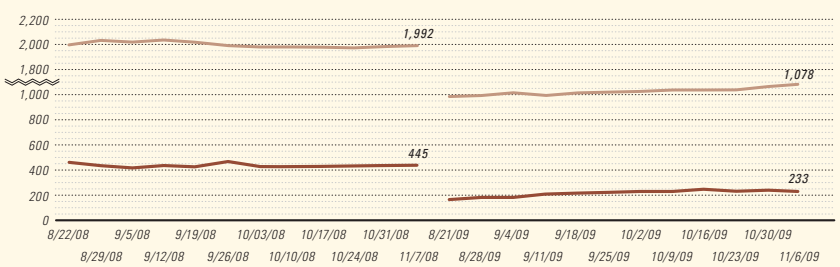
[1]Based on revised figures. [2]Includes adjustments for fuel ethanol and motor gasoline blending components. [3]Includes other hydrocarbons and alcohol, refinery processing gain, and unaccounted for crude oil. [4]Stocks divided by average daily product supplied for the prior 4 weeks. [5]Weekly average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

largest producing area is the Tui fields at an original 50 million bbl.

Recent additional discoveries at Manaia and the Maari M2A sands plus the main Moki reservoir together "amount to over 100 million bbl of recoverable oil," said Richard Tweedie, chairman of Maari minority partner Cue Energy. Maari field went on production in April.

The Manaia extended reach well is to be tied into Maari facilities and begin producing within months. Production from the M2A zone well in the Moki sands, 50 m above the main reservoir, is expected to start by yearend.

Another Maari partner, Horizon Oil, said the additional reserves will extend the field's production plateau. The MR9 well to the M2A zone will produce intermittently when capacity becomes available.

Horizon said the Manaia-1 horizontal well cut 1.5-km-long Mangahewa reservoir section with a net-to-gross pay factor of 60-70% and that logs and gas-oil ratio analyses confirm the presence of oil throughout.

There was no revision to the predrill oil in place estimate of 50-60 million bbl at this stage. Horizon said oil in place estimate for the Maari M2A zone is 30-40 million bbl (OGJ Online, Oct. 7, 2009).

Exploratory wells have penetrated two more oil zones at Maari that are not yet appraised, Horizon noted. They are the deeper Mangahewa formation at Maari and the shallower Moki formation at Manaia.

Maari-Manaia interests are OMV 69%, Todd Energy 16%, Horizon Oil International 10%, and Cue Energy Resources 5%. Todd Energy owns 27% of Cue.

EOG sees reserve hike in Barnett Combo play

Improved horizontal completion techniques in the North Texas Barnett Combo play have led EOG Resources Inc. to estimate that ultimate recoveries in one area will be 80% higher than the company's early 2008 estimates in the play.

The new EUR figure for wells in eastern Montague and western Cooke counties is 280,000 boe, EOG said.

The two recent horizontal wells, Christian A-1H and B-1H, had initial production of 1,000 b/d and 6,000 b/d of oil and 2.5 and 2 MMcfd of gas, respectively. EOG has 100% working interest.

Meanwhile, in the play's core area, where pay intervals are thickest, EOG has been developing its acreage with vertical wells that are expected to recover more than 220,000 boe. For example, the Fitzgerald-1 and Stephenson-1 vertical wells had initial rates of 1,100 b/d and 450 b/d of oil and 2.1 MMcfd and 700 Mcfd, respectively. EOG's interest is 100%.

The company, which rarely makes acquisitions, made a tactical purchase of 7,800 net acres in the two counties in the quarter ended Sept. 30.

Reliance reports Cambay oil discovery

Reliance Industries Ltd., Mumbai, reported a Miocene oil discovery in the Cambay basin southwest of Ahmedabad, India, that Reliance said "is expected to open future potential within the block."

CB10A-A1, Reliance's fifth well, went to a total depth of 1,451 m in Part A of the two-part block and flowed at a rate of 500 b/d of oil from the Babaguru formation of Miocene basal sand on a 6-mm bean with 360 psi flowing tubinghead pressure. The well has a gross reservoir thickness of 15 m.

Block CB-ONN-2003/1, won in India's fifth licensing round, has two parts in Gujarat. Part A to the west covers 570 sq km, and Part B to the east covers 65 sq km. Reliance, which holds 100% participating interest, named the discovery Dhirubhai-43.

Reliance has shot 3D seismic data over 80% of the block and 2D data over its entirety. Based on interpretation of the 3D data, Reliance has identified several prospects at different stratigraphic levels to fulfill the minimum work obligation under the production sharing contract.

GeoResources Bakken participation growing

GeoResources Inc., Houston, said the pace of activity in the Williston basin Bakken/Three Forks play is increasing in its joint venture with Slawson Exploration Co., private Wichita-based operator.

GeoResources expects to participate in 60 joint venture wells in the next 18 months and will hold minor interest in numerous other wells. The company has 10-18% working interest in 110,000 net acres in the Bakken and has a 100% success rate with 34 Slawson-operated wells.

GeoResources, which continues to acquire land, said 63,000 acres are in Mountrail County, ND, on the east side of the Nesson anticline.

The company also owns minor working interests with multiple operators in more than 125 wells in the Bakken/Three Forks play in different parts of the basin.

Most wells in which GeoResources participates will be on 640-acre units, but the company is scheduling 1,280-acre and some larger spacing units and has numerous locations that may result in or require the larger units.

Completed well costs for single-lateral wells on 640-acre units are $3-3.5 million. Initial production rates have improved as the number of frac stages increases, and recent wells have had 18 stages. Three rigs are running and a fourth rig joins in from time to time. ✦

Drilling & Production — *Quick Takes*

Rio Napo JV starts operations at Sacha field

Rio Napo, a 70-30 joint venture of Ecuador's state oil company Petroecuador and Venezuela's Petroleos de Venezuela SA (PDVSA), has begun operating Sacha oil field in Ecuador's Amazon.

Marco Nogera, Rio Napo's manager of planning, said the firm plans to reach output of 70,000 b/d of oil by 2014-15—an increase of 40% over the current 49,780 b/d—or about 10% of Ecuador's total oil production. Sacha field holds 491 million bbl of oil reserves.

According to Nogera, the JV plans to invest $621 million in ex-

ploration and production activities at Sacha over the next decade, with about 60% of the investment coming in the next 5 years. In September Rio Napo signed a service contract with Petroproduccion, a Petroecuador subsidiary, for Sacha field. PDVSA said the contact was to "manage, increase production at, develop, optimize, integrally improve, and exploit" the Sacha site.

Analyst BMI said Sacha is "one of the country's largest producing fields, but insufficient investment has meant that, as is the case with several other fields operated by Petroecuador, it has yet to reach its full potential."

BMI added that the Rio Napo JV is one of a series of accords reached between Ecuador and Venezuela since President Rafael Correa took power, in line with the strategy of the Venezuelan leader Hugo Chavez of offering "special treatment" to his leftist allies in the region.

In addition to Venezuela, Ecuador last month also signed an E&P contract for its Oglan field with a joint company of Petroecuador and China Petroleum & Chemical Corp. (Sinopec).

With the agreement, Sinopec joins a handful Chinese state oil companies that have positioned themselves in the Ecuadorian market as partners of Petroecuador, including China National Petroleum Corp., Andes Petroleum, Petroriental, Sinopec, and CPEB Changqing Petroleum.

Petroecuador also started talks with Angola's Sonangol, which is interested in Blocks 28 and 29 in the Amazon region as well as offshore Block 42. In April Petroecuador and Sonangol signed an agreement to cooperate in several blocks in Ecuador.

PSAC sees low 2010 Canadian drilling activity

The Petroleum Services Association of Canada (PSAC) expects the oil and gas industry to drill 8,000 wells in Canada during 2010.

This number of wells is about the same as its current forecast for 2009, which is 1,500 wells less than it expected in July and considerably less than the 16,000 wells it had forecast at yearend 2008.

PSAC's 2010 breakdown by province and change from 2009 is 5,095 wells in Alberta (a 5% decrease), 630 in British Columbia (a 7% increase), 1,935 wells in Saskatchewan (a 10% increase), and 300 wells in Manitoba (a 22% increase).

PSAC noted that it sees adequate oil prices in 2010 to sustain conventional drilling activity in areas such as Saskatchewan and northeast Alberta, but continued low gas prices that will reduce by 30% conventional shallow-gas drilling in southeast Alberta.

PSAC based its 2010 forecast on an average $5 (Can.)/Mcf gas price and a $72/bbl West Texas Intermediate oil price.

Contract let for coal gasification plant

Tenaska Energy Inc., Omaha, has let a contract to Siemens Energy for coal gasification technology at the planned Taylorville Energy Center (TEC), one of the first commercial-scale facilities of its kind in the US to use carbon capture and sequestration.

Siemens will provide equipment contracts and licensing agreements for four 500-Mw-class gasifiers.

TEC, in Taylorville, Ill., will have gross generating capacity of 730 Mw, and net capacity of 500-525 Mw.

It will use a hybrid integrated gasification combined-cycle process to convert coal into synthesis gas, which in turn will be converted into methane, called substitute natural gas (SNG) by project sponsors, to fuel power generation.

Officials of Tenaska, TEC managing partner, expect the facility to produce about 33 trillion btu of SNG/year.

Volumes not needed as fuel for two gas turbines will move to a connection with the interstate pipeline system. Amounts will depend on coal and gas prices. Officials say current modeling indicates the SNG pipeline volume will be about 10 trillion btu/year.

The project will capture as much as 3 million tons/year of carbon dioxide at the synthesis gas stage, more than half its output of the greenhouse gas. It will sequester the CO_2 underground near the plant site or sell it for use in enhanced oil recovery.

Tenaska and Siemens officials say capturing that much CO_2 will make the TEC comparable in greenhouse gas emissions to a power plant fueled by natural gas.

The facility is expected to cost $3.5 billion. The US Department of Energy has selected the project for negotiation of loan guarantees totaling as much as $2.579 billion under a program created by the Energy Policy Act of 2005.

DOE last month issued a notice of intent for the preparation of an environmental impact statement for the TEC loan guarantee. ✦

Processing — *Quick Takes*

Western Refining trimming New Mexico units

Western Refining Inc., El Paso, is consolidating operations of its two small refineries in New Mexico to reduce operating costs in a period of shrunken refining margins.

To be consolidated at Gallup are the 23,000 b/d refinery there and the 17,000 b/d facility at Bloomfield, which will be idled. Western said total crude throughput will not decline from recent combined levels, which in the first 9 months of this year averaged 25,560 b/d.

The company said the move will cut operating costs by about $25 million/year beginning in the first quarter of 2010.

The Gallup refinery's processing capacities include 7,000 b/d of catalytic cracking, 8,000 b/d of catalytic reforming, 16,500 b/d of catalytic hydrotreating, 2,500 b/d of alkylation, and 5,000 b/d of isomerization.

Bloomfield's capacities are 5,000 b/d of catalytic cracking, 5,100 b/d of catalytic reforming, 8,300 b/d of catalytic hydrotreating, and 2,000 b/d of polymerization.

The refineries, about 95 miles apart, process mainly light sweet crude and natural gas liquids produced nearby. Western owns more than 250 miles of crude gathering lines.

"The company is evaluating alternative uses for the Bloomfield refinery, including the possibility of biofuels production," Western said in a press statement.

Western also operates a 128,000 b/d refinery in El Paso and a 70,000 b/d refinery in Yorktown, Va.

Citing the margin squeeze and low differentials between heavy and sour crude, the company reported a third-quarter loss of $4.8 million, compared to a profit of $109.2 million for the same period last year.

Three refineries pending for Pakistan

Three refineries with a total capacity of 465,000 b/d "are in the pipeline," Pakistan Minister for Petroleum and Natural Resources Naveed Qamar told the National Assembly.

Included are the 250,000-b/d Khalifa Coastal refinery and the 115,000-b/d Bosicor Oil Pakistan Ltd. facility, both in Hub, Balochistan Province; and the 100,000-b/d Trans-Asia Refinery Ltd. facility at Port Qasim in Karachi.

Existing refineries in Pakistan include the 100,000-b/d Pak-Arab refinery; the 62,050-b/d National refinery; the 47,110-b/d Pakistan Refinery Ltd. facility; the 42,000-b/d Attock refinery; the 30,000-b/d Bosicor Pakistan facility; the 2,500-b/d Dhodak Refinery Ltd. facility; and the 2,646-b/d Enar Petrotech Services Ltd. facility.

As an incentive to attract local and foreign investment, the current petroleum policy requires no prior government permission for a new refinery project.

The minister said refineries are free to sell their product to any marketing companies, or they can set up their own marketing firms. The Pakistan government recently approved additional incentives for all new megaprojects of minimum 100,000 b/d production capacity to be installed along the coastal belt of Balochistan, particularly Gwadar, with 20 years income-tax holiday, he added.

The terms and conditions contained in the Ministry of Commerce trade policy for 2008-09 will be applicable for import of second-hand refinery project in its letter and spirit. The sponsors shall ensure the design of second-hand refinery is thoroughly reviewed and verified by an independent engineering consultant. ✦

Transportation — *Quick Takes*

Transneft poses export tariff zones for ESPO line

Russia's OAO Transneft has proposed dividing its East Siberia-Pacific Ocean oil pipeline into three export tariff zones, according to a company official.

Spokesman Igor Dyomin said Transneft wants the ESPO line to be divided into the eastern, western, and central export tariff zones, with $34/tonne charged for oil transported via the eastern zone, $48/tonne via the western zone, and $42/tonne via the central zone.

The eastern zone will extract oil from Talakan field, the western zone from Vankor field, and the central zone from fields in the southern Krasnoyarsk territory, said Dyomin, who added that the proposals already have been filed with the Russia's Federal Tariffs Service.

Transneft expects the tariff for oil transportation through its system to increase in 2010 at a rate comparable with inflation, said Dyomin, who added that the state firm has no plans to increase its tariff proportionally to the growth of its expenses, which are expected to rise by 30%.

Russian authorities last month said oil for the line is to be branded Vsto, and will be light and medium-sour, superior to Urals export blend but inferior to Siberian Light (OGJ Online, Oct. 12, 2009).

Moldova to investigate gas pipeline explosion

Moldovan Prime Minister Vladimir Filat said his government has established a commission to investigate the cause of an explosion on a natural gas trunkline that supplied the Balkans with Russian gas.

A section of the line, about 70 km southeast of Moldova's capital Chisinau, burst on Nov. 8 and cut supplies to 34 Moldovan villages and towns but left gas transit to the Balkans unaffected.

MoldovaGaz Chief Executive Officer Alexander Gusev said the blast may have occurred due to wear-and-tear or even negligent work in its construction. Earlier this year, another blast occurred along the pipeline in the self-proclaimed Dniester Republic, and was attributed to wear-and-tear.

"The country's gas pipelines are ageing while no serious investment in upgrades has been made or is on the horizon," said analyst IHS Global Insight. "With the onset of winter and no imminent investment on the horizon for Moldova's gas pipeline network, further explosions and gas disruptions may well occur."

First phase finished for PNG LNG project

ExxonMobil Corp. and its joint venture partners completed the front-end engineering and design phase for their Papua New Guinea LNG project.

All that is needed before a final investment decision for the project are a benefit-sharing agreement with the Papua New Guinea government, expected in the next few weeks, and ExxonMobil finalizing loan finance as well as sales and purchase agreements with customers.

Papua New Guinea Prime Minister Michael Somare said the project would help transform the economy and raise living standards in the country.

About 60,000 landowners in remote rural areas will be direct beneficiaries of royalties and dividends in addition to the increased capacity of the national, provincial, and local governments to improve infrastructure and services.

ExxonMobil and its partners are already implementing a number of programs, including work on building training facilities for 1,000 people at Juni in the Southern Highlands and in Port Moresby.

Work will be carried out to help landowner companies via the provision of jobs and cash dividends.

The Papua New Guinea LNG project will cost $15 billion and have the capacity to produce 6.6 million tonnes/year of LNG. The country's Department of Environment and Conservation approved its environmental impact statement. ✦

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Letters

Focus on jobs

One of the unfortunate characteristics of the oil and gas industry is its unwillingness to estimate the impact of government actions in terms that the public can relate to.

While industry people can get silly about impacts in terms of marginal barrels per day and dollars per barrel, what the public relates to is jobs created and jobs destroyed.

For a change, it would be nice to see the American Petroleum Institute, National Petrochemical and Refiners Association, or National Petroleum Council objectively look at the options on the table before Congress and estimate the jobs impacts on the primary hydrocarbons business—and also on the secondary jobs that depend on oil and gas.

Congress would look differently at the oil provisions if its members knew that, say, 500,000 jobs in the business

would be destroyed.

If you look at lobbyists for the renewable energy industry, all they talk about in Washington is jobs created within their sector. We never learn.

Tony Pavone
Menlo Park, Calif.

Calendar

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

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International Petroleum Technology Conference (IPTC), Doha, +971 4 390 3540, e-mail: iptc@iptcnet.org, website: www.iptcnet.org/2009. 7-9.

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Spending clunkers cash

Sam Fletcher
Senior Writer

The US government's $3 billion Cash for Clunkers program, designed to put more fuel-efficient vehicles on the road, mainly involved deals that swapped used, full-size pickups for new, full-size pickups with barely better gasoline mileage, according to an Associated Press analysis of federal data.

New Ford F-150 and Chevrolet Silverado pickups, along with Ford's Escape midsize sports utility vehicle, were among the 10 most popular vehicles purchased with government rebates. "The most common truck-for-truck and truck-for-SUV deals totaled at least $911 million," AP reported.

The single most common swap—with more than 8,200 deals reported—was trading older F-150 pickups for new models of the same type of vehicle.

AP reported participants in the government program were "17 times more likely" to buy a new F-150 than a Toyota Prius. The Prius, according to a separate study by Deutsche Bank Securities Inc. (DBS), is "far and away the most successful hybrid vehicle in the US, accounting for over half of all hybrids sold to date in the country (797,000 out of 1.584 million through August)." That would seem to support a common assumption "that Soccer Moms…want to drive a four-DVD living room welded to a light truck chassis to the shops, for their comfort, convenience, and perceived security," said Paul Sankey, DBS senior analyst for US integrated oil and refining. But that assumption "may be a misconception," he said.

When oil prices climbed in 2007-08, consumers stopped buying SUVs. "They did not switch from conventional SUVs to hybrid SUVs; they abandoned SUVs altogether," Sankey said. "If presented with extremely high gasoline prices, Americans will move towards smaller, lighter, and more-efficient cars, because that is clearly what they did in 2007-08." And, he said, "We see no evidence to date that SUV sales are rebounding in a lower gasoline price environment; thus we believe that the change in vehicle tastes for the US consumer may have undergone a secular shift."

'Disruptive' hybrids

Hybrid vehicles are "a 'disruptive technology' like digital cameras—a superior product that altogether replaces the previous incarnation," Sankey said. "Our view is that oil supply tightness will squeeze against rising global GDP-driven oil demand into a major price rise that will peak at $175/bbl in 2016. This will stimulate a further acceleration in the adoption of high-efficiency vehicles, most notably hybrids, a trend that will put sustained pressure on US gasoline demand, the largest single component of global oil demand."

A "key conclusion" from DBS's recent analysis of hybrid vehicle economics is that the Prius is "close to economically justified" in terms of price premium vs. efficiency savings. "But do Americans really want to drive a slow, lightweight hatchback?" Sankey asked. "Crucially, we estimate that before 2020, hybrid SUVs don't justify the expense with efficiency unless oil hits $230/bbl."

DBS said the fuel efficiency gain from current SUV hybrid technology is much lower than for cars, which undermines the economics for the SUV. Average fuel economy for the Ford Escape conventional SUV is about 21 mpg, while the hybrid version gets about 28 mpg, analysts said.

Sankey said, "Unless there is a step-change in the fuel efficiency differential between hybrid and combustion SUVs, we believe it will be a long time before the light truck category (which is still about 42% of US personal vehicle sales in 2009) has an economically advantaged hybrid. Right now only about 1% of US personal light vehicle sales are hybrids (either SUV or pickup truck) vs. about 3.5% of cars."

Sales of hybrid light trucks peaked in 2006, just 2 years after the launch of the first hybrid SUV. Light trucks accounted for almost 30% of hybrid sales in 2006, before falling to 20% in 2007, even before the 2008 oil price spike and recession. Year-to-date in 2009, SUVs and pickups account for 18% of hybrid sales, DBS reported.

The US incentive program for hybrids has lost much of its impact with major hybrid-makers being phased out as their eligibility ends. Federal tax credits of as much as $3,400 for the purchase of a new hybrid vehicle have been available since the 2005 tax year. The credits phase out over a 1-year period for any given manufacturer once the company has sold over 60,000 eligible vehicles.

"We believe, however, that a new round of incentives will emerge from the US government to encourage purchase of hybrids and electric vehicles," said Sankey. ✦

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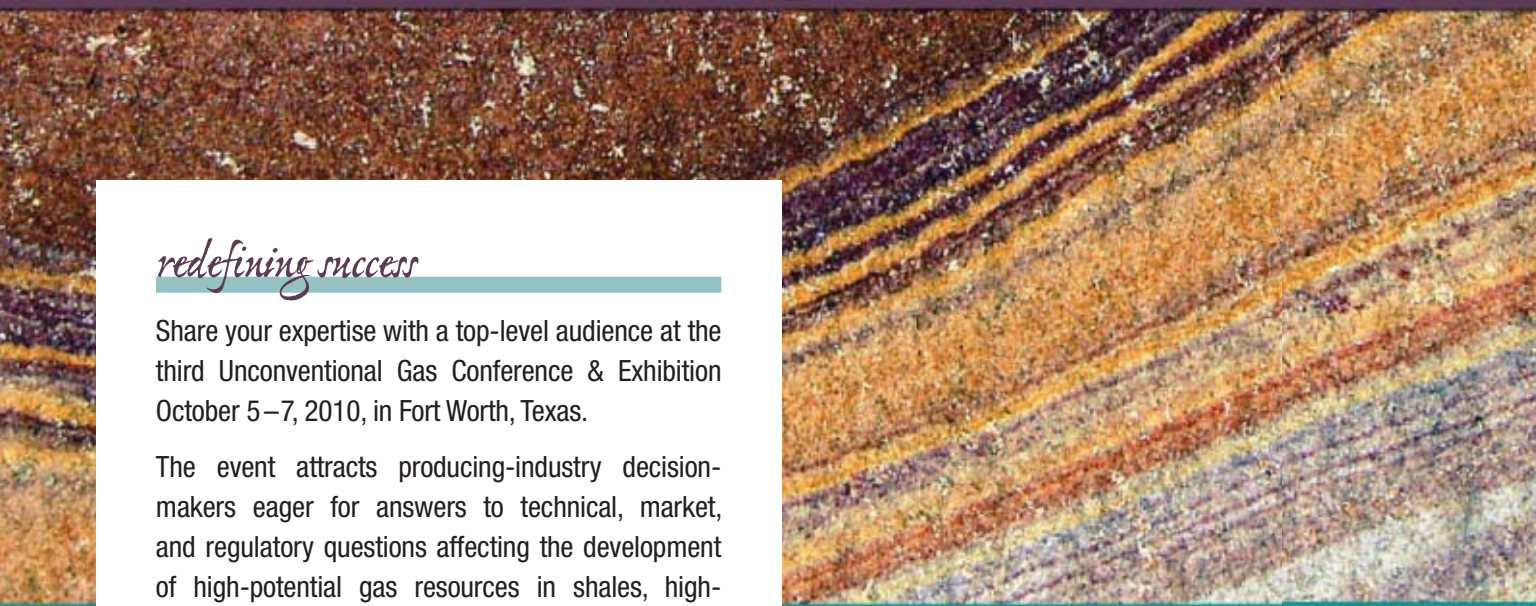

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Editorial

The reckless IST mandate

The 111th Congress has shown yet again a dangerous urge to govern before thinking. The House on Nov. 6 passed a security bill that would put the federal government in the middle of safety decisions that instead should be made by facility designers and operators.

The Chemical and Water Security Act of 2009 contains provisions that have the effect of mandating design and operational principles called inherently safer technology (IST; OGJ Online, Nov. 9, 2009). That phrase has irresistible appeal. Who can oppose something with such a name? It's easy to see why politicians yearning to govern would want to enshrine it in law with their names attached.

Flexibility needed

But that's the problem. IST is supposed to guide decisions in the real and ever-changing world of processing businesses. To be effective, it must be flexible and responsive, able to accommodate fresh technologies and complex, dynamic relationships. It works best as a central dimension of decision-making, starting at the earliest stages of a project. It's not meant for statutory rigidity. It's certainly not meant to be imposed retroactively by the Department of Homeland Security.

The legislative usurpation of IST brought quick statements of opposition from industry groups, including the American Petroleum Institute and National Petrochemical & Refiners Association. API warned the bill would endanger jobs and "create a mandate for government-selected changes to our operations, which is not consistent with a risk-based approach." NPRA called IST "a philosophy developed by professional chemical engineers," which has been "hijacked by political activists in a thinly veiled attempt to further their own agenda."

Equally troubling is the tendency of the current Congress to ignore warnings about costs and jobs and to smash the grimacing face of American commerce against the hard floor of official caprice. The House Committee on Homeland Security heard a level-headed description of the perils of mandating IST in a June 16 hearing but reported out a bill containing the mandate anyway. Now, just as heedlessly, the House has passed it.

The description came from Neal Langerman, chief executive and principal scientist of Advanced Chemical Safety, San Diego, representing the American Chemical Society. Pointing out that industry has applied the concept for decades, Langerman said IST "collectively captures a group of processes and technologies that improve safety by greatly reducing or eliminating hazards through a permanent and inseparable element of the process." Safety, he noted, "is built into the process from the outset, not added on, and the hazards are reduced or eliminated, not simply controlled." IST can include engineering changes, material substitution, or quantity reduction, he said, and is one among many ways to reduce risk. Objecting to inclusion of a requirement for IST in facilities covered by legislation that became the bill passed by the House, Langerman said, "Application of IST is a complex and nuanced process. Professionals, in a real-world context, need to apply these principles and processes where appropriate."

He went on to describe how designing for inherent safety tries to minimize quantities of hazardous substances, substitute less-hazardous materials where possible, moderate conditions that elevate risk, and simplify processes to reduce chances for error. IST design also balances process safety with production efficiency. Citing a case study in which application of IST principles guided changes to a boiler that cut emissions of nitrogen oxides, Langerman said, "Deciding among several designs requires evaluating a variety of metrics, including volume of hazardous materials, area affected by and frequencies of releases, consequence and severity of releases, and the life-cycle costs."

Creating problems

Can government officials in Washington, DC, effectively balance all these considerations for all facilities covered by the bill? No. Can they flexibly apply IST guidance to existing facilities? Of course not. And Congress can't fix IST principles in law and force them into practice without creating more problems than it solves—including problems involving safety and security risks, not to mention employment and economic health.

Despite good-faith warnings, the frenzied House has produced another harmful bill. Its signature recklessness is fast becoming one of America's biggest security threats. ✦

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Construction survey shows delay in completion dates

Leena Koottungal
Survey Editor/News Writer

Oil & Gas Journal's semiannual Worldwide Construction Update shows a decline in construction activity compared with the previous edition of the update (OGJ, Apr. 6, 2009, p. 22).

Many companies have delayed project completion dates. Some projects have been cancelled. Following are details from the latest survey, which is available online (see box).

Refining

Irving Oil Corp. and BP PLC have suspended plans to build a 300,000-b/d refinery at St. John, NB (OGJ, Aug. 3, 2009, Newsletter). The companies said an 18-month feasibility study determined the Eider Rock project "was not viable at a time of global economic recession and dampening forecasts for petroleum product demand in North America." Privately held Irving operates a 250,000-b/d refinery at St. John.

Petroleos Mexicanos has settled on a site at Tula in Hidalgo state to construct a $9 billion refinery, and will modernize another facility at Salamanca in nearby Guanajuato state for $3 billion (OGJ Online, Aug. 14, 2009). The 300,000-b/d facility to be built in Tula is expected to come on stream in 2015. The expansion of the Guanajuato facility will be ready by yearend 2014.

In October, the government of southern Sudan approved plans to build a $2 billion refinery, according to a senior official of the semiautonomous state. (OGJ Online, Oct. 19, 2009). Energy Minister John Luk said the southern government plans to build the 50,000-b/d refinery in Akon, Warap state, to serve all seven states west of the Nile.

Luk said construction will take 36 months, and the refinery will process crude from the fields of Unity state.

Royal Dutch Shell PLC is to install a $500 million hydrodesulfurization plant at its 400,000-b/d Pernis refinery in the Netherlands (OGJ Online, Aug. 20, 2009). Pernis is the largest refinery in Europe. The upgrade will be finished by the second half of 2011.

Shell awarded an engineering, procurement, and construction management contract to Technip for the first phase of its "Connect" project in Germany. By connecting two existing refineries in Godorf and Wesseling,

OGJ subscribers can download free of charge the 2009 Worldwide Construction Update tables at www.ogjonline.com: Scroll down to Additional Information, click on OGJ Subscriber Surveys, then Worldwide Construction.

This link also includes previous editions of the update. To purchase spreadsheets of the survey data, please go to www.ogj.com/resourcecenter/orc_survey.cfm or email orcinfo@pennwell.com.

Shell will create the largest refinery in Germany: the Rheinland refinery.

The first phase of the project will be implemented in the Wesseling refinery. It includes the modification of process units (desulfurization and hydrogen manufacturing) as well as the construction of new facilities. The units at Wesseling will also be used for the desulfurization of gas oil produced in Godorf.

Staatsolie Maatschappij Suriname NV let a project management consultant contract to Aker Solutions for its refinery expansion project in Suriname. Once completed, the project will double the refinery's processing capacity to 15,000 b/d, producing diesel, gasoline, fuel oil, bitumen, and sulfuric acid. The expansion is to be completed in spring of 2013.

A worker helps construct the Arbuckle Pipeline, a 440-mile natural gas liquids pipeline extending from southern Oklahoma through the Barnett shale of North Texas and on to Mont Belvieu, Tex., on the Gulf Coast. Construction was completed on the line in late July. Photo from Oneok Partners.

Petrochemical

Expansion of the petrochemicals complex at Shuaiba, Kuwait, about 25 miles south of Kuwait City, was completed earlier this summer, according to its engineering contractor Fluor Corp. The project spanned 5 years (OGJ Online, Aug. 27, 2009).

Fluor began work on Olefins II in July 2004 by providing overall management consultancy and front-end engineering and design for utilities and infrastructure. Olefins II doubles capacity of the existing complex that has operated there since 1998 (OGJ, Sept. 15, 1997, p. 36).

Olefins II also included Fluor oversight of engineering and construction of an 850,000-tonne/year (tpy) ethane cracker, a 600,000-tpy ethylene glycol unit, a 450,000-tpy ethyl benzene/styrene monomer unit, and a debottleneck expansion of an additional 225,000 tpy of polyethylene capacity at the existing complex.

Brahmaputra Cracker & Polymer Ltd. has awarded contracts for the license and basic engineering of two new chemical plants to Lummus Technology. BCPL's ethylene plant, which has a design capacity of 220,000 tpy, will utilize Lummus Technology's proprietary ethylene technology. The downstream polypropylene plant, which has a design capacity of 60,000 tpy, will utilize Novolen advanced gas-phase polypropylene technology. The two plants will be built in Lepetkata, Assam, India.

LNG

On July 16, Taiwan's CPC Corp. inaugurated the country's second LNG terminal at Taichung in the north, according to press reports (OGJ Online, July 17, 2009). Start-up of the nearly $955 million terminal was more than a year behind schedule.

In September, The UK's 4.4 million-tpy Dragon LNG terminal at Milford Haven, South Wales, began commercial operations (OGJ Online, Sept. 2, 2009). Commissioning formally began on July 14 with arrival of BG Group LNG's, 145,000-cu m carrier Methane Lydon Volney. BG Group holds a 50% interest in the terminal with Petronas (30%) and 4Gas (20%). BG Group (50%) and Petronas (50%) also have agreements governing capacity rights for a 20-year term, allowing them each 2.2 million tpy of throughput.

Qatargas 2 partners Qatar Petroleum and ExxonMobil Corp. completed the 7.8 million-tpy Train 5 (OGJ Online, Sept. 9, 2009). This follows start-up in the second quarter of Qatargas 2's other 7.8 million-tpy Train 4.

China commissioned its third LNG terminal last month. China's Shanghai LNG terminal received its first LNG cargo of 45,000 cu m aboard the 88,000-cu m Arctic Spirit LNG carrier from Bintulu, Malaysia on Oct. 11.

Also in China, construction began on the Ningbo LNG terminal south of Shanghai, in Zhejiang Province. It will be the fifth Chinese terminal. When completed in 2012, Phase 1 will have installed 3 million tpy of regasification capacity.

Chevron Australia awarded a $550 million contract for its Gorgon-Jansz LNG project off Western Australia to CB&I (OGJ Online, Oct. 2, 2009). The scope of the work includes the engineering, procurement, fabrication, and construction of two 180,000-cu m LNG containment tanks and four condensate tanks as well as the associated piping, electrical, instrumentation, and civil works. The work is slated for completion in third-quarter 2013.

Gas processing

Williams Cos. Inc. announced that

For Woodside Petroleum Ltd.'s Pluto LNG Project, CB&I is supplying two 120,000-cu m LNG storage tanks as well as additional condensate tanks. The Pluto LNG liquefaction facility, built on the Burrup Peninsula in Western Australia, is expected to produce 4.3 million tonnes/year of LNG. Photo from CB&I.

the 450-MMcfd Willow Creek natural gas processing plant in western Colorado's Piceance basin has achieved full processing operations. The plant began operations on Aug. 7.

Construction of the Willow Creek facility began November 2007 and finished in July. It consists of a single-train amine treating and cryogenic plant in Rio Blanco County, Colo., about 25 miles northwest of Williams' facilities in Garfield County. The Willow Creek plant is currently recovering about 20,000 b/d of natural gas liquids.

Enterprise Products Partners LP plans to build a 75,000-b/d NGL fractionator at its Mont Belvieu, Tex., complex east of Houston (OGJ Online, Aug. 12, 2009). The unit will provide additional capacity to accommodate growing NGL volumes from producing areas in the Rockies, the Barnett shale, and the emerging Eagle Ford shale play in South Texas.

When completed in early 2011, the project will increase Enterprise's NGL fractionation capacity at Mont Belvieu to about 300,000 b/d and net system-wide capacity to about 600,000 b/d.

Joint venture partners Apache Energy Ltd. and Santos Ltd. broke ground at the Devil Creek domestic natural gas processing plant site in the Pilbara region of Western Australia about 50 km south of Karratha. (OGJ Online, Sept. 17, 2009). The plant will supply as much as 220 TJ/day of gas into the Dampier-Bunbury trunk line. It will also produce as much as 500 b/d of condensate.

Clough Australia is contractor on the project. The $54 million (Aus.) contract is for engineering, design work, and procurement of all permanent materials and equipment plus fabrication and assembly of all modules for the facility.

Other gas

Sasol has formed a partnership with Petronas and Uzbekistan state oil and gas company Uzbekneftegaz to establish a 1.3 million-tpy GTL plant in Uzbekistan (OGJ Online, July 17, 2009).

No start up date was provided nor were details on which gas fields could produce the feed to produce the diesel, kerosine, naphtha, and LPG. Sasol said the GTL facility will use its proprietary Slurry Phase Distillate process, which produces a clean-burning, high-performance diesel fuel. Each company will have an equal equity share in the JV. The plant will have a capacity of 36,000-40,000 b/d. Project cost is $2.5 billion.

Electricite de France SA, in coordination with EnBW Energie Baden-Wurttemberg AG, awarded Technip an engineering, procurement, and construction management contract for the Crystal Gas Plant project in Etzel, Germany. The project covers gas compression and treatment facilities for the storage of gas in underground salt caverns. Gas will be injected into the caverns at times of low gas prices and withdrawn to feed into the Dutch and the German gas grids, notably during periods of peak demand.

Abu Dhabi Gas Industries Ltd. (Gasco) let a $530 million contract to CB&I for the engineering, procurement, fabrication, and construction of six low-temperature/cryogenic storage tanks, two ambient storage tanks, and the associated piping, controls, power distribution, and civil works systems. The project is part of the expansion of Gasco's Integrated Gas Development project in Ruwais.

Sulfur

WorleyParsons is working with several sulfur projects in the engineering stage. A Claus project for Petroleo Brasileiro SA's Reduc facility

in Rio de Janeiro will process 145 tonnes/day (tpd) of sulfur from refinery acid gas.

Meanwhile, a Claus project for PetroCanda Fort Hills in North Alberta will process 1,400 tpd of sulfur from refinery acid gas.

In the US, two Claus projects are under construction for Chevron Corp. in California with completion scheduled for 2013.

The Peru LNG liquefaction plant is not only the largest industrial project ever to be undertaken in Peru, but is also South America's first baseload LNG export facility. CB&I was awarded a contract for the engineering, procurement, fabrication, construction, and commissioning of the plant in January 2007. Completion is slated for 2010. Photo from CB&I.

Pipeline

Energy Transfer Partners LP (ETP) has completed construction of the 160-mile Texas Independence Pipeline (TIP), which increases its gas takeaway capacity in Texas by an incremental 1.1 bcfd (OGJ Online, Sept. 1, 2009). ETP also completed the Rulison expansion project in Colorado.

The 42-in. OD TIP system will transport gas from Waha, the Bossier sands, and Barnett shale in east and north-central Texas to southeast Texas. Originating just west of Maypearl, Tex., and ending near Henderson, Tex., the TIP system connects ETP's existing Central and North Texas systems to its East Texas pipeline network. With the addition of compression, the project can be expanded to transport gas volumes in excess of 1.75 bcfd.

The Rulison expansion project includes the 10-mile, 24-in. OD Rulison pipeline and the Holmes Mesa compressor station in Garfield County, Colo. These projects are designed to increase the capacity of ETP's South Parachute-Rifle pipeline system. The project will also create an outlet for producers to access the Meeker processing plant at the White River hub.

The Rulison line will initially add more than 70 MMcfd of capacity, with the ability to expand to more than 200 MMcfd. The Holmes Mesa compressor station has more than 9,000 hp of compression.

Natural gas service on the roughly 500-mile Midcontinent Express Pipeline began Aug. 1 between Delhi, La., and Transcontinental Pipe Line's Station 85 in Butler, Ala. (OGJ Online, Aug. 3, 2009). Interim service from Bennington, Okla., to Delhi began in April. Completion of the final segment of MEP connects production from the Barnett shale, Bossier sands, and other plays in the region to the eastern US.

Kern River Gas Transmission Co. awarded Gulf Interstate Engineering Co. a contract to perform detailed engineering services on the compression facilities associated with its Apex Expansion Project (OGJ Online, Sept. 17, 2009).

The project entails adding 78,000 hp of incremental compression at one new and three existing compressor stations, and replacing a compressor unit at one station.

Gulf will provide detailed engineering services for a new turbine-driven compressor and ancillary equipment at the grass-roots Milford Compressor Station in Utah; additional compression at Coyote Creek Compressor Station in Wyoming, Elberta Compressor Station in Utah, and Dry Lake Compressor Station in Nevada; and replacement of a compressor unit at Fillmore Compressor Station in Utah. Kern expects the Apex Expansion Project to enter service Nov. 1, 2011.

China National Petroleum Corp. began construction in Chad of a 300-km oil pipeline that will transport crude from Koudalwa field to the Djarmaya refinery, north of N'Djamena (OGJ Online, July 2, 2009).

Neither the cost nor the capacity of the pipeline were disclosed. The project is slated to come online in 2013. ✦

House passes chemical security bill; provision intact

Nick Snow
Washington Editor

The US House approved a chemical and water security bill with a provision requiring inherently safer technology (IST) by a vote of 230 to 193 on Nov. 6, despite objections from the petroleum and other industries.

Two major oil industry trade associations immediately criticized the bill, HR 2868, which now heads to the Senate. National Petrochemical & Refiners Association Pres. Charles T. Drevna said by including the IST provision, the House is "sending a clear signal that it wants to put the federal government in a position to dictate chemical practices and procedures to chemical engineers."

Drevna said, "While IST may be a great political sound bite, it is not a panacea for security. IST is not a technique; it is a philosophy developed by professional chemical engineers. Unfortunately, the IST concept has been hijacked by political activists in a thinly veiled attempt to further their own agenda."

Drevna said IST actually is governed by physics and engineering laws, not politics and emotion. "Forcing the switching of chemicals for certain processes may simply shift, and potentially increase, risk at facilities and in their surrounding communities," he warned.

The American Petroleum Institute issued a statement saying that it joins the agriculture, trucking, and other industries in opposing the bill and supporting reauthorization of current federal security standards, which have been successful since their enactment 3 years ago.

"If the bill passed by the House today becomes law, it would go beyond the current protection requirements and endanger jobs and increase the risk of our operations," the statement said. "The bill would create a mandate for government-selected changes to our operations, which is not consistent with a risk-based approach."

"Bad people would love to get into facilities with vulnerabilities and do them harm. What we're trying to do is help those facilities create the capacity to be secure." ***—Bennie G. Thompson (D-Miss.), Homeland Security Committee chairman***

Sought removal

In a Nov. 4 letter to House Speaker Nancy Pelosi (D-Calif.) and Ranking Minority Member John A. Boehner (R-Ohio), API, NPRA, the International Liquid Terminals Association, National Propane Gas Association, Petroleum Equipment Suppliers Association, and Petroleum Marketers Association of America joined the National Association of Manufacturers, US Chamber of Commerce, and 19 other trade associations seeking the IST provision's removal.

They said the US Department of Homeland Security should be focused on making the nation more secure and protecting US citizens from terrorist threats, instead of having to make engineering or business decisions for chemical plants.

As floor debate began the afternoon of Nov. 5, the bill's sponsor, Homeland Security Committee Chairman Bennie G. Thompson (D-Miss.) said Titles II and III of HR 2868 close a major security gap by establishing a program for drinking water and wastewater facilities to complement DHS's existing Chemical Facility Anti-Terrorism Standards (CFATS) program.

The bill also requires all plants that are part of the CFATS program to determine and adopt the best methods to reduce the consequences of a terrorist attack, Thompson said. This IST provision "simply incorporates this best practice into how all tiered facilities in-

"I believe that we took…an admirable concept of enhancing chemical plant security, and have allowed concepts and ideas regarding the environment…[to] have too large an influence on this bill." ***—Peter T. King (R-NY), House Homeland Security Committee ranking minority member***

tegrated security into their operations," he said, adding, "Additionally, HR 2868 strengthens CFATS by adding enforcement tools, protecting the rights of whistleblowers, and enhancing security training."

Simply extending the program's existing authority for 3 years "flies in the face of testimony that we received about gaps in CFATS and would be a rejection of all the carefully tailored security enhancements in the bill," Thompson said.

Beyond chemicals

Peter T. King (R-NY), the committee's ranking minority member, said HR 2868's IST provision would create confusion and unnecessary expenses, cost jobs, and stifle the private sector. "We should keep in mind that we're not just talking about large chemical plants, but we're also talking about institutions such as colleges and hospitals which will have to incur these costs," King said.

King said the current law is working, and that DHS did not ask for an extension of its authority. "I believe that we took…an admirable concept of enhancing chemical plant security, and have allowed concepts and ideas regarding the environment…[to] have too large an influence on this bill," he said.

Bill Pascrell Jr. (D-NJ), a committee member, said the bill was long overdue, noting that his home state is the location of what the FBI considers the most dangerous 2 miles in America with several large chemical plants near residential areas along the New Jersey Turnpike. State law requires chemical plants to conduct safer technology assessments "and believe it or not, our state is not only safer for it, but the sky hasn't fallen on the chemical companies in New Jersey," he said. Such state authority should not be preempted in federal legislation, he added.

But Charles W. Dent (R-Pa.) said New Jersey's law requires IST assessments, but not implementation, and that HR 2868 would go much farther. DHS already is required to assess plants' vulnerabilities and has completed about a third of the estimated 6,000 assessments, he noted. "Adding these IST assessments will be enormously costly," he said. IST assessments also are designed to deal with workplace safety issues, not plant security, he added.

Thompson said: "What we're looking at now is an opportunity to go into facilities that don't, in many instances, have security assessments. If we make security assessments, then we will identify those vulnerabilities in those facilities and help them correct them. Bad people would love to get into facilities with vulnerabilities and do them harm. What we're trying to do is help those facilities create the capacity to be secure."

"HR 2868 is far from perfect, but it includes substantial compromises to permanently extend chemical and water security regulations while reducing duplicative regulatory standards, increasing worker protections, and providing important safeguards to chemical facilities and water systems."— **Gene Green (D-Tex.), House Energy and Commerce Committee member**

Concerns addressed

Gene Green (D-Tex.), who supported the bill, said chemical and other facilities in his district have invested $8 billion to improve their security since 2001 and are fully complying with CFATS provisions which have not been fully implemented. He noted that he had some concerns when HR 2868 was introduced but that many of these were addressed when the bill went through the Energy and Commerce Committee.

"First, granting the [Homeland Security] secretary authority to mandate a facility to perform a 'method to reduce a consequence of a terrorist attack,' or IST, raises questions as to whether, or how, to involve government agencies like DHS that have few, if any, process safety experts, chemical engineers, and other qualified staff," Green said in extended comments. "We worked to include a fair and transparent technical appeals process…that requires DHS to examine such decisions with facility representatives as well as with experts knowledgeable in the fields of process safety, engineering, and chemistry."

The scope of facilities nationwide that would potentially be affected by IST requirements was substantially reduced by focusing exclusively on chemical facilities in populated areas subject to a release threat, Green said. DHS also would not be able to mandate IST if it was not feasible or if the facility would no longer be able to continue operating at that location, he said.

The original bill also contained language which unnecessarily duplicated chemical facility regulations under the Marine Transportation Security Act (MTSA), according to Green. He said

"If this bill becomes law, my projection is [that] within 10 years or so, many of those facilities are going to be closed down and inoperable, tens of thousands of jobs are going to be lost, and our chemical industry is simply going to move onshore." ***—Joe Barton (R-Tex.), House Energy and Commerce Committee ranking minority member***

it now states that the US Coast Guard will be the main enforcement entity for MTSA facilities; explicitly states that the Coast Guard will be the primary consultant should the Homeland Security secretary consider mandating IST on an MTSA facility; ensures that MTSA facilities would not have to perform additional background security checks under CFATS requirements, and identify the Transportation Worker Identification Credential as satisfactory for the bill's CFATS requirements.

Green said the bill also contains a new provision under which a worker can petition DHS to reconsider whether he or she poses an actual security threat; limits citizen lawsuits to compelling DHS to act under the law or report potential violations, but not sue private companies; and streamlines drinking water and wastewater provisions by placing EPA in charge of their implementation and enforcement.

'Substantial compromises'

Green maintained, "HR 2868 is far from perfect, but it includes substantial compromises to permanently extend chemical and water security regulations while reducing duplicative regulatory standards, increasing worker protections, and providing important safeguards to chemical facilities and water systems."

But Joe Barton (R-Tex.), the Energy and Commerce Committee's ranking minority member, said the bill goes beyond reasonable requirements for vulnerability assessments, site security plans, and emergency response plans which have been part of many indus-

tries' security programs for years.

"I'm an industrial engineer and understand plant processes and chemical processes to some extent," he said. "I think we're very blessed in this country to have a robust chemical industry, much of which is located in Texas and Louisiana. If this bill becomes law, my projection is [that] within 10 years or so, many of those facilities are going to be closed down and inoperable, tens of thousands of jobs are going to be lost, and our chemical industry is simply going to move onshore."

HR 2868 is not about preventing terrorist attacks, but simply sets up a regime under which DHS and EPA employees who know little about chemical processes make key technical decisions, Barton said. "As if this was not enough, this legislation weakens the protections traditionally given to high-risk security information by treating need-to-know information like environmental right-to-know data," said Barton. "I'm for transparency in government, but why should we give the terrorists who we're trying to prevent attacking these facilities almost an open book to go in and, under these open meeting requirements and open records requirements, get information that could allow them to concoct schemes to destroy these very facilities?"

Republican amendments to preempt state laws, to strike the IST provision and simply extend the existing CFATS program, and to remove language allowing citizens to sue DHS to compel enforcement were defeated on Nov. 6 before the bill's final vote. ✦

Senate panel considers climate change bill's impacts

Nick Snow
Washington Editor

Days after one US Senate committee approved a climate change bill with a carbon cap-and-trade program, the chairman of another convened a hearing to examine the possible economic consequences.

Finance Committee Chairman Max Baucus opened his panel's Nov. 10 hearing after casting the single vote against S. 1733 on Nov. 5 when Democrats on the Environment and Public Works Committee approved the measure sponsored by that committee's chairman, Barbara Boxer (D-Calif.), and John F. Kerry (D-Mass.) following a 3-day markup that Republicans generally boycotted.

Baucus expressed commitment to passing climate legislation, saying that in addition to considering economic consequences, "We also need to consid-

WATCHING GOVERNMENT

Nick Snow, Washington Editor

Blog at www.ogjonline.com

EIA forecast mentions rebound

Economists are generally hesitant about using "r" words. Many waited a year ago before admitting that the world had entered a recession. They're equally cautious now about any possible rebound.

The US Energy Information Administration nevertheless raised by $7/bbl its forecast price of West Texas Intermediate crude in its latest short-term energy outlook because it believes sustained economic growth in China and elsewhere in Asia may lead to a rebound in demand.

WTI prices should average $77/bbl in the October-March period and reach $81/bbl by December 2010 if US and world economic conditions keep improving, particularly in Asia where growth has been stronger than expected, EIA said on Nov. 10 in its latest monthly forecast.

The forecast assumes US real domestic product will grow by 1.9% in 2010 while world oil consumption-weighted GDP increases by 2.6%.

High inventories tempered EIA's assessment. "Although Organization for Economic Cooperation and Development inventories remain high, optimism for a continued economic turnaround, combined with the impact of Organization of Petroleum Exporting Countries production cuts, have driven oil prices higher," it said.

Could weaken

"However, if the economic recovery stalls and oil consumption doesn't rebound, oil prices could weaken given the high level of inventories," EIA said.

While it expects OECD members' oil consumption to continue to show another year-to-year decline in the fourth quarter, demand in non-OECD countries should "more than offset these losses, leading to the first growth in global oil consumption in five quarters," it said.

EIA said it projects a 1.26 million b/d growth in world oil consumption during 2010, with non-OEDC countries representing the largest share. It expects OECD consumption to increase by only 100,000 b/d next year, largely because of a projected turnaround in the US, which would reverse a decline that began in 2005.

'Surprisingly strong'

Oil production outside OPEC averaged 50.1 million b/d during 2009's first three quarters, about 500,000 b/d above the average for the comparable 2008 period, EIA reported. "Non-OPEC oil production has been surprisingly strong in 2009, largely the result of higher-than-expected production from Russia," it said.

Russia produced more than 10 million b/d during August, setting a new post-Soviet era record, EIA said. It expects non-OPEC production to grow by about 250,000 b/d in 2010, with higher output from the FSU and the US offsetting falling production in Mexico and the North Sea.

OPEC production averaged 29 million b/d in the first three quarters, 2.4 million b/d lower year-to-year, EIA said. It expects OPEC members to raise output gradually in 2010 to an average 29.4 million b/d in response to higher demand.

EIA also expects OPEC's surplus production capacity to remain above 4 million b/d through the forecast period, compared with a 1998-2008 average of 2.8 million b/d. ✦

er the consequences of failing to act."

Two witnesses warned that economic harm could be substantial, especially if other countries don't take similar steps. Others emphasized jobs and revenue in a transition to a lower-carbon energy system.

Initial assessments

Among initial assessments by committee members, Charles E. Grassley (R-Iowa), the ranking minority member, said, "An honest cost assessment requires us to acknowledge that there would be no economic benefit for Americans from it, at least initially."

Pat Roberts (R-Kan.) said that his state has supported renewable energy development for some time and that investments have been based on market forces.

Kansas ranks ninth in oil production and eighth in gas production among US states and has three small refineries that contribute jobs and money to nearby communities, he noted.

"Under the bill which some said was railroaded out of the Environment and Public Works Committee last week, officials in these communities have told me they would suffer significant job and economic losses," Roberts said.

In comments submitted to the committee, the National Petrochemical and Refiners Association cited an Energy Policy Research Foundation Inc. study earlier this month that said even before US refiners face higher costs from carbon emissions they would face a higher cost structure and increased international competition, which would threaten to close 2.5 million b/d of the existing 17.5 million b/d of US refining capacity.

But Kerry said comprehensive climate change legislation would create jobs. He dismissed reports such as the one cited by NPRA saying, "Your studies aren't credible because you haven't considered the impacts of inaction."

He said, "What business people like Lou Hay, chairman of Florida Power & Light, and Jim Rogers, chairman of

Duke Energy, are telling me is that if we don't do anything, countries like China, which is tripling its wind energy investment, are going to leave us behind."

He questioned a statement by Kenneth P. Green, a resident scholar at the American Enterprise Institute for Public Policy Research (AEI), that a cap-and-trade system would be an inappropriate greenhouse gas control tool that would cause economic damage, cost jobs, and provide little environmental benefit.

"Legislation now before Congress will create regional winners and losers," Green said. "Cap-and-trade creates a poorly understood financial instrument, which will increase debt. As biofuels gain favor, more agricultural farmland will be converted to fuel from food production."

Margo Thorning, senior vice-president and chief economist at the American Council for Capital Formation, said a reason economic assessments of cap-and-trade's potential impacts reach such differing conclusions is that some use input-output models and others rely on macroeconomic assessments, which she said most government and think-tank analysts prefer because they can show impacts on capital markets and other economic components.

"Macroeconomic studies show significant costs," she maintained. "As [the US Environmental Protection Agency] and others have admitted, the environmental benefits will be almost nil if the US goes it alone."

Acid rain comparison

Baucus warned against predicting dire economic consequences from new cap-and-trade policies, pointing to the cap-and-trade system established by the Clean Air Act Amendments of 1990, which he helped write, to reduce sulfur dioxide emissions related to acid rain.

During debate on that bill, he said, several industry studies made dire predictions about potential economic effects and job losses. EPA studies even estimated $2.7-4 billion of annual costs and predicted that 13,000-16,000 coal-mining jobs would disappear as a result of the program. A decade later, he said, an EPA analysis estimated the cost at $1-2 billion/year and job losses at one-fourth the predictions.

"About 95% of the jobs lost were due to productivity gains in the industry," Baucus said. "Very few were lost due to the acid rain program itself."

AEI's Green said the acid rain program was much smaller than a cap-and-trade operation for carbon dioxide would be.

"In acid rain, you had a smaller number of players with an easily measurable pollution source affect-

ing a smaller segment of the economy. The final costs turned out to be lower because early problems led to changes in the system," he said.

When Maria Cantwell (D-Wash.) asked whether derivative market loopholes should be closed before a carbon allowance system was established, the AEI analyst said they should. "We're talking about a huge amount of the energy economy which would be put into these securities. If they are not sustainable, the government will burst the bubble, and it would be a very big bubble," Green said.

Other witnesses said federal lawmakers should consider which forms of energy would work best in creating jobs during a transition to lower-carbon sources. Carol Berrigan, energy infrastructure director at the Nuclear Energy Institute, said construction of nuclear plants would create tens of thousands of jobs.

Abraham Breehey, legislative director at the International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers, and Helpers, said coal with carbon capture and sequestration and nuclear expansion have higher job potential than natural gas.

Committee member Debbie Stabanow (D-Mich.) said, "I look at this whole discussion through the prism of jobs." ✦

IEA: Recession lowers global energy outlook to 2030

Marilyn Radler
Senior Editor-Economics

In its 2009 World Energy Outlook (WEO), the International Energy Agency projects in its reference scenario that global energy demand will climb 40% between 2007 and 2030, and the agency says that the world's energy resources are adequate to meet this projected demand increase through 2030 and well beyond.

In last year's WEO, IEA projected that worldwide energy demand would expand by 45% between then and 2030.

In the current reference scenario, IEA assumes that government policies will go unchanged throughout the period. Fossil fuels remain the dominant sources of energy worldwide, accounting for 77% of the demand increase to 2030. By far, coal will see the largest increase in demand over the forecast period, followed by gas and oil. But oil will remain the single-largest fuel in the energy mix in 2030, even though its share falls to 30% from 34% now, according to the WEO.

Electric power generation, set to climb at a rate of 2.5%/year over the forecast period, will drive gas and coal demand. More than 80% of this growth will take place in countries outside the Organization for Economic Cooperation and Development (OECD), according to the WEO, as additions to power generation capacity total 4,800 Gw by 2030 worldwide. The largest additions are set to occur in China.

Southeast Asia's energy demand expands by 76% between 2007 and 2030 in IEA's reference scenario. Collectively, non-OECD countries will account for more than 90% of the increase, their share of global energy demand rising to 63% from 52%. China and India represent more than 53% of incremental demand to 2030. Outside of Asia, the Middle East will see the fastest growth rate, contributing 10% to incremental demand, according to IEA projections.

In what it terms a '450 Scenario,' IEA sets out an aggressive timetable of actions needed to limit the long-term concentration of greenhouse gases in the atmosphere to 450 ppm of carbon dioxide equivalent (CO_2e) and keep the global temperature rise to around 2° C. above preindustrial levels.

To reach the goals of the 450 Scenario, which would require cumulative incremental investment of $10.5 trillion in low-carbon energy technologies and energy efficiency by 2030, the Paris-based agency says that fossil fuel demand would need to peak in 2020.

Oil, gas forecasts

The WEO identifies higher oil prices and the downturn in oil investment as serious threats to the world economy. As a result of the current financial crisis, IEA says that investment in upstream oil and gas has already been cut by more than $90 billion this year compared with 2008. While demand for oil has dropped sharply, in the agency's reference scenario oil demand starts recovering in 2010, reaching 88 million b/d in 2015, and then 105 million b/d in 2030.

Worldwide natural gas demand between 2007 and 2030 is forecast to climb by 41% in the reference case, but only by 17% in the 450 Scenario due to more efficient use, lower electricity demand, and increased switching to nonfossil energy sources.

IEA expects the boom in North American unconventional gas production together with the recession's impact on demand to prolong the glut of gas supply for the next few years.

"The analysis of WEO 2009 shows that the annual underutilization of interregional pipeline and LNG capacity could rise from around 60 billion cu m in 2007 to 200 billion cu m by 2015. This glut could have far-reaching consequences for the structure of gas markets, with suppliers to Europe and Asia-Pacific coming under pressure to modify pricing terms under long-term contracts, to delink gas prices from oil prices, (to) sell more gas on a spot basis, and to cut prices to stimulate demand," IEA said. ✦

IPAA advocates fact-based hydraulic fracturing study

Paula Dittrick
Senior Staff Writer

The Independent Petroleum Association of America will work to ensure that an upcoming study on hydraulic fracturing is scientific, based on facts, and includes input from the oil and gas industry as well as state regulators.

Various speakers at IPAA's annual meeting in New Orleans discussed the attention and concerns raised by some members of Congress and some environmental groups about fracing and its safety.

Water management issues have come into play because of suggestions by some industry critics that fracing chemicals might get into ground water. There has been no definitive evidence of that in various studies that have been done.

On Oct. 29, the US House of Representatives and US Senate approved a Department of Interior appropriations bill that includes a provision directing the Environmental Protection Agency to produce another study on hydraulic fracturing.

IPAA Chairman Bruce Vincent, president of Swift Energy Co., Houston, said no such study is necessary. Fracing is crucial to recovering gas from shale plays.

Vincent noted that state regulators have successfully monitored fracing operations for 60 years. He said ongoing congressional efforts to impose federal regulations could result in extensive, costly monitoring of chemicals throughout the life of a well.

"It's the environmentalists wanting a way to further regulate our business," Vincent said. "Antidevelopment movements based on misinformation and scare tactics cannot delay or deter the responsible development of American resources," he said.

Vincent said other principal policy priorities for IPAA are resisting tax changes as proposed in US President Barack Obama's 2010 budget. The Obama administration has proposed repealing numerous tax provisions,

including percentage depletion and intangible drilling costs.

"There is still serious concern about the direction of energy policy in this country," Vincent said, adding, "It's clear to me that policy battles will remain front and center."

Other areas of concern are increased oversight and regulation of financial markets along with gaining access to more oil and gas off the US, Vincent said.

Chemical disclosures

Lee O. Fuller, IPAA's vice-president of government relations, told OGJ on the sidelines of the IPAA meeting that he has never seen "an environmental issue with less substance behind it" as concerns about fracing chemicals contaminating ground water.

Well completions create a barrier around the wellbore to prevent the leeching of any chemicals, Fuller said, noting that industry has been doing this successfully for decades.

"There's been no history of problems with hydraulic fracturing," Fuller said. "It is a very orchestrated effort to try to diminish production." He believes "people historically opposed to developing natural gas" are raising the concerns.

Some groups have called for oil and gas companies to disclose the chemicals that they use in fracturing. Most producers resist that, saying the chemical mixtures are proprietary information.

IPAA does not believe that companies should have to disclose the chemicals, Fuller said. If analysis were to show chemicals from a specific oil and gas operation getting into water, then IPAA would support getting the chemical information to regulators who could supply it to first responders, he said.

Industry comments

Separately from the IPAA meeting, Oklahoma City independent Chesapeake Energy Corp. issued an Oct. 28 news release saying that it supports efforts by the state of New York to require fracing vendors to register their products and disclose the chemicals used.

Chesapeake already has posted its fracing chemical mixture on the company web site, Chesapeake Chief Executive Officer Aubrey A. McClendon said.

"We fully support setting high environmental standards for the extraction of natural gas from the Marcellus shale, and we look forward to continuing that process with the state," McClendon said.

On Oct. 23, Schlumberger Ltd. Chairman and Chief Executive Officer Andrew Gould said he expects to see more US drilling regulations, and he supports discussing disclosure of fracing ingredients.

"I'm pretty sure that there will be some form of new regulation in order to satisfy the authorities and the public's desire to know that what is being done is safe," Gould said during an Oct. 23 webcast on Schlumberger's quarterly earnings. ✦

Study: Cooperation key to growth in oil sands supply

Although the oil sands industry will continue to develop in Alberta despite the jolt it received when oil prices plunged last year, total Canadian oil exports to the US face constraints, according to a study by the Center for Global Energy Studies, London, and Geopolitics Central, Calgary.

Oil sands production will increase by 1.19-1.99 million b/d during 2009-20, depending on the degree of economic and environmental cooperation among major countries, the study says.

Cooperation extensive enough to keep the global recession relatively short and ensure strong and lasting growth afterward would support oil prices and enable oil sands production in Alberta to rise from 1.21 million b/d in 2008 to 3.2 million b/d in 2020.

The production growth in that scenario would occur despite high costs related to economic strength in Alberta and rising outlays for environmental mitigation, the study says.

In an alternative scenario, competition among major economic powers prolongs the recession, leads China and Russia to challenge Western powers for dominance, and produces a second economic dip in 2010 with subsequent growth slower than in the recent past.

In the lower-growth scenario, oil prices below those in the alternative set of assumptions restrict growth in Albertan oil sands production in 2020 to 2.4 million b/d. The increase occurs because of projects in progress, lower costs, and gradually rising oil prices.

The study notes a preference by project operators for upgrading of bitumen outside Alberta because of cost advantages elsewhere. But in the higher-growth scenario, the provincial government legislates that new projects by 2015 upgrade all bitumen in Alberta. In the lower-growth scenario, this isn't an option because light-heavy price differentials are too narrow.

As a result, 82% of new bitumen production is upgraded in Alberta with high growth, half that amount with lower growth.

The main market for incremental oil sands supply through 2020 is Northeast Asia, where refineries prefer lighter grades of crude.

In the low-growth scenario, the main market for new oil sands supply is the US, chiefly the eastern Midwest. But total exports to the US are limited to "a relatively small increase" by a "relatively large decline" in Canada's conventional oil production, the study says. ✦

FACTS: Abu Dhabi needs gas for domestic market

Sam Fletcher
Senior Writer

Abu Dhabi currently imports 740 MMscfd of natural gas from Qatar via the Dolphin Pipeline and likely would buy more if the Qatari gas moratorium were lifted, according to FACTS Global Energy (FGE).

"The Dolphin Pipeline has extra capacity of 1.2 bscfd," FGE said in a recent report. "If the Qatari gas moratorium is lifted, the UAE would be an easy source of incremental exports if the price is right. Given that Abu Dhabi is developing high-cost domestic gas and considering using oil for power generation, there is likely an increasing willingness to pay higher gas prices."

In 2005 Qatar—third-largest gas producer in the world behind Russia and Iran—placed a moratorium on additional gas development projects at its massive offshore North field, pending results of a study of the field's reservoirs that is not expected to be completed until after this year. That means that no new projects are likely to be signed before 2010, said FGE.

Meanwhile, Abu Dhabi is the largest gas producer in the UAE with production of 4 bscfd of gas for sale.

Abu Dhabi has several new projects pending that could produce large amounts of gas, condensate, or other gas liquids in 2010-15. However, some of that gas will be reinjected into the Emirate's oil fields. Some 1.4 bscfd of gas currently is reinjected into Abu Dhabi's oil fields to maintain oil production levels.

Hungry gas market

Abu Dhabi's domestic market currently consumes 2.3 bscfd of gas, with electric power production representing almost 60% of the country's total gas consumption and the rest going to industry. Gas represents almost 99.8% of the fuel mix in electric power generation, which increased 13% in 2008. Gas demand for power generation is expected to increase at an average growth rate of 8-9%/year during 2008-20. Demand also is increasing rapidly as a result of the expanding local, petrochemical, and industrial projects.

However, large gas reinjection

requirements to maintain Abu Dhabi's oil production are expected to limit the amount of gas available for the domestic market. As a result, national leaders are considering increased use of alternatives for generating power, including construction of the country's first oil-fired electric power stations.

The Abu Dhabi Water & Electricity Authority is talking with major steam turbine manufacturers that could supply equipment for oil-fired plants. It may result in the planned Taweelah C independent water and power project (IWPP) becoming the first to run exclusively on liquid fuel, FGE reported. The planned Fujairah 3 IWPP could be the Emirate's next steam turbine power plant, it said.

Pending projects

Abu Dhabi's Onshore Gas Development III (OGD-III) will construct a gas processing plant in the Habshan Zone of Bab field with the capacity to process 1.3 bscfd of raw gas and produce 1.2 bscfd of dry gas, 4.3 million tons/year (tpy) of NGLs, and 130,000 b/d of condensates. The gas will come from the Thamama F reservoir and, after liquids separation, will be reinjected into the oil reservoir. The engineering, procurement, and construction contract was awarded to Bechtel Corp. in December 2004. The project is slated to be completed at yearend and start commercial operation early 2010.

The Asab Gas Development II (AGD-II) calls for installation of two gas treatment and NGL recovery units with a total capacity of 743 MMscfd. It is designed to recover 2.3 million tpy of NGL. Residual gas will be reinjected back into the reservoir for pressure maintenance purposes. The EPC contract was awarded to Bechtel in July 2005 and operations are scheduled to start by the end of this year.

In addition, the third NGL extraction train at Ruwais is under construction to treat NGLs from the OGD-III and AGD-II gas projects. Ruwais is expected to extract 2.3 million tpy of ethane, 4.4 million tpy of LPG, and 2.1 million tpy of naphtha. The project is expected to be completed in 2010 and will provide feedstock for the petrochemical expansions (Borouge II) in Abu Dhabi.

Borouge's current production capacity is 600,000 tpy of polyethylene. With the Borouge II expansion, the complex capacity will increase to 2.1 million tpy in mid-2010. Borouge II includes 1.5 million tpy ethane cracker. In June, Borouge awarded a $1.1 billion contract to the Linde Group for construction of a 1.5 million tpy ethane cracker (Borouge III). The expansion also includes construction of polypropylene and polyethylene units, a low density polyethylene unit, and a butane unit, as well as related offsite utilities and marine facilities. The contract will be executed on a lump sum turnkey basis and will be carried out by the Greek Consolidated Contractors Co. (CCC).

Borouge III is expected to be on stream by yearend 2013, using feedstock from expansions of the Abu Dhabi National Oil Co. (ADNOC) refinery and gas processing expansions at Ruwais (Habshan 5). FGE said completion of the new expansion will give Borouge the world's largest ethane cracker complex.

The Integrated Gas Development (IGD) project is designed to produce 2 bscfd of high-pressure gas from the offshore Umm Shaif and Khuff reservoirs. It is expected that 1 bscfd of gas will be reinjected into Umm Shaif oil field and the remaining 1 bscfd will be treated in the Habshan gas processing plant (Habshan 5) for the domestic market. Habshan 5 is expected to produce 900 MMscfd of sales gas for industrial projects, as well as fulfill power generation requirements in Abu Dhabi and the northern Emirates. The project will also produce 4.4 million tpy of NGLs. The NGLs will be treated in the fourth Ruwais NGL extraction unit. The IGD project is expected to be completed in late 2013.

In July, Abu Dhabi's Gasco, a subsidiary of ADNOC, awarded lump sum EPC contracts to different EPC contractors:

- Construction of the gas processing plant at Habshan (Habshan 5) to a joint venture of the Japanese JGC Corp. and Italian Maire Tecnimont SPA.
- Contraction of utilities and offsite work to South Korean Hyundai Engineering & Construction Co. Ltd.
- Construction of Ruwais' fourth NGL train to a joint venture of Petrofac Ltd. and South Korean GS Engineering & Construction Corp.
- Construction of storage tanks to Chicago Bridge & Iron Co. NV.

The OGD-III, AGD II, and IGD projects are expected to increase gas reinjection during 2009-20 by an extra 3 bscfd of gas, FGE reported.

Shah gas development

Development of ultra-sour gas reserves in Shah gas field is the most expensive gas project in the UAE and is expected to produce only 500-600 MMscfd of gas for new industries, power generation, or reinjection into the oil fields, said FGE. ADNOC selected ConocoPhillips to develop the field. That involves drilling 20 wells plus construction of necessary infrastructure, with gas scheduled to start flowing by first-quarter 2015.

Development cost is estimated as high as $10 billion, making it the country's largest and most expensive nonassociated gas project. Through development of Shah's gas reserves, roughly 1 bscfd of raw gas, 1.6 million tpy of NGL, 30-40,000 b/d of condensate, and 3.4 million tpy of sulfur will be produced. After gas treatment, 500-600 MMscfd of dry gas could be available for domestic market or reinjection purposes.

ADNOC wants to proceed with development of Hail and Bab sour gas fields. Hail gas field is expected to add an extra 400-600 MMscfd of gas, while Bab would produce 1.3 bscfd of gas. However, Abu Dhabi has not yet awarded EPC contracts to develop these fields, and these projects are unlikely to come on stream before 2015-16, said FGE. ✦

Gabon to launch 40-block licensing round

Eric Watkins
Oil Diplomacy Editor

Gabon will launch an oil licensing round for more than 40 blocks from two of its deepwater basins in May 2010, according to an official at CGGVeritas.

The licensing round, which will close in November 2010, says Steve Toothill, CGGVeritas chief geologist, is a deepwater round, with attention on subsalt plays.

Gabon presents a vast unexplored basin and drilling so far has been only above the salt, according to Toothill, who said his firm has seen some large structures below the salt where there is large potential.

CGGVeritas, which has been hired to advise the government on promotion of the licensing round, purchased 12,000 km of seismic data and reprocessed much existing data. Some companies, all deepwater players, have already signed up to buy data, Toothill said.

Word of the licensing round comes as Gabon's production has fallen to 250,000 b/d from its peak of 371,000 b/d in 1997—apparently due to maturing fields and a lack of new ones coming online.

Liquids production down

Analyst BMI said, "Following Brazil's recent significant subsalt discoveries and Angola's deepwater discoveries, Gabon will be hoping that its deepwater offshore acreage holds similar potential."

However, in its most recent Gabon Oil & Gas Report, BMI forecasts that in 2008-18 the country's oil and gas liquids production will decrease by 3.95%, with volumes peaking at 265,000 b/d in 2010, before falling steadily to 226,000 b/d by the end of the 10-year forecast period.

BMI said Gabon's oil consumption in 2008-18 is set to increase by 56%, with growth slowing to an assumed 5%/year towards the end of the period and the country using 21,000 b/d by 2018.

Gas production is expected to rise to 1 billion cu m by the end of the forecast period, the analyst said. With demand rising by 900% in 2008-18, BMI said, "there should be a balanced market, with no need for imports or scope for exports."

Political uncertainty

Word of the licensing round also follows reports that Gabon has been plunged into a degree of political

Setback in Ireland

Ireland's planning authority, An Bord Pleanala, has told Royal Dutch Shell PLC it is dissatisfied about the level of risk posed by the planned Corrib gas pipeline.

The board said the proposed high-pressure pipeline would run too close to housing at Rossport and between Glengad and Aughoose. It is "unacceptable" that these houses were within "the hazard range of the pipeline if a failure should occur."

The board said, "The design documentation for the pipeline and the quantified risk analysis provided with the application does not present a complete, transparent, and adequate demonstration that the pipeline does not pose an unacceptable risk to the public."

The board asked Shell and partners Statoil Exploration and Vermilion Energy Trust to modify part of the pipeline route, and provide more information on the project.

Incomplete application

An Bord Pleanala's ruling also said the application could not be approved because part of the application dealing with the pipeline section between chainage 83+390 and chainage 83+400 was missing.

The board further noted that 5.64 km of the 9-km route was unacceptable because of its proximity to houses, its impact on local land value, and insufficient plans to upgrade the road network in the area.

The board gave the partners until Feb. 5, 2010, to return with additional information on the safety of the pipeline and its effect on the peat bogs along the route.

The board also asked that the route between chainages 83+910 and 89+550 be diverted to the Sruwaddacon estuary, a move which the partners had ruled out earlier due to environmental and technical considerations.

If these requests were complied with by the deadline, the board said, it would be "appropriate" to approve the project.

Rethink needed

However, opponents of the Corrib project suggested it is now time for a complete rethink not only of its safety but also of its basic economics.

"This is a clear vindication of the stance that local people have taken on health and safety grounds over the last 10 years, and those concerns will remain our top priority until a resolution is found," said John Monaghan of the protest group Pobal Chill Chomain.

"It is now time for a complete rethink on the Corrib project by the developers Shell and Statoil, and even more importantly by Minister Eamon Ryan and his department, within whose remit the safety issues central to the ongoing conflict clearly lie," Monaghan told Mayo News.

Sounding an altogether different note was Maura Harrington of the Shell to Sea protest group: "It is now time for a proper economic debate on the huge implications of this giveaway."

For its part, Shell was quoted as saying: "In relation to the issue of safety, the Corrib gas partners remain firmly of the view that the pipeline, as designed, is safe and meets all international standards and industry best practice." ✦

uncertainty due to the death in June of President Omar Bongo Ondimba, who ruled almost unchallenged for 41 years.

"Political uncertainty is also expected to affect economic activity, as several companies will delay their investments until they are assured the country will remain politically stable," said the Economist Intelligence Unit in a recent report.

"In addition, despite the recent recovery in oil prices, there is still widespread uncertainty over the prospects for oil prices and some companies will delay investments until contractors' costs have been significantly reduced," the EIU report said.

Meanwhile, largely on political grounds, the Gabon government has replaced its oil minister as part of a reshuffle following elections which were necessitated by the death of the former president.

Julien Onkogho is the new oil minister, replacing Casimir Oye Mba, who had opposed the ruling party's choice of Ali Ben Bongo, the late president's son, as its candidate in the country's presidential elections. Ali Ben Bongo claimed victory in September. ✦

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WILLISTON WAULSORTIAN MOUNDS—2

Geochemical innovations point to vast Lodgepole oil expanse

Jamil Azad
Oil For America
Calgary

New technologies reveal that Lodgepole reef oil discoveries near Dickinson, ND, may be part of a supergiant oil field that covers a much larger area of the Williston basin.

Geochemistry innovation

Since collapse chimneys were not created equal, the ability to rank them and obtain at the same time a nonseismic confirmation of their location would obviously be helpful.

Fig. 12, an explorationist's desideratum (unequivocal geochemical measurements of whatever with high signal-to-noise ratio, repeatability, and significance) led the author to delve the morass of geochemical literature in the hope of finding a jewel lurking in its murky depths.

The author subdivided the subject into: 1) indirect geochemistry, 2) alkane geochemistry, and 3) aromatic geochemistry.

Indirect geochemistry

Even a casual acquaintance with this subject in my opinion indicates this superstition is no more useful for finding oil than is astrology and that further investigation is a waste of time.

Alkane/alkene geochemistry

This technology posits that since petroleum does occasionally rise from underground reservoirs to create visible macroseepages, microseepages that only instruments can detect should also exist.

The logic is impeccable, but countless failures and two pertinent studies show that alkane microseepage geochemistry cannot work—even though it has been carried out since 1929.

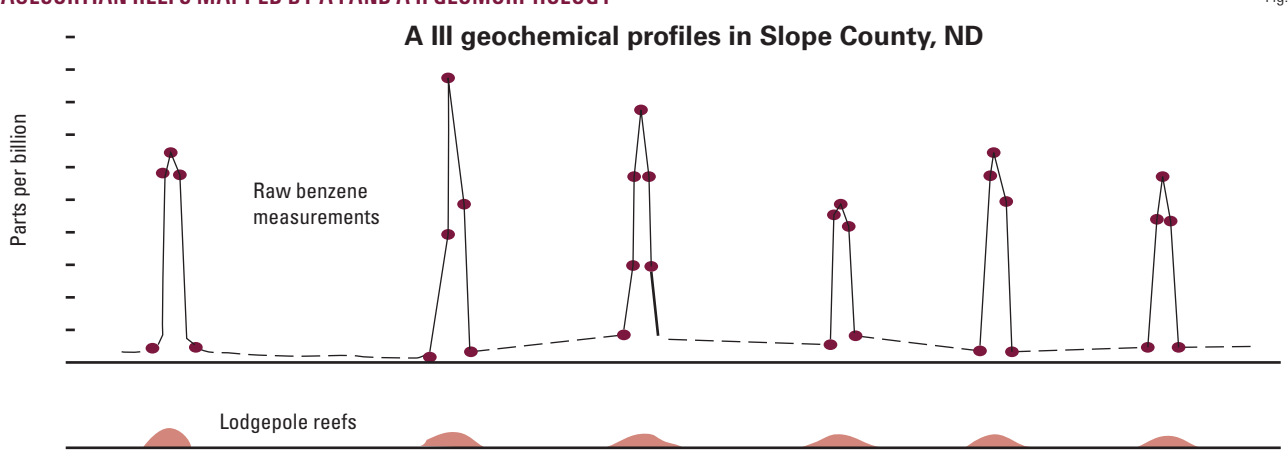
Smith and Ellis[6] demonstrated in 1963 that the decomposition of roots and grasses in soils creates the same alkanes and alkenes assumed to come from microseepages and warned that "these findings seriously challenge the usefulness of this approach to prospecting for petroleum," a tactful way to state that alkane geochemistry doesn't work.

Persistent doubts about the value of alkane geochemistry led the Geological Survey of Canada and industry in 1970 to run a huge survey in Alberta that covered 540 sq miles and used 4,561 core holes to retrieve samples later dissolved in acid and analyzed for desorbed alkanes "a la Horwitz."[7]

Limestones are said to adsorb and desorb 10 times more alkanes than clays and clays 10 times more alkanes than sandstones. This huge sampling variation, which changes from sample to sample, has not been and cannot

WAULSORTIAN REEFS MAPPED BY A I AND A II GEOMORPHOLOGY

Fig. 12



be adequately corrected for. The GSC's conclusion was that the recovered alkanes correlated mostly, if not wholly, with soil lithology, were most likely generated in soils, and were not microseepages rising from the subsurface.

The report's senior author volunteered that the method is useless.

Direct aromatic geochemistry

It would be nice for aromatic hydrocarbons to only pop out of microseepages, but studies indicate that they, too, may originate in near surficial sediments.

One likely reason for the recent appearance of aromatics in shallow sediments (and so-called biogenic gas) is the emergence of instruments that allow detection in parts per billion. To circumvent this problem we first determine, in the field, the background level of aromatics, and then know that the soil-air aromatics we sample mostly derive from microseepages.

Two types of commercial aromatic hydrocarbons geochemistry were available. One requires burying traps in soil for 3 weeks before analyzing their catch; the other detects benzene, toluene, ethylbenzene, and xylene directly in soil-air.

Our tests were conducted on the axis of the collapse chimney of our first discovery in Dickinson (Fig. 13). The chimney, offset from the contamination of surface production facilities, offers a perfect testing ground.

Conoco used seismic to site its vertical No. 1 dry hole. No. 2, a directional reentry from No. 1 and entirely based on our A II, hit the reef and had an 1,800 b/d IP. No. 3 was drilled in defiance of A II vehement prediction of a dry hole. This well missed the reef core and hit the tight flank, as did No. 1. An attempt to convert it into an injection well was a complete failure, following an immediate communication between wells 2 and 3.

The "buried traps" aromatic geochemistry found that chimney and background gave identical measurements. The other method using soil-air aromatic geochemistry proved hugely nonrepeatable.

Clearly, if we wanted the profiles of Fig. 12 (they are actual A III geochemistry, published here for the first time), somebody had to construct ad hoc instruments and invent algorithms to interpret their measurements.

Fortunately the author's partner is an engineer, an essential requirement for although all the elements of our prototype are off-the-shelf items, the machine assembled according to instructions gave measurements charitably described as amusing. It took months of redesign and testing before analyzer, carrier gas, calibration gas, digitized display, sampling hardware, and handling protocols that constitute A III aromatics analyzer worked to our specification of 1 ppb (which is like measuring 1 km to an accuracy of 0.001 mm).

Rudely, the field tests revealed three unexpected problems which, unless solved, would make our own aromatic hydrocarbon geochemistry useless.

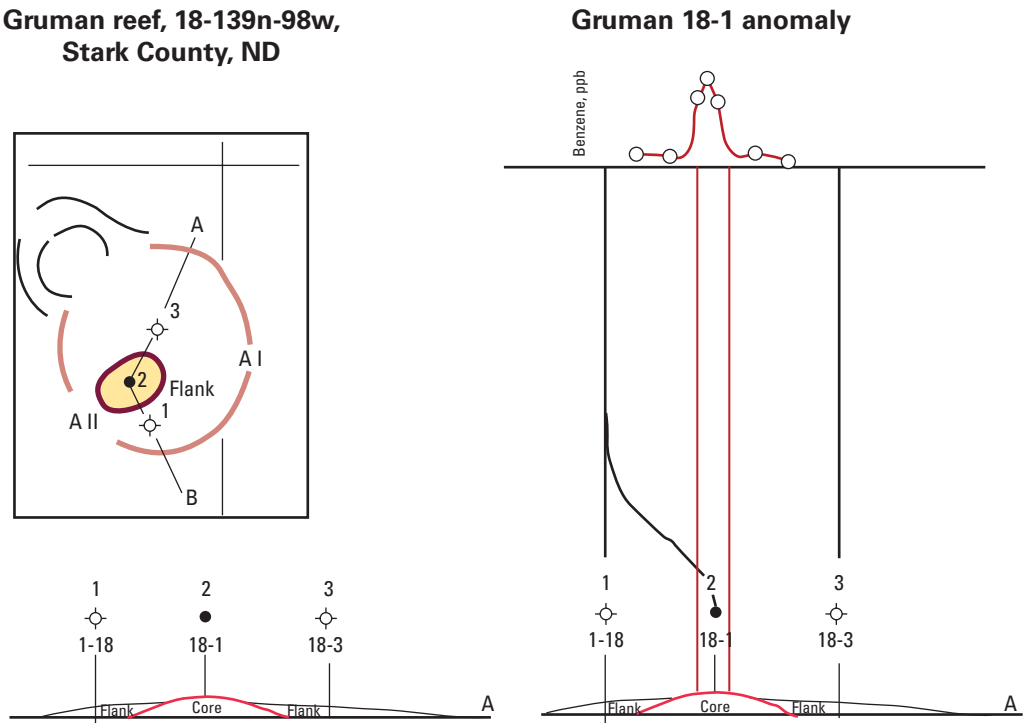
Mobile equilibrium

The three aromatic gases benzene, toluene, and ethylbenzene, sampled in soil-air, are found between their melting and boiling temperatures.

This means that Le Chatelier mobile equilibrium partitions them between liquid and gaseous phases (alone analyzed), which in turn means that

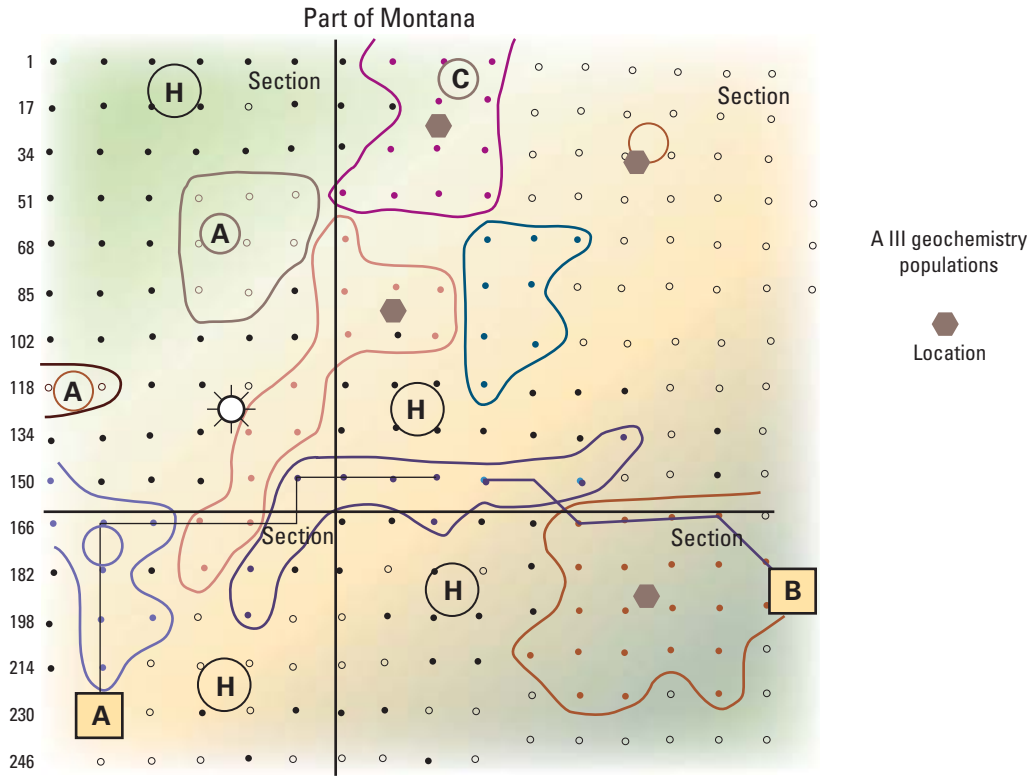
GRUMAN GEOCHEMICAL ANOMALY

Fig. 13



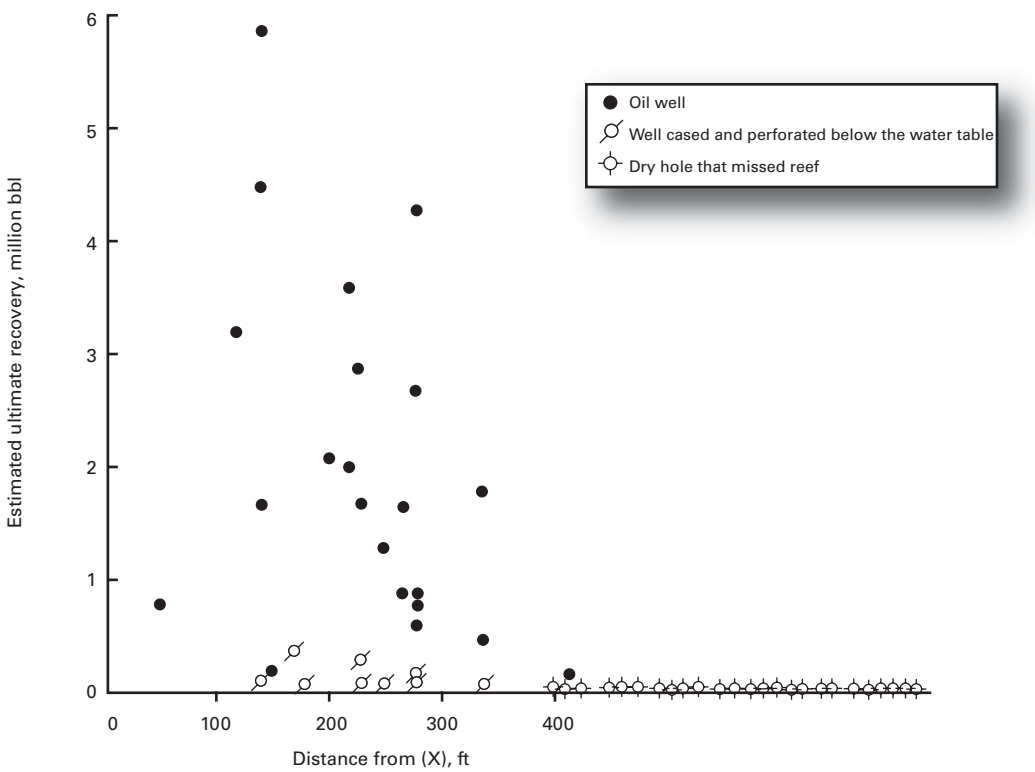
GRIDDED A III SURVEY SHOWING VARIOUS PODS OF SHALLOW GAS FINGERPRINTS

Fig. 14



DICKINSON OIL RECOVERY PLOTTED AGAINST DISTANCE TO (X)

Fig. 15



depending on the soil-air temperature samples at the same location may register as anomaly or background.

Obviously, in most cases, in order to be meaningful the raw measurements need be normalized, which has been accomplished.

Venting

The rising aromatic microseepages emerge from the phreatic zone to mix with the air of the vadose zone; there changes in pressure and temperature cause the commixture to leak out to atmosphere at rates that depend on the vertical transmissibility of near-surface rocks—a hard shale being the best and gravel the worst cap.

Thirteen raw benzene measurements taken at 20 ft intervals over the heart of the Gruman 18-1 anomaly (Fig. 13) varied between 18 and 134 ppb, a huge variation due to venting which makes the raw measurements meaningless. If uncorrected, our soil-air geochemistry would be invalid as many

others had been.

The effective corrections for venting to atmosphere (too bulky for this summarization) have been worked out.

A V fingerprinting

The various oil and gas sources are reflected in their respective aromatic microseepages.

Thus, it is possible to distinguish the Lodgepole petroleum microseepages from that of shallow gas channels, for instance. It is also possible to map (then drill) odd-shaped shallow gas accumulations by running a gridded survey as was done in Montana (Fig. 14). This obviously beats random drilling.

We have called this innovation A V technology. I know no other method that can do this.

Ground shot of surface-visible A II feature with a diameter of 700 ft (Fig. 16). Photo by Robert J. Angerer Jr.

Results to date

The account of the first applications of A I and A II technologies gave the results of 21 exploration wells in the Fort Worth basin of North Texas. All these wells hit the target reefs.

In Dickinson the first three were sited solely on AI and AII technologies and found that not all Lodgepole reefs had equal oil potential.

The need to highgrade the identified Lodgepole reefs led to A III technology. No well has been drilled yet using the A V innovation.

To date eight wells have been drilled in the Williston basin using these new technologies, and six of the eight found high reef and collapse chimney. One well missed (surveyor's error), and one well hit forereef, which area we will avoid in the future.

Completions and observations

The recoveries of the Dickinson wells demonstrate the importance of drilling close to the (X) of the A II target (Fig. 15), seeing that 400 ft away from the X of an A II has invariably yielded dry holes. The author's regression of this plot indicates that the expected recovery of a well drilled on an (X) to be 4 million bbl (Fig. 2).

Our drilling shows that A I finds reefs and A II finds reef-generated collapse chimneys, but that the Madison is the fractured reservoir and leaving acid in the formation longer than it takes to change connections and reverse it out results in the precipitation of the products of attack of carbonates by acid as the acidity of the solution decreases.

Also, the acid extracts sludge from the Lodgepole oil that effectively plugs the fractures. In the last three wells, the operators used acid, and although hydrocarbons were present, the fracture system was plugged with the products of the acid precipitates. This experience will avoid similar plugging in the future.

The problems of producing the postulated Dickinson supergiant oil field should be solved, at least for those operators willing to apply sound science and the lessons learned.

Conjectural reserves

There is no shortage of drilling locations seeing that A II has found thousands of outcropping collapse chimneys in the basin such as that shown in Fig. 16.

Only a tiny area of the potential ca. 25,000 sq miles of the Dickinson oil field has so far yielded production; this restricts reserve estimates to the category of wild guesses.

The simplest of these anchors on Eland oil field, said to cover 5¼ sq

miles and have an estimated ultimate recovery of 32 million bbl, which gives a recovery of about 6 million bbl/sq mile.

Prorating this figure (or 0.02% of the prospective area) to the area of the Dickinson supergiant oil field yields a most satisfying—if highly aleatory—150 billion bbl potential and puts it in the category of Alberta's Athabasca tar sands. Dividing this figure by 10 still yields a giant field. ✦

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Montana

Bill Barrett Corp., Denver, said it expensed four vertical wells in the quarter ended Sept. 30, 2009, at its Circus prospect in the Montana overthrust southeast of Helena.

The company focused on the Upper Cretaceous Cody shale, 900-2,000 ft thick at 3,000-7,000 ft, "to identify a large, repeatable natural gas resource play, but test results instead indicate more complex geology than anticipated that is not aligned with the company's strategy and timeline for development."

Barrett tested the Cody shale in three vertical wells drilled in 2008. Results varied but were noncommercial and included gas flows up to 1.1 MMcfd, oil flows up to 117 b/d, and large quantities of water.

Utah

Clayton Williams Energy Inc., Midland, Tex., plans to drill a third exploratory well in the last quarter of 2009 in the Central Utah thrust belt.

Target at the Maple Canyon prospect, in Sanpete County north of Providence oil field, is the Jurassic Navajo sandstone formation.

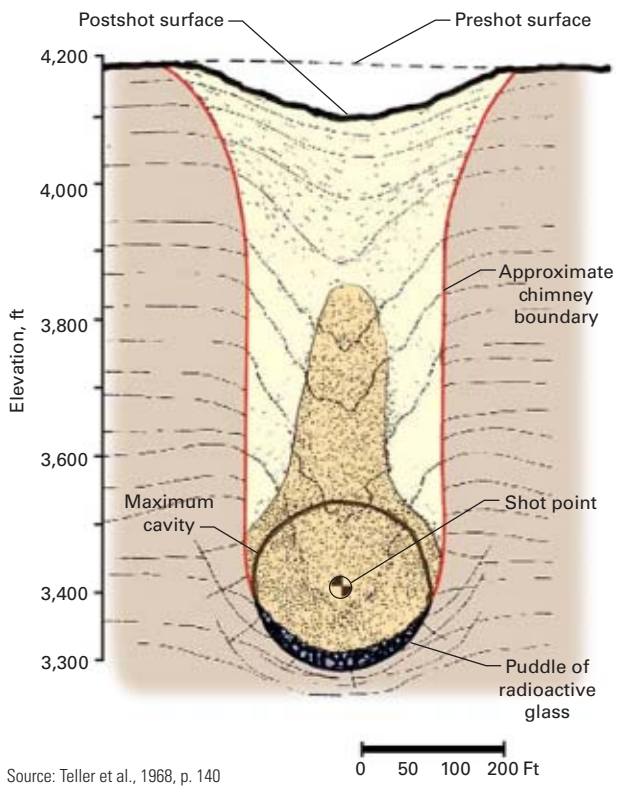
Williams, which holds 22,755 net acres and has a one-third interest in the play in Sanpete County, has previously drilled two dry holes in the northwestern part of the county.

Correction

Here is the correct Fig. 7 that was intended to run with Part 1 of the foregoing Williston Lodgepole article by Jamil Azad (OGJ, Nov. 9, 2009, p. 32).

SUBSIDENCE CRATER CROSS-SECTION IN ALLUVIUM

Fig. 7



Source: Teller et al., 1968, p. 140

CO_2 INJECTION—1

Restaged CO_2 compressors, new pumps remove bottleneck at Weyburn

Kenneth. J. Vargas
Falcon EDF Ltd.
Calgary

The restaging of CO_2 compressors and installation of injection pumps removed the bottleneck caused by the lack of reinjection compression capacity for the produced recycled gas at EnCana Corp.'s Weyburn Saskatchewan oil battery. The battery reinjects dense-phase CO_2 for enhancing oil recovery.

The reinjection process entails separating produced gas from the oil, compressing the gas, and then recycling it into the reservoir together with CO_2 from the North Dakota's Great Plains Synfuels Plant.

EnCana lead facilities engineer Blair Eddy developed a detailed plan for adding capacity that involved pumping the dense-phase recycled gas.

EnCana Weyburn engaged Falcon EDF Ltd. to perform the detailed engineering to implement Blair's plan and work under his direction.

This first of a two-part series describes the design work for the projects. The second part will cover the detailed engineering.

Weyburn battery

The Weyburn battery, built in the mid 1950s, produced 10,000 b/d during its peak primary recovery phase. Secondary recovery with field-water injection commenced in the 1960s.

In 1997, EnCana and partners signed a carbon-dioxide supply agreement with Dakota Gasification Co. (DGC). DGC is a wholly owned subsidiary of Basin Electric and Power Cooperative of Bismarck, ND, and owns and operates the Great Plains Synfuels Plant.

A 323 km, 16-in. pipeline from Beulah ND conveys the CO_2 to Weyburn, Sask. Current CO_2 delivery to Weyburn is 125 MMscfd.

Oil production at the battery has increased to 29,000 b/d and Encana expects production to continue to increase as it refines the injection strategy.

The existing reciprocating K-701-1/2 compressors, capable of compressing 25 MMscfd each, were a bottleneck. Due to problems in bringing on additional com-

DISTILLED OIL FRACTION*

Table 1

Temperature, °F.	Oil fraction distilled
150	0.05
210	0.10
260	0.15
312	0.20
375	0.25
430	0.30
485	0.35
530	0.40
595	0.45
645	0.50
700	0.55
740	0.60
845	0.65
910	0.70
980	0.75
1,040	0.80

*Oil ASTM D-86 analysis.

OIL VISCOSITY

Table 2

Temperature, °C.	Viscosity, cst	Viscosity, cp
50	9.3	10.5
20	44.0	49.3

GAS COMPOSITION

Table 3

Component	Mole fraction, Existing	Mole fraction, Future
H_2	0.0000	0.0000
He	0.0000	0.0000
N_2	0.0167	0.0054
CO_2	0.8196	0.9299
H_2S	0.0120	0.0087
C_1	0.0535	0.0175
C_2	0.0307	0.0101
$C_2^=$	0.0414	0.0136
C_3	0.0016	0.0085
iC_4	0.0000	0.0000
C_4	0.0000	0.0000
iC_5	0.0000	0.0000
C_5	0.0000	0.0047
C_6	0.0000	0.0000
C_{7+}		

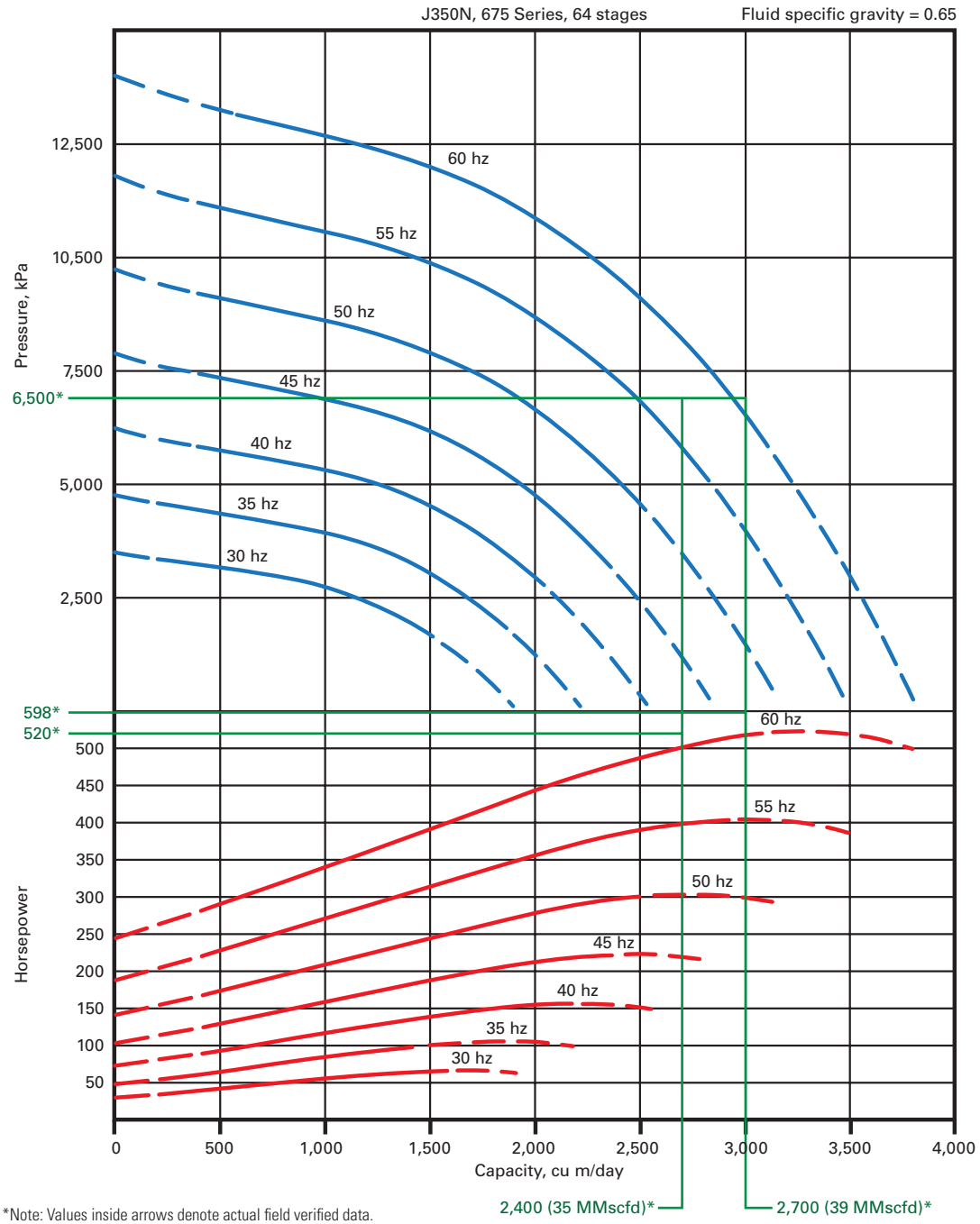
NEW DESIGN

Table 4

Compressor stage	Suction, kPa-a	Discharge, kPa-a	Horsepower	Cooler, MMbtu/hr
Operating conditions				
First	1,070	2,035	1,360	1.6
Second	2,035	4,000	1,580	5.7
Third	4,000	8,412	1,540	9.6 at 43° C.
Flow, 1,000 std cu m/day	991	991	Σ=4,160	
Maximum operating conditions				
First	1,276	2,413	1,621	2.1
Second	2,413	4,378	1,660	6.3
Third	4,378	8,412	1,610	11.1 at 43° C.
Flow, 1,000 std cu m/day	1,270	1,270	Σ=4,891	

REDA PUMP CURVE

Fig. 1



*Note: Values inside arrows denote actual field verified data.

pression as quickly as required, EnCana management directed its lead facility engineer Eddy to fast track an interim alternative of recylindering existing compression with dense-phase CO_2 pumping after the restaged compression.

Recycle compressions

Existing compression consisted of two Cooper W-76 Frame, 6,000 hp, four-stage electrically driven compressors. Each compressor can handle 25 MMscfd (882,000 cu m/day). Inlet suction pressure was 1,000 kPa and discharge pressure was 15,300 kPa.

The stages consisted of two 17-in. cylinders on the first stage, two 11.5-in. cylinders on the second stage, one 9-in. cylinder on the third stage, and one 8-in. cylinder on the fourth stage.

The plan was to fast track restaging the compressor. The change from four stages to three stages would increase throughput. A centrifugal multistage pump would give the final boost.

The advantage of this plan was that the cylinders required for restaging compression and the pumps had shorter delivery times than installation of a new compressor.

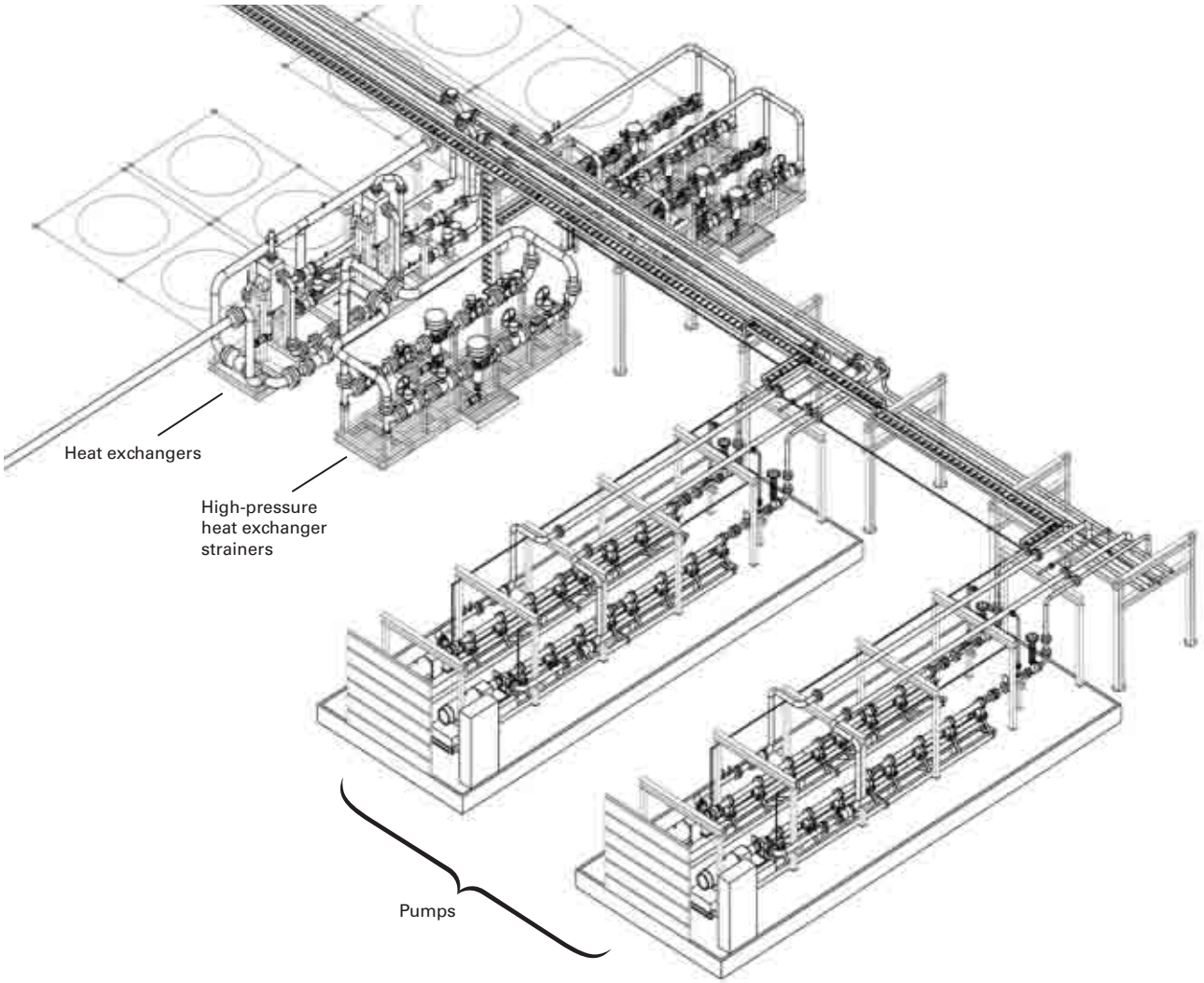
The recylindered compression configuration was:

- Stage 1: two 17-in. new cylinders with a higher than existing maximum working pressure.
- Stage 2: two 11.5-in. existing cylinders.
- Stage 3: two 9-in. new cylinders.

The pumps chosen were Schlumberger Reda 64-stage J350N 675 series multistage horizontal centrifugal pump. The initial pump motor selected was a variable-frequency drive controlled, 400-hp motor; however, once the pump ran, the motor's available horse-

NEWLY INSTALLED SKIDS

Fig. 2



power was too low.

The required flow rate of the 82% CO_2, 0.6 specific gravity, dense-phase recycle gas required 520 hp. Subsequently, the pump required upgrading to a 600-hp motor.

To ensure pump redundancy and ample capacity, the design required installation of two pumps per compressor train. A programmable-logic controller controlled the pumps. One pump operates at 100% capacity, while pump suction pressure controls the other one that had a VFD drive. Thus, the second pump ensures a uniform compressor throughput.

In addition, the design included installation of heat exchangers to avoid summer 43° C. gas off the third-stage compression from bottlenecking the Reda pump. Note that dense-phase CO_2 is very sensitive to temperature. As temperature increases above 25° C., the specific gravity decreases rapidly, thereby lowering the pump's throughput volume. As the specific gravity increases, the throughput increases and the horsepower required increases also.

Fig. 1 shows the pump performance curves for recycled gas with a 0.65 specific gravity, 82% CO_2 at 25° C.

Fig. 2 shows a 3D Autocad drawing of the piping with the newly installed skids.

Design basis

The properties of the crude oil, based on the CoreLab PCP Weyburn composite analysis Apr. 29-May 13, 1992, were:

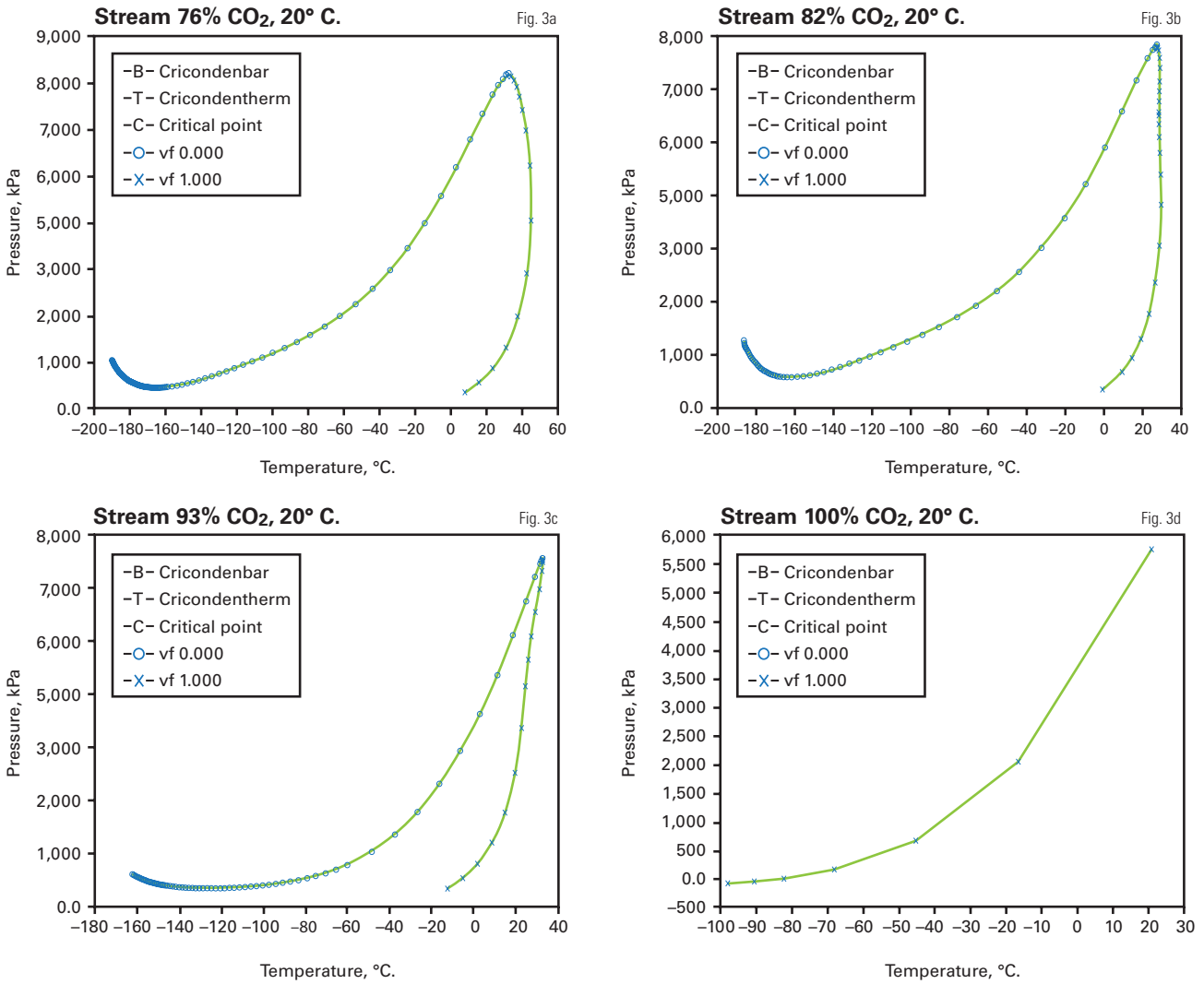
- Dark brown color.
- 27.6° gravity at 15° C.
- 889 kg/cu m at 15° C. absolute density.
- +4° C. pour point.

Table 1 lists the distillation cuts; Table 2 shows the oil viscosity at different temperatures.

Based on the latest information given by EnCana for the debottlenecking study, the gas has a 1.46 sp gr. (42.4 molecular weight) with current and

RECYCLED GAS PHASE ENVELOPES

Fig. 3



future gas compositions as shown in Table 3.

The design work included the simulation to two cases. The first case was for low flow of 35 MMscfd (991,000 cu m/day)and low 82% CO_2. The second was for high flow of 45 MMscfd (1.27 million cu m/day) and high 93% CO_2.

Table 4 shows the new approximate operating conditions for the three-stage existing recycle compressors for the two operating cases (low and high).

The existing cooler capacities were:

- 7.24 MMbtu/hr for first stage (old second stage).
- 6.21 MMbtu/hr for second stage (old third stage).
- 9.68 MMbtu/hr for third stage (old fourth stage).

The maximum case cannot reach 45 MMscfd due to cooler limitations.

The projected new third-stage cooler duty required for the high-flow case was 11.1 MMbtu/hr. Therefore, the restaged compressor could not deliver.

Total driver power of the K-701-1/2 compressors was 6,000 hp each.

Injection pumps

The pump design conditions for the two 400 hp (initial motor size) Schlumberger-Reda 64-stage, 1,100 psi boost pressure pumps were:

- 2,300 cu m/day liquid design flow.
- 2,700 cu m/day maximum liquid flow.
- 7,585-8,620 kPa-a at 43° C. inlet conditions.
- 15,300 kPa-a discharge pressure.
- 3,570 rpm, VFD compatible pump speed.
- Dense-phase CO_2/H_2S/HC (see gas analysis) internal material.
- TEFC-XP motor.

An injection recycle gas pump skid would house the two multistage pumps.

Instrument air from the existing battery air compressors provided instru-

Four 58-MW Rolls-Royce Trent GTGs Available for Immediate Delivery

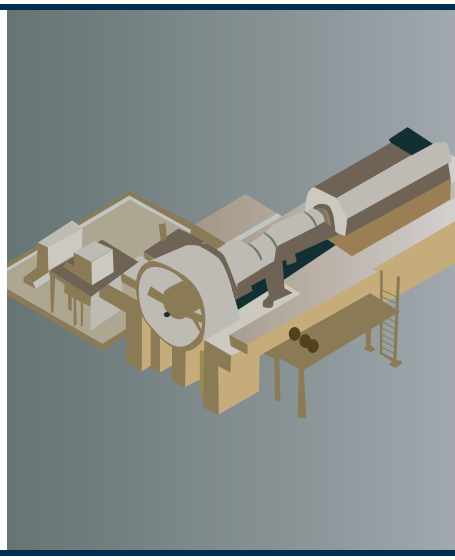
The Rolls-Royce Trent 60 is an advanced aeroderivative gas turbine that delivers up to 58 MW of electric power in simple cycle service. At 42% efficiency, the Trent 60 is highly fuel efficient. It offers operators fast delivery and installation times, and beneficial environmental performance. All or part of the following is available for immediate sale:

- Four Trent 60 Dual WLE GTGs rated at 58 MW with a gross heat rate of 8,592 BTU/kWe.hr (LHV)
- Dual fuel – natural gas and liquid
- Two left-handed units; two right-handed units
- Four generators rated at 13.8 kV, 3 phase, 60 Hz, 0.85 power factor
- Water injection system included
- SCR and carbon monoxide conversion systems with 80-ft stacks
- Acoustic abatement for SCR cladding and silencer
- Water wash system
- Special tools
- GSUs
- Two transformers able to handle two 58-MW units
- GE Prolec 90/120/150 MVA (2 units), with a low voltage 13.8 kV Delta, and a 115 kV Wye HV winding
- Price includes new transformer oil

Two New Alstom 50-Hz Combined Cycle 140-MW Steam Turbine Generators Available for Immediate Shipment

These steam turbine generators (STGs) are new, 140-MW Alstom two-cylinder (HP and IP/LP) reheat condensing steam turbine generator sets suitable for combined cycle outdoor operation with axial exhaust and air-cooled (TEWAC) generator. Initial steam conditions 1900 psia/1050°F/1050°F reheat. Units include manufacturer's performance guarantees and warranties. Units may be shipped directly to your site from Alstom's European manufacturing facility.

- Units come complete with all normally supplied auxiliaries and include factory warranties covering manufacturing defects and performance guarantees.
- Configured as a two-cylinder machine with an HP turbine and a combined IP/LP turbine with an axial exhaust.
- Steam inlet conditions are 1900 psia (nominal)/1050°F/1050°F.
- Air-cooled TEWAC generator rated 165 MVA, 15.75 kV, 3 phase, 50 Hz, 3000 rpm.



Unused GE D11 HP/IP Turbine Assembly Available for Immediate Sale

All parts professionally stored in Pensacola, Florida

Unused GE D11 HP/IP turbine assembly and other miscellaneous parts including LP casings and 304-MW generator stator now available for immediate sale.

Solar Centaur 40 T4701S Turbine Generator Package Now Available

Offered by Williams Field Services Company exclusively through PennEnergy

Solar Centaur 40 T4701S Turbine Generator Package with approximately 60,000 accumulated hours at 50% load. Package was in service from 1999 until August 2007. Engine is BACT compliant with OEM 25 ppm Nox/50 ppm CO guarantee. Operates off SAB-type Ideal generator rated at 3500 kW, 4375 kVA and 13,800 volts at 60 Hz. Miscellaneous equipment includes inlet air filtration and simple exhaust systems, and auxiliary control console with start/stop/sync/control.

Williams

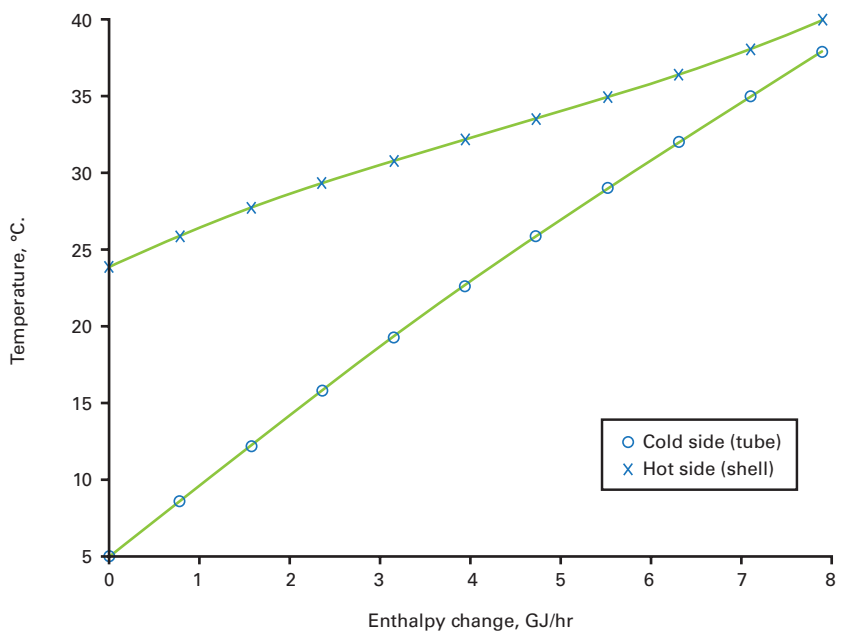
For Info or Pricing Contact

Randy Hall rhall@pennenergy.com P: 713-499-6330 | Bart Zaino bzaino@thomassenamcot.com P: 817-263-3273

To minimize size constraints in the facility, the project installed compact printed-circuit heat exchangers (Fig. 4).

HEAT EXCHANGER PROFILE

Fig. 5



ment air for all pneumatic devices. The design included a new remote-rack PLC for controlling the new Reda pumps. The new PLC provided local overall process control.

Power for the pumps was from the existing 4,160-v line. A new 750-kva transformer reduced the voltage to 480 v.

A spare area in the main master control center building housed the switchgear and fuse for the new pump feeders. The design used the existing flare for blowdown and pressure safety valve discharge because the gas is sour. The process directed all equipment purges, PSVs, and blowdown valves to flare.

The skid also housed all critical instruments such as vibration switches, gas detection, and pressure transmitters.

Material balance

Based on compressor discharge conditions, it was evident from the pump curves and the phase envelopes for the different CO_2 concentrations of the recycled gas that several conditions would govern the pump suction.

Fig. 3 shows the phase envelopes for recycled gas concentrations varying from 76-100% CO_2. The dense-phase critical point pressure varies from 8,200 kPa for 76% gas to 5,800 kPa for 100% CO_2 gas. Hence, the process ensures a dense-phase gas at the existing 82% CO_2 concentration and a Reda pump suction pressure of 8,458 kPa-g. This pressure is greater than the 7,800 kPa critical point pressure for 82% CO_2 gas.

Fig. 4 shows the pump curve provided for the REDA HPS 675 series 0.65 sp gr dense-phase CO_2. For 82% CO_2 gas, the required pump's inlet pressure temperature is 24° C. at 8,458 kPa-g. The pump curves provided under predicted horsepower and over predicted flow rate.

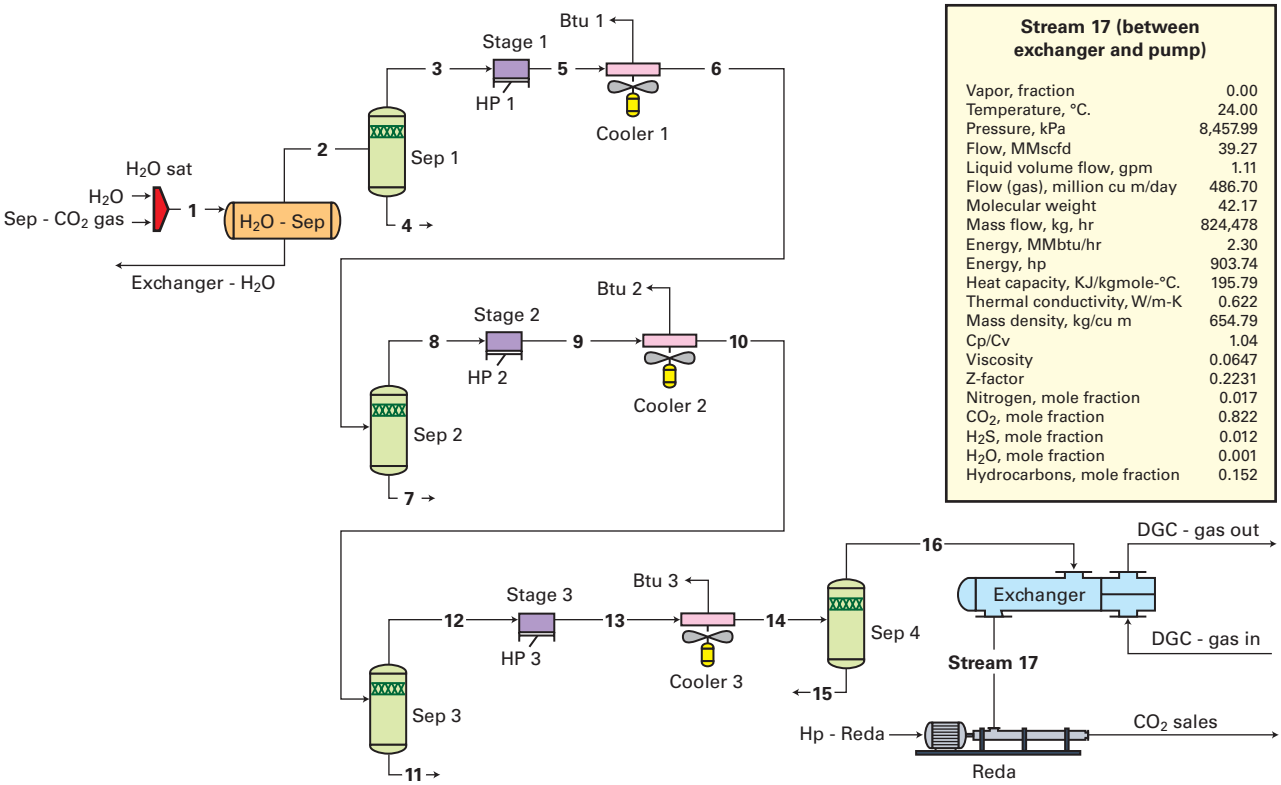
After installation, the running of the pumps provided actual flow rates, pressures, and temperatures.

The x and y axes of Fig. 1 compare the actual operating parameters with the curve values. Note that the actual capacities are 2,400 liquid cu m/day vs. 2,700 liquid cu m/day and 2,700 liquid cu m/d vs. 3,000 liquid cu m/day. The 2,400 liquid cu m/day is equivalent to 35 MMscfd of gas and the 2,700 liquid cu m/day is equivalent to 39 MMscfd gas.

The actual curve horsepowers were 520 and 598 for the 2,400 and 2,700 liquid cu m/day flow rates, respectively.

HEAT EXCHANGER PROFILE

Fig. 6



Stream 17 (between exchanger and pump)

Vapor, fraction	0.00
Temperature, °C.	24.00
Pressure, kPa	8,457.99
Flow, MMscfd	39.27
Liquid volume flow, gpm	1.11
Flow (gas), million cu m/day	486.70
Molecular weight	42.17
Mass flow, kg, hr	824,478
Energy, MMbtu/hr	2.30
Energy, hp	903.74
Heat capacity, KJ/kgmole-°C.	195.79
Thermal conductivity, W/m-K	0.622
Mass density, kg/cu m	654.79
Cp/Cv	1.04
Viscosity	0.0647
Z-factor	0.2231
Nitrogen, mole fraction	0.017
CO_2, mole fraction	0.822
H_2S, mole fraction	0.012
H_2O, mole fraction	0.001
Hydrocarbons, mole fraction	0.152

Because of the curve under predicting the horsepower and flow rates, EnCana decided to install two pumps per train (a total of four pumps) with 600-hp motors on each.

As discussed previously EnCana also decided to ensure a constant pump temperature in the summer. It decided to install heat exchangers as soon as possible.

To minimize size constraints in the battery, it selected a compact printed-circuit exchanger. The overall (flange to flange in-out) dimensions of these exchangers were 45-in. overall width and 76-in. overall length

Fig. 4 shows the exchangers installed. An equivalent shell and tube exchanger would have required two stacked exchangers each consisting of two 1,219 mm (4 ft) diameter by 13,176 mm (45 ft) long units (2 by 2 stacked exchanger units).

Fig. 5 shows the heat-exchanger profile. It assumes summer conditions with the DGC pipeline exchanger gas inlet temperature of 5° C. and the K-701 compressor cooler third-stage outlet at 43° C. into the exchanger.

The process required installation of inlet strainers upstream of both exchanger inlets because the exchangers are susceptible to fouling. Inspection of recycled and DGC gases shows them to be extremely dirty on start-up. The heat-exchanger strainers were worth the investment but were extremely time consuming to depressure and clean.

Fig. 6 shows a single-train process flow diagram. The material balance for the summer conditions and a liquid flow rate of 2,700 liquid cu m/day or 39 MMscfd of gas equivalent dense-phase CO_2 was one of the key conditions evaluated. The main data for this material balance are:

- Dense-phase recycled gas with 82% CO_2 flowing at 39.3 MMscfd at an ambient 43° C.
- DGC heat-exchanger gas flow at 42 MMscfd.
- An 8,460 kPa-g at 43° C. compressor third-stage discharge pressure.

The PFD-material balance shows the three-stage compressor and coolers, the Heatric printed-circuit heat exchanger, and the Schlumberger REDA booster-pump stream data. The stream table shows the critical parameters for ensuring that the design meets all required process conditions.

One can check any condition of the plant on the PFD material balance; for example the Reda horsepower is 594 (stream hp-reda701). The most important stream is Stream 17, which shows the process conditions before the pump suction.

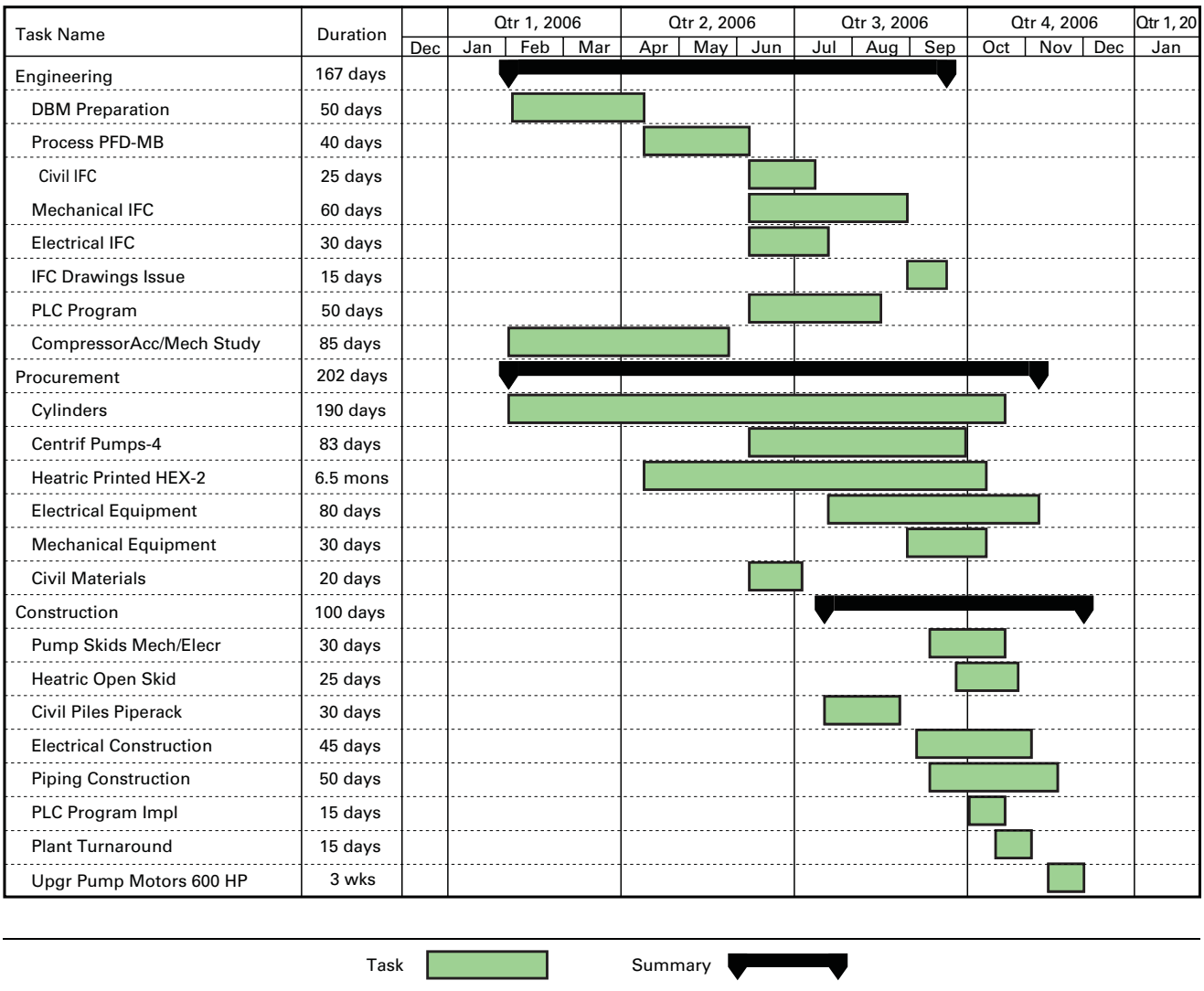
Stream 17 key parameters are:

- 39.3 MMscfd dense phase flow, mostly CO_2.
- 8,548 kPa-g at 24° C. pump inlet pressure.
- 0.655 kg/cu m mass density.

From the above simulation results, it is evident that any slight fluctuation in the temperature (specific gravity)

PRODUCED GAS RECYCLE COMPRESSOR DEBOTTLENECKING

Fig. 7



changes the throughput through the pumps. To meet the 35-40 MMscfd (2,400-2,700 liquid cu m/day) throughput, the specific gravity must be 0.65 or the dense phase fluid into the pump must be below 24° C. with at least a 600-hp pump motor driver.

Economics, schedule

The design work modified the project as a whole several times to ensure that the motors had enough horsepower and the summer month's weather would not overheat the gas into the pump suction.

The final installed cost for the equipment and materials was $4,893,000 broken down as follows:

- $2,375,000 for four pumps (piped and wired) on fully enclosed skid.
- $660,000 for two sets of new compressor cylinders.
- $593,000 for two Heatric heat exchangers.
- $244,000 for electrical and instrument equipment.
- $1,321,000 for pipe valves, fittings, control valves, structural steel, and insulation.

The construction cost was $3,606,000. This included $2,637,000 for the mechanical and civil installation work and $969,000 for the electrical instrumentation work.

Total project cost was $9.928 million.

To understand the economic advantage of this project, following is a comparison of the cost of new compression vs. the upgrade.

An installed cost of a reciprocal 4,000-hp compressor with a 25 MMscfd throughput is $26 million compared with the $10 million cost of a three-stage, one-train K701s with REDA rated for a 39 MMsfd throughput.

The 4,000 hp compressor costs were from a canceled project fully scoped and bid for the Weyburn plant last year.

Total production increase for the two trains was 28 MMscfd (2 × (39-25)).

Addition of the dense-phase pumps and restaging compression added 28 MMscfd for a $10 million investment vs. the $26 million of compression to realize a 25 MMscfd gain. This translates to $0.36 million/MMscfd for compressor restaging-pumps vs. $0.96 million/MMscfd for reciprocating compression.

Schedule

Fig. 7 shows the simplified project schedule, derived from the final project completion schedule as recorded after start-up.

In spite of all the additions, it took 9 months to complete the project as scheduled.

The schedule included the following long lead items:

- Design and engineering of process equipment, skids, in plant piping modifications, electrical upgrades, control philosophy-design, and turnaround electrical-piping tie-ins.
- Delivery of all long delivery equipment, such as cylinders, pumps, heat exchangers, VFD, transformers, and upgraded motors.
- Installing equipment in skids.
- Pipe racks with piping and cable in cable trays.
- PLC program.
- Plant turnaround.
- Final tie-ins. ✦

The author

Kenneth J. Vargas is president of Falcon EDF Ltd. and has more than 35 years of experience in designing upstream oil and gas facilities. Vargas specializes in process engineering and project management of onshore and offshore projects. He previously worked for IBM, DuPont, Eldorado Nuclear, and Gulf. Vargas is a graduate of the US Air Force Academy and is a registered professional engineer in Western Canada, Northwest Territories, North Dakota, and Montana.

Final institute report refines, forecasts cyber-security issues

Annie McIntyre
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Albuquerque

This article follows a 2006 article that introduced the Institute for Information Infrastructure Protection (I3P) and presented initial research findings and industry perspectives on cyber-security risks facing critical control systems in energy infrastructures.[1]

These initial findings included a characterization of risk in terms of threat, vulnerability, and consequence. Over the past 3 years, this characterization has remained a common thread through the I3P's Process Control System (PCS) Security and Survivability projects.

The 2006 article presented conclusions about vulnerabilities, consequences, and the general perceptions on cyber security as provided by the oil, gas, and chemical industry and its vendors. This research provided a foundation for the I3P to continue working to meet the goals of government—to secure process control systems—while working closely with industry members.

As the I3P PCS project completes its fourth and final year, many conclusions about process control system risk have evolved, and progress has been made between government and industry in addressing the security of control systems in the US critical infrastructure.

This article outlines major findings from industry since the initial report and presents an outlook on the future of process control system security.

Background

The I3P was created in 2001 in response to a need recognized by the US government for research and development to protect critical national infrastructure.[2] The I3P project team consists of scientists and engineers from nonprofit organizations, national laboratories, and academia.

Begun in 2005, the PCS project focused on cyber security for the oil, gas, and chemical sectors.[3] Owners, operators, and vendors participated through workshops and by site visits by I3P project team members to outline critical operational areas and address the feasibility of technology and methods to identify and rank cyber-security needs.

Findings, observations

Asset owner, operator concerns:
- A need for comprehensive security across control systems. The architecture must be addressed as a whole.
- Consideration of interdependences when implementing security in the architecture.
- Overall intrusion detection and prevention that includes monitoring, event correlation, first-day intrusion awareness, and alarm processing.
- Engagement of stakeholders at all levels of an organization, including asset owners and managers.
- Acceptance that critical infrastructure is an attractive target.

Vendor concerns:
- Management engagement early in decisions about obtaining and implementing security controls.
- Increased awareness and training among operators and integrators on security controls.
- Industrial plant network to be considered multilayered enterprises rather than a collection of individual nodes. This facilitates comprehensive protection.
- Clearly defined roles and relationships between IT staff and operators, with open communication lines.

Shared concerns:
- Securing wireless connectivity.
- A set of widely accepted standards, guidelines, and best practices.
- An understanding of how interoperability affects security within the enterprise at various levels within an organization.
- Life-cycle and maintenance planning.
- A plan to address legacy systems.
- Realization that economic justification is required for implementing security throughout the enterprise.

I3P team observations:
- Asset owners, operators, and vendors can have different expectations. Asset owners often expect security to be addressed by vendors, while vendors often expect a certain user awareness and operational security already in place.
- Specific concerns over remote access, wireless, and communications backbones still exist.
- Metrics play an important role to industry. Asset owners, operators want to know their current security posture. Metrics provide data they can analyze to determine where they stand on security and to support decisions on security investments.
- A secure design is key to many industry members.
- Cyber security should be considered in the context of simply one more risk to manage.
- Historically, security has been approached in piecemeal, patching only what is needed. This has resulted in many complex and disparate architectures.
- The cost-benefit or return on investment is still extremely important when considering security.
- The role of organizational communication is critical.
- A balance between physical and cyber security is needed to achieve better operational security.

The I3P team developed a methodology and supporting technologies over the following years. An industry advisory board guided development of this methodology and toolset. A feedback loop with industry ensured that these tools filled gaps and solved specific needs. The 2006 article present findings and characterized risk from the first 2 years of research.

In 2007, the PCS project took on a new scope that included survivability and recovery of process control systems. This new phase built upon the foundational research but included reliability, resilience, and overall ability to survive and recover from a cyber incident with minimal impact. Many in industry felt this area was the next step in securing overall operations.

Realizing that the best chances of meeting national security goals was to ensure that research and development are usable in actual architectures and support overall operations, the I3P launched an additional outreach initiative. This outreach project facilitated increased interaction, feedback, and awareness. Both projects continued workshops, security forums, and site visits.

After several years of collaboration, we can summarize the cyber security climate in the oil and gas industry and recognize future needs to ensure that energy continues without interruption to flow to consumers nationwide.

Many observations are conveyed in the following sections in attempts to enumerate the perspective of industry on cyber security and provide insight to critical issues in the future.

Observations

Early in the project, a main objective was to agree on bounds and definitions that comprised cyber security for process control systems. Following definition, the next step was to develop a general acceptance among the oil, gas, and chemical industry that cyber security is a legitimate, defined problem. It was not unexpected that agreement and acceptance of cyber security as a problem could be a hurdle.

Differing architectures, historical processes, and procedures are sometimes vastly different among organizations. Different interpretations also exist between separate organizational subgroups and among vendors.

To approach this problem from a technical view, the project team first defined how industry members were actually conducting operations and structuring control system architectures, especially during emergency situations or when trying to bridge communications to remote locations. Identifying shared perspectives on security and understanding realistic operating practices provided a more accurate view of potential risks. These views were gathered from workshops, forums, and site visits; the accompanying box on the opposite page lists those findings.[4]

RISK EQUATION

Threat x Vulnerability x Consequence = Risk
Resources Weaknesses Effect Business impact

Understanding what motivates industry to reduce risk and preserve operations helped researchers define and apply the correct mitigation. The project team defined risk in terms of threat, vulnerability, and consequence (accompanying box above); this definition has remained consistent throughout the project, although threats, vulnerabilities, and consequences have become more complex over time.[1]

A threat implies that an individual or group has the ability and access to damage or exploit a system for a specific gain. A vulnerability is a weakness that exists in a system, network, application, or process that can be exploited by a threat to create an adverse effect. Finally, a consequence is the resulting loss, damage, or impact resulting from a threat successfully exploiting a vulnerability. The result can have physical, economic, environmental, and human consequences.[1]

The 2006 article details examples of characterized vulnerabilities and their resulting consequences and effects. Building an understanding of how each vulnerability leads to a consequence, one can develop a business case for applying security. In nearly all cases, industry members shared common overall operational goals, including:

- Financial stability.
- Production and movement of product.
- Safety.
- Security.
- Reliability.
- Environmental compliance.
- Preparedness.

Mapping high-level operation goals to specific cyber risks can help define the scope of the problem, promote understanding of potential consequences, and allow security controls and mitigations to be applied more effectively.

Applying these solutions with an operational perspective is key in an industry in which reliability and the production and movement of product are absolutely critical. For cyber security to be applied successfully, it must be viewed as simply one more operational aspect, rather than an additional burden or optional consideration.

Awareness, cultural shift

During the first 2 years of collaboration with industry, a cultural shift seemed to be emerging. Cyber security began, in fact, to transform into an operational element and potential investment area. Awareness and discussions on security increased, and industry feedback indicated that communication across different organizational departments was increasing.

Outreach events, such as workshops and security forums held over the past several years, provided government and researchers with a chance to understand industry perspectives and concerns fully, and facilitated collabora-

tion to produce solutions while meeting operational needs.

The I3P project team found increased participation from various parts of industry organizations to include technical managers, IT staff, auditors, and supervisory control and data acquisition managers. Feedback indicated that, technical challenges aside, communication and investment justification were two areas of particular concern and interest to industry.

Linking cyber security to a business investment is difficult. Making the case for an investment to prevent something bad from happening to a network or architecture can be difficult.

Many industry members developed their own strategies to justify spending on protection and awareness. These included potential consequence cost assessments and development of cross-segment risk analysis teams. Market drops in the past few years affected momentum that security had gained early in the project. Reduced staffing, increased workloads, limited training, and shrinking travel budgets slowed the major security efforts.

An interesting but beneficial consequence to these events, however, was the broadening of communication across different areas within industry organization. For several years, the I3P team has recommended strong communications across organizations.[5] The first workshop indicated that departments within the organization worked at different paces and with different objectives for security. A need to reconcile objectives, motivators, and application in operational segments became evident.

At a time when resources are strained, a need to maximize and coordinate limited security budgets for comprehensive solutions, technology, and policy is evident. In 2008, the I3P conducted its second SCADA Security Forum in conjunction with the API IT Security Conference. Overwhelming feedback from industry at this event suggested that technical staff and SCADA managers had a strong awareness of cyber security and many had integrated security into their operations.

Feedback suggested, however, that a next step was needed to extend this awareness to CEO and executive management to ensure cyber security was a major consideration in strategic planning. These areas, in addition to evolving technical options, are considered important pieces in the future of securing infrastructure.

Technology advancements

In addition to outreach, methodology development, and risk characterization, the I3P project team researched specific technologies and gathered feedback from industry on its primary needs. Early in the project, feedback from workshops indicated several areas that industry felt required focus:[6]

- Wireless.
- Intrusion detection.
- Situational awareness.
- Legacy and interoperability.
- Standards compliance.
- Business and control system network connectivity.
- Forensic data and traceability.
- Life-cycle maintenance, patching, upgradability.

Some of these concerns, such as interoperability and life-cycle issues, are ongoing, but many new options are available to assist asset owners. Over the past few years, the market has seen new technologies, products, and services erupt in this area.

Industry members may select component-level solutions, total consultant solutions, or third-party membership-information portal services. The choice typically boils down to what meets an organization's specific objectives, funds, and the staffing resources available in-house.

Many industry members indicated they do not want a component level, "bump in the wire" solution. They also strive for control and management of cyber security, however, and attempt to meet very specific security objectives. Purchasing a comprehensive service and solution seems less agreeable.

The reality is likely somewhere in between and a mix of options. Regardless of how much an organization does in-house or farms out, a comprehensive operational approach is still the most effective option. This includes:

- Assessment.
- Determination of risk.
- Identification of vulnerabilities.
- Analysis and application of mitigation.
- Support with policies and procedures.
- Development and utilization of a life-cycle maintenance plan.
- Periodic assessments.

As is always recommended, an approach that includes people, processes, and technologies best removes gaps in a security solution.

Perhaps the greatest challenge is system interconnection. This includes all connectivity, such as the business network to the control system network, the connection of remote and field sites, or the connection of simple sensors to the network.

Controlling the flow of data as well as ensuring its integrity can certainly benefit from technology-based solutions. Typically, however, an organization must still review its own operations to determine specific needs before applying security to interconnection points.

A one-size-fits-all technology cannot be applied to disparate architectures. Technology-based security controls, along with supporting policies, however, can mitigate many risks. As an example, general architectural guidelines and interconnectivity recommendations can be found in API 1164 SCADA Security Standard for Pipelines.[7] Encryption, intrusion monitoring, firewalls, and role-based controls can provide the technology that facilitates the architectural goals.

Industry is also interested in tools that help it reduce risk while making the business case. Market conditions at present demand strong economic viability of technical solutions. A shift towards component-based solutions that

require lower up-front costs is visible in the market today. Doing something towards security, even a small improvement, provides some level of assurance to some industry members rather than taking risks and waiting until budgets are stronger to address security.

Industry faces tough choices on how to invest in security in a tough market. Many more options exist today, however, than even a few years before in terms of technology, tools, guidelines, and methodologies that can help.

Industry is also now more aware of cyber security and potential technical and economic consequences, and it can make more informed decisions based on its own architectures and business needs.

Changes in risk elements

Changes in the elements of the risk equation will always occur over time, especially in the evolving critical infrastructure. Suggestions that the threat has changed are arguable. Many insider and outsider threat characteristics will always exist.

The US has not seen a large attack since Sept. 11, 2001, but attempts on critical infrastructure over the past several years have been well publicized. If anything, one can assume the threat will increase capability, just as defenses increase.

Vulnerabilities change rapidly. Just as the information technology sector realized many years ago, the shift towards zero-day attacks and rapid exploit development takes advantage of vulnerabilities that many know little about. Increased connectivity among networks, remote sites, and third parties has increased the possibility of new vulnerabilities in a network design.

Finally, potential consequences can change in their value and characteristics. Evolving architectures can change the technical consequences, while a public perception in flux requires an organization to place a value on negative perception associated with incidents.

The oil and gas sector is already facing these challenges in the market and the technological landscape. It can only be anticipated that the elements of risk will continue to evolve and at different rates, which requires industry to focus on preparedness rather than reaction measures.

Great strides have been made in securing infrastructure. The changing elements of risk, however, prove that we must continue to keep security in focus as energy systems evolve to meet the demands of the future.

Global events

Global changes and events affect industry perspective, the market, and general preparedness. These events spur a shift in focus and awareness, which can create a change in how security is viewed and prioritized.

Certainly weather hazards such as hurricanes, tornadoes, floods, and ice storms often increase the need to review backup procedures, reevaluate the location of control centers, and address survivability. Other events such as transportation risks and global political instability generate the need to assess the organization's position on preparedness, accessibility of staff, physical security and responses to public perception.

All these events require the need to consider cyber security, even in relationship to other risks addressed by physical security and company policies. Many industry members have suggested that these events illustrate the need to address cyber security as part of operations, but that some organizations have shifted focus to physical security rather than investing in cyber.

In reality, a balanced approach to cyber and physical can increase the impact in both areas and maximize investment in security in general. In any case, global events have a decided effect on the application and maintenance of cyber security. Hurricanes Katrina and Rita in 2005 on the US Gulf Coast provided a great deal of after-action evidence to review, both from cyber and physical preparedness perspectives. Hurricane Ike in 2008 on the Texas Gulf Coast, though not as severe, then illustrated a better prepared industry that dealt with challenges quickly and maintained the critical flows of energy.

Standards, guidelines

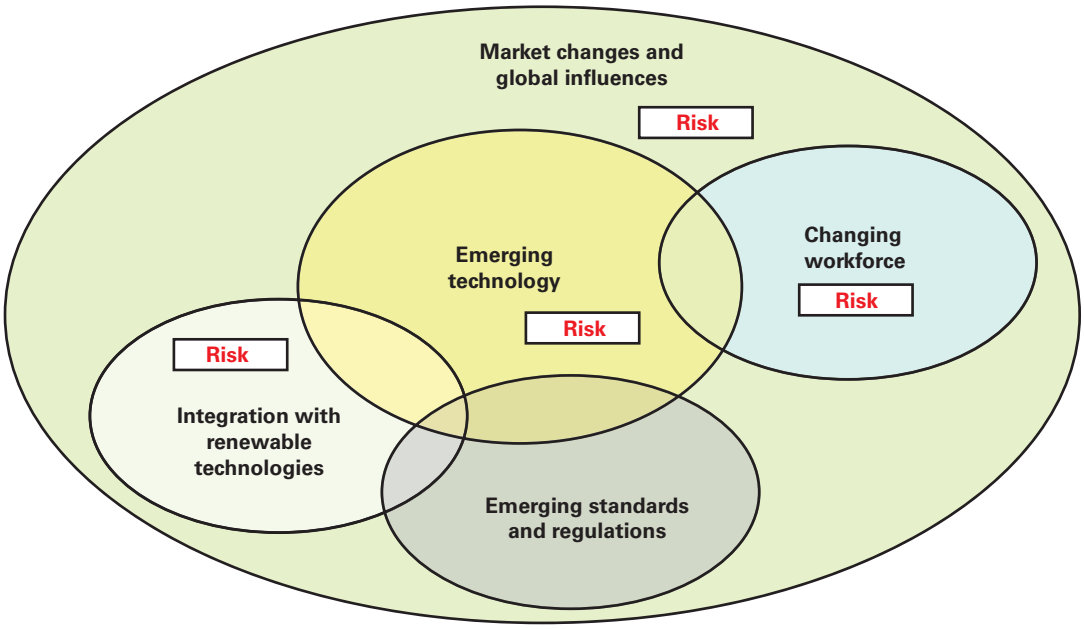
Early in the I3P project, industry and vendors indicated that standards and guidelines were necessary to facilitate application of security solutions. In efforts to ensure industry created those guidelines, industry forums and bodies stepped up to create guidance with a security focus. Guidance took the form of written standards, conferences and workshops, and outreach efforts.

Members of industry frequently point out that guidelines should be developed to facilitate the application of controls that support secure operations rather than requiring large investments of resources or redesigns that hinder or slow operations. Working together, such industry bodies as the American Petroleum Institute, the National Petrochemical and Refiners Association, and the Instrument Society of America can ensure guidance is available that provides a clear benefit to industry.

Standards that provide a backbone for organizational and operational policies are extremely beneficial. Consistently throughout the research on the I3P project, the role of policy that supports technology-based and operationally based security controls has remained critical. The need to react accordingly to information during an incident, meet organizational objectives, and ensure continuity of operations relies heavily on policy and guidelines.

Many in industry have suggested that cyber-security regulation will only increase. The best preparation for industry is to become involved in establishing standards that may provide a solid technical foundation for those regulations while meeting operational objectives. The rapid deployment of new technologies within the smart-grid environment and understanding how fossil-energy systems may interconnect and interface in the future re-

NEW RISKS, WAYS OF THINKING



quire preparation and analysis now to maximize opportunity, support system design choices, and minimize operational impact.

There are many challenges in standards development. Developing guidance that is not product or technology specific that may date the document, while providing enough detail to be useful, can be difficult. The benefits that industry brings from an operational view, business and practicality sense, however, are extremely valuable. The end result is typically a useful product and a positive experience.

Often in this competitive market, cyber or operational information is not readily shared. Complete security incident data will likely never be openly shared for obvious reasons. Industry members, however, have been very willing to participate in developing guidance, brainstorming on protective measures, sharing ideas, and participating in industry-wide events. A continued commitment to these activities will ensure that security in this sector will continue to evolve throughout lifecycle, market, and global changes.

Market effects

Many events, certainly those with the magnitude of Sept. 11, 2001, affect the culture, technology, and business investments of the energy industry. Certainly, the market changes over the past 5 years have affected all areas. The shift from large budgets, expansions, and new ideas, to tighter belts, critical decisions, and reductions has affected the focus on security and survivability. Examples are:

- Tough choices on spending while maintaining operational and business objectives.
- The need to rank main goals and prioritize objectives.
- Choosing solutions wisely, such as robust all-in-one technology solutions vs. piecemeal tools and applications at a lower cost.
- Utilization of staff resources. Can a dedicated security staff be afforded? What about training budgets?
- Participation in industry forums, maximizing information sharing and lessons learned in cyber security.

In times of tighter budgets, a few overarching ideas about security can be applied to maximize the investment of time and money. These include:

- Define an approach up front, before application of new security controls.
- Rank priorities.
- Balance a lower cost operational security option with technology choices.
- Select an approach that does not include a large system redesign with hardware, software, and staff resource implications.
- Identify and address high-value targets first.
- Minimize major gaps and address "low hanging fruit" that provides a good return on resource investment.
- Consider the life cycle and long-term costs and return on investment. These can be tough to define but attempt to weigh the risks.
- Consider a perspective that includes cyber security as another critical operational element.
- Define the role of people, processes, and technology.
- Utilize research, technical guidance, and standards to help.
- Convey organizational objectives and maintain good intraorganizational communication.

The oil and gas industry has survived many market changes over many decades. One can expect approaches on technology, operations, and cyber security to continue to adapt to continuous market changes in the future.

Future

Given the changes in the market and industry over the past several years, one can expect to see changes in the approach to cyber security in the near and

longer term. Several infrastructure-scale areas will be relevant when addressing cyber security in the next few years. The accompanying diagram illustrates the presence of risk and interconnected areas.

- Emerging technologies. These are adaptive technologies that facilitate protection, detection, response, and decision making. Combining protection and response is particularly attractive and presents a good return on investment.
- Integration with renewable energy systems. Many are now focusing on the inclusion of solar, wind, and other renewable energy sources in their systems and operations. Industry is also currently engaged in discussions on the role and impact of smart grid in the oil and gas infrastructure.
- Emerging standards and regulation. New policies and regulations that focus on cyber security may emerge that could include technical and operational guidelines. Traditionally, these standards and regulations focused on safety, but cyber security may be considered, just as physical security, as an operational element.
- Market changes. Adaptability of security implementations, including technology and operations, may be the key to surviving market changes. Balancing available budgets with short and long-term needs, as well as carving out the role of security in the future of the organization is important.
- Changing work force. Many discussions are under way within industry on how to deal with a changing workforce and the retirement of those with critical skill sets. Operational learning curves and lack of experience can lead to an unintentional incident from a trusted insider. Conversely, awareness of emerging technologies among younger workers through recent education can be an advantage.

A great deal of research exists, lessons learned from global events, and shared experiences that can be built upon to ensure secure critical infrastructure. Understanding potential threats, vulnerabilities, consequences, and effects is essential to moving forward with continued risk mitigation.

Maintenance that includes continual reduction in vulnerabilities is required for a company to stay abreast of new security risks and meet the needs of a changing infrastructure. Recommendations for the future include broadening the view of cyber security to include emerging technologies such as advanced situational awareness tools or renewable energy components. Increased interconnection and interoperability can also be expected and will require cyber-security considerations throughout a system's life-cycle.

An increased need for a return on investment from cyber security and its role in business strategies is expected. This requires that cyber security be continually recognized as a key organizational objective, a thread that must exist through staffing, market, and organizational changes. Successful, uninterrupted operations can continue with the perspective that security has a permanent role in the organization.

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Offshore pipelay vessels grow in strength, number

Christopher E. Smith
Pipeline Editor

The need to continue developing offshore oil and gas resources has kept strength in demand for offshore pipelay and construction vessels. New vessels dedicated for work offshore India, offshore West Africa, in the Asia Pacific, Arctic, and North Sea are all either under development, being built, or have recently been launched.

The economic slowdown has led to delays in some of these vessels. But all are still likely to eventually be built.

Smaller vessels

Leighton International Offshore Oil and Gas launched a new pipelay and offshore construction vessel in Batam, Indonesia, October 2009. The Leighton Eclipse will initially deploy to India for work on Oil and Natural Gas Corp.'s $750 million Pipeline Replacement Project (PRP II) in the Mumbai High oil field about 180 km off the coast of Mumbai.

Leighton's commitments under PRP II include installing around 60 km of 6-16 in. pipeline in water depths of 70-80 m during the 2009-10 weather window (ending April 2010) and a further 60 km the following season. Leighton built Eclipse—which conforms to ABS class, mobile offshore drilling unit requirements, and is special purpose shipping code compliant—to meet PRP II's timeframe.

Eclipse measures 130 m long, 32 m wide, and has a hull depth of 8.5 m. The vessel can handle pipe diameters between 6-in. and 60-in. OD, and has two 60-tonne pipe tensioners. Eclipse is fitted with a 300-tonne pedestal crane

The 130-m long Leighton Eclipse entered service in October 2009. The moored vessel's first deployment will be off India as part of Oil and Natural Gas Corp.'s pipeline replacement project in Mumbai High oil field (Photo: Leighton International Ltd., Fig. 1).

and can work in water depths of up to 150 m. Eclipse includes facilities for manual, semi-automatic, and fully automatic welding. The vessel uses electric mooring winches, with fully integrated bridge mounted controls.

Leighton now has two pipelay barges operating between South East Asia, India, and the Middle East. Its flagship pipelay barge, Leighton Stealth, built in 2006, recently completed an extensive upgrade, including a new 232-person accommodation block.

The 150-m Jascon 18 is a dynamically positioned ship-shaped pipelay and construction vessel capable of laying pipe up to 48-in. OD once it enters service in 2010 (Photo: Sea Trucks Group, Fig. 2).

A second vessel likely destined for work offshore India appears to be running behind schedule. Larsen & Toubro and SapuraCrest Petroleum Bhd ordered the S2500 combination heavy-lift pipelay vessel in May 2007 to enter service this year. S2500 features a more shipshape bow than the S3000 design it was adapted from, allowing a transit speed of up to 10 knots.

Sea of Solutions designed the vessel, to be built by ASL Marine, with a 10-point mooring system upgradable to dynamic positioning. The 160-m vessel features a 3,000 ton AmClyde heavy lift main crane.

In April 2009 Abu Dhabi-based National Petroleum Construction Co. awarded Sea of Solutions the basic design contract for new-build large derrick pipelay vessel DLS-4200. The vessel, also a modified version of the S3000, will combine double-joint S-lay operations with a 4,200-ton lift capacity. NPCC will initially operate the DLS-4200 in the Arabian Gulf and offshore India. Vessel design allows for a DP2 dynamic positioning system to eventually replace the mooring system it will initially include.

DLS-4200 features two fixed-pitch shaft driven main propellers of 5,500 kw each, allowing for a top speed of 12-13 knots. Future DP upgrade will require five 3,500-kw retractable azimuth thrusters.

Sea Trucks Group, meanwhile, is building two somewhat smaller ship-shaped pipelay crane construction vessels, Jascon 18 and 35. Jascon 18, due for delivery in mid-2010, will be able to lay pipe of 4-48 in. OD. The 150 by 36.8 m vessel features a Class III DP system, 1,800 sq m of clear deck area, a 1,600 ton heave-compensated main crane with underwater capacity of 300 ton at 3,000 m, an S-lay system below the main deck with three 200-ton tensioners and a 120 m stinger, and total thruster power of 23,300 kw. Jascon 35 uses the same design but features an 800-ton main crane, three 100 ton tensioners, and 16,700 kw of total thrust.

STG anticipates Jascon 35 entering service shortly after Jascon 18. Both had earlier been slated for second-half 2009 delivery. Either or both vessels will likely be deployed off the coast of West Africa, assisting in long-term development work off Nigeria and Angola.

Tiong Woon Oil & Gas Services completed construction of the hull, other major components, and installation of equipment in late September 2009 on a new 146.3-m derrick pipelay barge for owner-operator NorCE Offshore Pte Ltd. The barge, held in place by a mooring system, features an 1,100 tonne crane and can lay pipe up to 48-in. OD in as much as 200-m water. The vessel, launched in Bintan, Indonesia, will operate in the Asia Pacific region.

Big vessels

Allseas Group awarded Deltamarin Ltd. the detailed-design contract for platform installation-decommissioning and pipelay vessel Pieter Schelte. The contract includes naval architecture, structural engineering, accommodation and system engineering (including piping), electrical and instrumentation, and heating, ventilation, and air-conditioning. Deltamarin is scheduled to have completed the design by March 2010.

Allseas had already ordered long-lead items such power generation equipment, thrusters, and high-tensile steel as of February 2009 (allowing Deltamarin a high-level of detail in its design process) and was evaluating shipyards. Tendering will follow design completion. Original delivery plans for 2011 have slipped to 2013.

Pieter Schelte measures 382-m long

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Allsea's Pieter Schelte platform installation-decommissioning and pipelay vessel (382 m long) will focus on global large-diameter pipeline installations and platform decommissioning in markets such as the North Sea once launched in 2013 (Photo: Allseas Group, Fig. 3).

and 117-m wide. The dynamically positioned vessel will have a topsides lift capacity of 48,000 tons and a jacket lift capacity of 25,000 tons. Two portal cranes at Pieter Schelte's stern will lift jackets by means of a tilting beam system, allowing tilting of the jacket into a horizontal position on the ship's deck. The vessel's pipelay tension of 2,000 tons will double Allsea's Solitaire, with the company describing Pieter Schelte as the world's largest pipelay vessel.

The ship has a top speed of 14 knots, accommodation for 577, and can lay pipe of 6-68 in. OD in a near-vertical orientation off its 175-m stinger. Pieter Schelte's welding facilities include a double joint factory with five lineup stations and two stations for combined internal and external welding. They also include a mainline with six welding stations for double joints, one non-destructive testing station, and six coating stations.

Allseas will pitch the vessel for large-diameter pipeline installations, and the company says its lift capacity will position it well for North Sea decommissioning work. Allseas says Pieter Schelte's movements in a 10-ft sea are smaller than those of a comparable semisubmersible vessel, despite its twin traditional-hull design. Allseas' initial cost estimates for the vessel were $1.7 billion.

Heerema Marine Contractors is designing its own $1-billion Class III DP deepwater construction vessel. The ship will be 220-m long and 88-m wide, with a maximum speed claimed by Heerema of up to 20 knots, roughly four-times that of its current fleet. Heerema's vessel will include facilities for 550 people, upgradable to 750, with a payload capacity of 25,000 tonnes and a dual crane capacity of 15,000 tonnes. Its J-lay tower, with 2,000-mt tension, will install pipe of up to 32-in. OD at depths of 200-3,500 m.

Heerema designed the vessel particularly for offshore construction in the Arctic, locating its cranes, J-lay tower, and other installation equipment so as to minimize the effect of the Arctic environment on operations. The vessel's hull and thrusters were also designed to withstand conditions likely to be encountered in environments such as the Barents Sea and Beaufort Sea, both of which Heerema has targeted as areas for future growth.

Heerema planned to have the vessel in service in 2010, but this schedule appears to have slipped. ✦

Equipment/Software/Literature

New geologic interpretation tool for upstream operations

StratEarth 2009 is a new upstream program designed to bridge the gap between seismic and geological interpretation.

Offered as an add-on to SeisEarth, StratEarth provides an integrated geological correlation and cross-section environment for evaluating and assessing reservoirs for better well positioning and field management.

StratEarth incorporates geologic and seismic data to facilitate advanced work flows that support exploration and development projects from initial interpretation to advanced subsurface modeling. The software suite enables users to automatically correlate hundreds of wells and quickly detect any inconsistencies between seismic data, petrophysical data, well markers, and geological data in markers positions and orders.

The suite provides users with intuitive interfaces to facilitate common work-flow elements and data analysis tools. It also offers seamless interoperability with SKUA 2009, a subsurface modeling software, enabling rapid construction of geologically valid, simulator-ready reservoir models from all available data.

Source: **Paradigm BV,** Reimersbeek 2, 10982 AG Amsterdam, the Netherlands.

Alliance offers catalyst that enhances diesel yield

Albemarle Corp., Baton Rouge, will offer NEBULA catalyst in hydrocracking and hydrotreating applications as part of the Hydroprocessing Alliance, the company's strategic alliance with UOP LLC, Des Plaines, Ill.

NEBULA catalyst—a material jointly discovered by ExxonMobil Research & Engineering Co., Annandale, NJ, and co-developed with Albemarle—offers greater catalyst activity and can enhance diesel yield and quality in hydrocracking and hydrotreating applications, the firm says.

The alliance offers the catalyst for reloads and revamps of hydrocracking and hydrotreating units for fuels applications. The company notes that the catalyst is a base-metal type with higher activity than conventional hydrotreating catalysts. NEBULA's high hydrodenitrogenation and hydrodearomatization activities can debottleneck hydrocrackers that have limited hydrotreating activity. Additionally, NEBULA enables production of ultralow sulfur diesel without additional capital investment and can enhance hydrotreating unit revamps to reach higher throughputs or achieve higher product quality standards.

UOP and Albemarle formed the Hydroprocessing Alliance in 2006 to support the production of clean transportation fuels worldwide. The alliance combines the strengths of UOP, a developer of hydrotreating and hydrocracking process technology and hydrocracking catalyst, and Albemarle, a developer and supplier of refinery hydrotreating catalysts and technologies.

Source: **Albemarle Corp.,** Baton Rouge Tower, 451 Florida St., Baton Rouge, LA 70801.

Services/Suppliers

CGGVeritas,

Paris, has named Jean-Georges Malcor CEO effective July 1, 2010. In connection with the appointment, CGGVeritas will separate the chairman and CEO functions on that date. Current Chairman and CEO Robert Brunck will continue his role as chairman as of July 1. Malcor, currently senior vice-president at electronics company Thales, Neuilly-sur-Seine, France, will join CGGVeritas on Jan. 1. Meanwhile, CGGVeritas has appointed Thierry Le Roux, a member of the company's executive committee, advisor to Brunck and Malcor. Beginning his career in underwater activities with Thales, Malcor moved up the organization through a variety of managerial positions, including director roles with several subsidiaries of Thomson-CSF, predecessor to Thales. He is a graduate of Ecole Centrale de Paris and holds an MS from Stanford University and a PhD from Ecole des Mines.

Malcor

CGGVeritas is a leading international pure-play geophysical company delivering a wide range of technologies, services, and equipment (through Sercel) to the global oil and gas industry.

ION Geophysical Corp.,

Houston, has signed a term agreement with BGP Inc., Beijing, to create a joint venture to provide land seismic products worldwide. ION will received $175 million in cash, and BGP will receive a 51% stake in the JV and a 16.66% interest in ION. The deal is subject to regulatory reviews and approvals in the US and China, expected to be completed by the first quarter of 2010.

ION is a leading provider of geophysical technology, services, and solutions for the global oil and gas industry.

BGP is the world's largest land seismic contractor, currently operating 110 seismic crews around the world.

Capstone Turbine Corp.,

Chatsworth, Calif., has received follow-on orders from two oil and gas industry clients totaling $3 million for microturbine energy systems. One is for 42 C30 systems to be installed for a large coalbed methane exploration and production project in Australia. That follows an order for >100 such systems, the first of which was installed last year for that project. The second order, from a large North American interstate gas transmission pipeline company, was for one C1000 and one C600 microturbine system in remote locations. This is a follow-on order to the first two C600s sold for use in the oil and gas industry in July 2009. Both recent orders are scheduled for shipment before March 31, 2010.

Capstone is a leading manufacturer of microturbine energy systems.

Imports of crude and products

	Districts 1-4		District 5		Total US		
	10-30 2009	10-23 2009	10-30 2009	10-23 2009	10-30 2009	10-23 2009	*10-31 2008
	1,000 b/d						
Total motor gasoline	1,074	693	3	63	1,077	756	1,040
Mo. gas. blending comp.	884	603	0	7	884	610	835
Distillate	197	168	0	16	197	184	149
Residual	349	437	0	52	349	489	352
Jet fuel-kerosine	34	27	52	80	86	107	136
Propane-propylene	110	157	12	8	122	165	232
Other	–193	181	79	51	–114	232	481
Total products	**2,455**	**2,266**	**146**	**277**	**2,601**	**2,543**	**3,225**
Total crude	**7,252**	**7,351**	**874**	**1,539**	**8,126**	**8,890**	**9,972**
Total imports	**9,707**	**9,617**	**1,020**	**1,816**	**10,727**	**11,433**	**13,197**

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

Purvin & Gertz LNG netbacks—Nov. 6, 2009

Receiving terminal	Liquefaction plant					
	Algeria	Malaysia	Nigeria	Austr. NW Shelf	Qatar	Trinidad
	$/MMbtu					
Barcelona	6.12	4.58	5.87	4.47	5.18	5.79
Everett	4.06	1.96	3.70	2.04	2.51	4.36
Isle of Grain	4.65	2.52	4.02	2.42	3.08	4.04
Lake Charles	2.19	0.40	1.97	0.53	0.70	2.81
Sodegaura	5.25	7.01	5.51	6.70	6.50	4.56
Zeebrugge	5.99	3.92	5.48	3.80	4.54	5.55

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	13,308	55,966	38,855	12,485	73,421	14,111	5,071
PADD 2	78,134	48,014	24,461	8,004	31,466	1,089	28,657
PADD 3	173,634	69,472	40,059	15,112	47,164	15,756	33,773
PADD 4	15,917	5,651	1,843	494	2,899	223	[1]2,231
PADD 5	54,921	29,174	25,047	9,088	12,426	3,875	—
Oct. 30, 2009	**335,914**	**208,277**	**130,265**	**45,183**	**167,376**	**35,054**	**69,732**
Oct. 23, 2009	**339,850**	**208,564**	**131,042**	**45,852**	**167,754**	**34,318**	**71,047**
Oct. 31, 2008[2]	**311,927**	**196,113**	**101,088**	**36,652**	**127,835**	**38,842**	**60,410**

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

Refinery report—Oct. 30, 2009

District	REFINERY OPERATIONS		REFINERY OUTPUT				
	Gross inputs	Crude oil inputs	Total motor gasoline	Jet fuel, kerosine	Fuel oils: Distillate	Fuel oils: Residual	Propane–propylene
	1,000 b/d						
PADD 1	1,283	1,296	2,427	74	353	120	53
PADD 2	2,944	2,930	2,236	166	841	49	279
PADD 3	7,106	6,950	2,578	726	2,131	333	674
PADD 4	506	503	280	26	157	9	[1]60
PADD 5	2,402	2,291	1,519	359	475	114	—
Oct. 30, 2009	**14,241**	**13,970**	**9,040**	**1,351**	**3,957**	**625**	**1,066**
Oct. 23, 2009	**14,448**	**14,203**	**8,834**	**1,327**	**3,786**	**570**	**1,074**
Oct. 31, 2008[2]	**15,017**	**14,617**	**9,110**	**1,313**	**4,389**	**535**	**1,064**
	17,672 Operable capacity		**80.6 utilization rate**				

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

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

OIL&GAS JOURNAL online research center

OGJ crack spread

	*11-06-09	*11-07-08	Change	Change, %
	$/bbl			
SPOT PRICES				
Product value	83.78	72.16	11.62	16.1
Brent crude	76.70	60.44	16.26	26.9
Crack spread	7.07	11.72	–4.65	–39.6
FUTURES MARKET PRICES				
One month				
Product value	84.48	69.31	15.17	21.9
Light sweet crude	79.04	64.31	14.73	22.9
Crack spread	5.45	5.00	0.45	9.0
Six month				
Product value	91.43	77.84	13.59	17.5
Light sweet crude	82.09	68.47	13.62	19.9
Crack spread	9.35	9.37	–0.03	–0.3

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

OGJ GASOLINE PRICES

	Price ex tax 11-4-09	Pump price* 11-4-09	Pump price 11-5-08
	¢/gal		
(Approx. prices for self-service unleaded gasoline)			
Atlanta	227.7	259.1	238.2
Baltimore	220.0	261.9	246.5
Boston	221.0	262.9	237.7
Buffalo	210.9	274.1	226.2
Miami	226.0	278.9	239.0
Newark	220.9	253.8	231.0
New York	209.4	272.6	245.9
Norfolk	214.4	252.1	226.2
Philadelphia	219.2	269.9	243.7
Pittsburgh	218.2	268.9	245.5
Wash., DC	230.1	272.0	246.5
PAD I avg	219.8	266.0	238.8
Chicago	243.5	298.6	244.1
Cleveland	240.1	286.5	228.7
Des Moines	222.5	262.9	224.2
Detroit	238.1	289.7	239.0
Indianapolis	233.5	283.6	234.0
Kansas City	214.0	249.7	209.5
Louisville	232.0	272.9	234.2
Memphis	214.7	254.5	218.2
Milwaukee	228.0	279.3	234.4
Minn.-St. Paul	228.1	273.7	227.5
Oklahoma City	201.7	237.1	196.9
Omaha	211.9	257.6	207.1
St. Louis	212.5	248.2	219.1
Tulsa	198.0	233.4	196.8
Wichita	208.1	251.5	210.2
PAD II avg	221.8	265.3	221.6
Albuquerque	215.1	252.3	227.6
Birmingham	219.0	258.3	214.8
Dallas-Fort Worth	211.2	249.6	213.3
Houston	213.1	251.5	202.3
Little Rock	206.4	246.6	216.8
New Orleans	220.9	259.3	231.9
San Antonio	216.9	255.3	226.0
PAD III avg	214.7	253.3	219.0
Cheyenne	219.9	252.3	232.1
Denver	218.6	259.0	259.9
Salt Lake City	211.1	254.0	248.8
PAD IV avg	216.6	255.1	246.9
Los Angeles	232.2	298.0	275.9
Phoenix	220.6	258.0	264.9
Portland	237.6	281.0	278.8
San Diego	233.2	299.0	284.9
San Francisco	239.3	305.1	290.0
Seattle	239.1	295.0	274.9
PAD V avg	233.7	289.3	278.3
Week's avg.	**221.4**	**266.2**	**235.6**
Oct. avg.	**208.4**	**253.6**	**317.6**
Sept. avg.	**211.0**	**256.6**	**367.2**
2009 to date	**182.4**	**228.0**	—
2008 to date	**306.1**	**350.2**	—

*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

	10-30-09 ¢/gal		10-30-09 ¢/gal
Spot market product prices			
Motor gasoline (Conventional-regular)		Heating oil No. 2	
New York Harbor	197.85	New York Harbor	196.47
Gulf Coast	193.35	Gulf Coast	195.76
Los Angeles	189.10	Gas oil	
Amsterdam-Rotterdam-Antwerp (ARA)	197.59	ARA	195.13
Singapore	195.60	Singapore	202.02
Motor gasoline (Reformulated-regular)		Residual fuel oil	
New York Harbor	194.73	New York Harbor	169.36
Gulf Coast	194.23	Gulf Coast	169.12
Los Angeles	200.85	Los Angeles	185.63
		ARA	171.73
		Singapore	175.41

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

BAKER HUGHES RIG COUNT

	11-6-09	11-7-08
Alabama	4	5
Alaska	6	10
Arkansas	40	57
California	24	46
Land	23	46
Offshore	1	0
Colorado	40	124
Florida	0	1
Illinois	1	1
Indiana	3	2
Kansas	21	10
Kentucky	11	12
Louisiana	169	191
N. Land	111	94
S. Inland waters	13	20
S. Land	13	26
Offshore	32	51
Maryland	0	0
Michigan	0	1
Mississippi	6	13
Montana	4	6
Nebraska	1	0
New Mexico	51	92
New York	3	5
North Dakota	54	90
Ohio	8	12
Oklahoma	78	195
Pennsylvania	59	30
South Dakota	0	1
Texas	407	922
Offshore	3	7
Inland waters	0	2
Dist. 1	23	26
Dist. 2	15	33
Dist. 3	28	65
Dist. 4	27	93
Dist. 5	63	175
Dist. 6	40	134
Dist. 7B	14	29
Dist. 7C	32	70
Dist. 8	74	124
Dist. 8A	19	26
Dist. 9	28	47
Dist. 10	41	91
Utah	18	43
West Virginia	22	31
Wyoming	39	77
Others—HI-1; NV-3; OR-1; TN-1; VA-3	9	15
Total US	**1,078**	**1,992**
Total Canada	**233**	**445**
Grand total	**1,311**	**2,437**
US Oil rigs	332	442
US Gas rigs	734	1,539
Total US offshore	36	63
Total US cum. avg. YTD	**1,078**	**1,885**

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	11-6-09 Percent footage*	Rig count	11-7-08 Percent footage*
0-2,500	74	2.7	88	3.4
2,501-5,000	65	67.6	144	52.0
5,001-7,500	113	23.0	268	13.4
7,501-10,000	237	8.4	454	2.2
10,001-12,500	221	13.1	430	1.1
12,501-15,000	146	3.4	382	—
15,001-17,500	145	—	167	—
17,501-20,000	61	—	72	—
20,001-over	34	—	32	—
Total	**1,096**	**11.4**	**2,037**	**6.3**
INLAND	20		33	
LAND	1,040		1,950	
OFFSHORE	36		54	

*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]11-6-09	[2]11-7-08
	1,000 b/d	
(Crude oil and lease condensate)		
Alabama	20	22
Alaska	693	719
California	650	651
Colorado	66	67
Florida	5	6
Illinois	26	26
Kansas	110	110
Louisiana	1,407	877
Michigan	18	17
Mississippi	64	64
Montana	86	86
New Mexico	167	167
North Dakota	203	207
Oklahoma	178	178
Texas	1,392	1,278
Utah	63	64
Wyoming	146	146
All others	67	74
Total	**5,361**	**4,759**

[1]OGJ estimate. [2]Revised.
Source: Oil & Gas Journal.
Data available in OGJ Online Research Center.

US CRUDE PRICES

	11-6-09 $/bbl*
Alaska-North Slope 27°	77.25
South Louisiana Sweet	68.55
California-Kern River 13°	77.25
Lost Hills 30°	69.18
Wyoming Sweet	73.50
East Texas Sweet	69.00
West Texas Sour 34°	74.00
West Texas Intermediate	74.00
Oklahoma Sweet	67.00
Texas Upper Gulf Coast	66.00
Michigan Sour	72.75
Kansas Common	63.50
North Dakota Sweet	66.75

*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]	10-30-09
United Kingdom-Brent 38°	76.80
Russia-Urals 32°	76.31
Saudi Light 34°	75.94
Dubai Fateh 32°	77.10
Algeria Saharan 44°	77.34
Nigeria-Bonny Light 37°	78.41
Indonesia-Minas 34°	80.38
Venezuela-Tia Juana Light 31°	76.78
Mexico-Isthmus 33°	76.67
OPEC basket	77.11
Total OPEC[2]	76.63
Total non-OPEC[2]	76.31
Total world[2]	76.49
US imports[3]	75.64

[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]

	10-30-09	10-23-09	10-30-08	Change, %
	bcf			
Producing region	1,189	1,188	939	**26.6**
Consuming region east	2,085	2,058	2,009	**3.8**
Consuming region west	514	513	461	**11.5**
Total US	**3,788**	**3,759**	**3,409**	**11.1**
	Aug 09	**Aug 08**	**Change, %**	
Total US[2]	**3,352**	**2,867**	**16.9**	

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

International rig count

Region	Oct. 2009 Land	Oct. 2009 Off.	Oct. 2009 Total	Oct. 08 Total
WESTERN HEMISPHERE				
Argentina	55	—	55	84
Bolivia	5	—	5	3
Brazil	32	28	60	58
Canada	243	1	244	446
Chile	4	—	4	4
Colombia	28	—	28	43
Ecuador	10	—	10	13
Mexico	94	26	120	99
Peru	7	2	9	10
Trinidad	—	2	2	4
United States	1,011	33	1,044	1,976
Venezuela	46	11	57	84
Other	1	—	1	1
Subtotal	**1,536**	**103**	**1,639**	**2,825**
ASIA-PACIFIC				
Australia	5	12	17	28
Brunei	1	2	3	2
China-offshore	—	21	21	21
India	64	32	96	79
Indonesia	48	12	60	64
Japan	3	—	3	2
Malaysia	—	11	11	12
Myanmar	3	1	4	5
New Zealand	3	—	3	6
Papua New Guinea	2	—	2	2
Philippines	5	—	5	3
Taiwan	—	—	—	—
Thailand	5	10	15	12
Vietnam	—	7	7	5
Other	—	—	—	3
Subtotal	**139**	**108**	**247**	**244**
AFRICA				
Algeria	27	—	27	25
Angola	—	4	4	2
Congo	1	—	1	3
Gabon	1	—	1	—
Kenya	—	—	—	—
Libya	12	2	14	16
Nigeria	2	4	6	6
South Africa	—	—	—	—
Tunisia	2	3	5	3
Other	2	2	4	5
Subtotal	**47**	**15**	**62**	**60**
MIDDLE EAST				
Abu Dhabi	8	3	11	10
Dubai	—	1	1	1
Egypt	34	10	44	60
Iran	—	—	—	—
Iraq	—	—	—	—
Jordan	—	—	—	2
Kuwait	8	—	8	13
Oman	44	—	44	54
Pakistan	19	—	19	24
Qatar	1	8	9	11
Saudi Arabia	54	12	66	77
Sudan	—	—	—	—
Syria	24	—	24	20
Yemen	11	—	11	15
Other	2	—	2	1
Subtotal	**205**	**34**	**239**	**288**
EUROPE				
Croatia	—	—	—	—
Denmark	—	4	4	3
France	1	—	1	—
Germany	7	—	7	10
Hungary	2	—	2	5
Italy	2	1	3	3
Netherlands	3	2	5	3
Norway	—	17	17	16
Poland	3	—	3	2
Romania	8	—	8	22
Turkey	6	—	6	6
UK	—	16	16	24
Other	11	1	12	7
Subtotal	**43**	**41**	**84**	**101**
Total	**1,970**	**301**	**2,271**	**3,518**

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

Oil import freight costs*

Source	Discharge	Cargo	Cargo size, 1,000 bbl	Freight (Spot rate) worldscale	$/bbl
Caribbean	New York	Dist.	200	92	1.05
Caribbean	Houston	Resid.	380	78	1.01
Caribbean	Houston	Resid.	500	65	0.84
N. Europe	New York	Dist.	200	117	2.16
N. Europe	Houston	Crude	400	84	2.28
W. Africa	Houston	Crude	910	60	1.86
Persian Gulf	Houston	Crude	1,900	28	1.63
W. Africa	N. Europe	Crude	910	66	1.48
Persian Gulf	N. Europe	Crude	1,900	31	1.29
Persian Gulf	Japan	Crude	1,750	47	1.57

*Oct. 2009 average.
Source: Drewry Shipping Consultants Ltd. Data available in OGJ Online Research Center.

Waterborne Energy Inc. US LNG imports

Country	Sept. 2009	Aug. 2009	Sept. 2008	Change from a year ago, %
	MMcf			
Algeria	—	—	—	—
Egypt	17,540	14,490	9,090	93.0
Equatorial Guinea	—	—	—	—
Nigeria	2,500	2,920	2,790	–10.4
Norway	—	—	—	—
Qatar	—	—	—	—
Trinidad and Tobago	16,890	19,930	20,600	–18.0
Total	**36,930**	**37,340**	**32,480**	**13.7**

Source: Waterborne Energy Inc.
Data available in OGJ Online Research Center.
Data not available at press time.

Propane prices

	Sept. 2009	Oct. 2009	Sept. 2008	Oct. 2008
	¢/gal			
Mont Belvieu	94.64	100.84	153.00	104.47
Conway	84.33	99.13	149.72	103.83
Northwest Europe	100.25	113.59	162.01	108.89

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

Muse, Stancil & Co. refining margins

	US Gulf Coast	US East Coast	US Mid-west	US West Coast	North-west Europe	South-east Asia
	$/bbl					
Oct. 2009						
Product revenues	82.07	79.43	81.62	83.05	80.11	76.33
Feedstock costs	–76.92	–75.56	–72.95	–71.53	–73.82	–75.91
Gross margin	5.15	3.87	8.67	11.52	6.29	0.42
Fixed costs	–2.15	–2.48	–2.42	–2.82	–2.42	–1.88
Variable costs	–1.44	–1.07	–1.31	–2.20	–3.27	–0.97
Cash operating margin	**1.56**	**0.32**	**4.94**	**6.50**	**0.60**	**–2.43**
Sept 2009	1.16	–0.04	4.46	9.57	–0.23	–0.21
YTD avg.	3.47	1.45	6.27	11.16	1.61	–0.45
2008 avg.	9.09	3.04	11.53	13.16	6.35	3.07
2007 avg.	12.60	6.65	18.66	20.71	5.75	2.25
2006 avg.	12.54	6.38	14.97	23.64	5.88	0.90

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

Muse, Stancil & Co. gasoline marketing margins

Sept. 2009	Chicago*	Houston	Los Angeles	New York
	¢/gal			
Retail price	262.84	241.82	309.40	276.11
Taxes	54.26	38.40	60.22	50.30
Wholesale price	190.42	182.27	233.40	195.99
Spot price	178.81	169.82	204.73	178.83
Retail margin	18.15	21.15	15.78	29.82
Wholesale margin	11.61	12.45	28.67	17.16
Gross marketing margin	**29.76**	**33.60**	**44.45**	**46.98**
Aug. 2009	25.75	29.68	33.42	27.12
YTD avg.	23.65	23.51	22.82	29.84
2008 avg.	33.11	32.15	27.22	41.81
2007 avg.	26.96	23.12	19.05	31.10
2006 avg.	19.74	19.94	18.03	27.90

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

Muse, Stancil & Co. ethylene margins

	Ethane	Propane	Naphtha
	¢/lb ethylene		
Oct. 2009			
Product revenues	42.97	74.06	94.62
Feedstock costs	–23.59	–57.32	–98.72
Gross margin	19.38	16.74	–4.10
Fixed costs	–5.38	–6.36	–7.19
Variable costs	–3.17	–3.67	–4.81
Cash operating margin	**10.83**	**6.71**	**–16.10**
Sept. 2009	14.75	11.89	–3.91
YTD avg.	13.87	10.53	–13.29
2008 avg.	21.00	22.89	–5.91
2007 avg.	14.41	14.14	–7.42
2006 avg.	19.54	22.45	1.36

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

Muse, Stancil & Co. US gas processing margins

Oct. 2009	Gulf Coast	Mid-continent
	$/Mcf	
Gross revenue		
Gas	3.67	3.53
Liquids	1.06	2.88
Gas purchase cost	4.09	4.73
Operating costs	0.07	0.15
Cash operating margin	**0.58**	**1.53**
Sept. 2009	0.60	1.48
YTD avg.	0.35	1.00
2008 avg.	0.45	1.61
2007 avg.	0.44	1.47
2006 avg.	0.26	0.97
Breakeven producer payment, % of liquids	43%	45%

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

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Shrinking to grow: Is Conoco plan a model for industry?

Although one company doesn't represent a whole industry, a shrink-to-grow strategy adopted by ConocoPhillips illustrates pressures on the biggest operators in a world of shrinking opportunity.

ConocoPhillips has disclosed plans to cut capital spending next year to $11 billion from $12.5 billion this year and $14-15 billion in earlier years and to sell properties in 2010-11 worth $10 billion.

The Editor's Perspective

by Bob Tippee, Editor

"We will be somewhat smaller," said Chairman and Chief Executive Officer Jim Mulva in an Oct. 28 conference call.

Mulva noted recessionary effects on credit markets and said diminishing access to large opportunities "is and will continue to be quite an issue."

Capital spending will target development of ConocoPhillips's 50 billion boe of oil and gas resources, Mulva said. Of next year's outlay, 90% will be upstream, with no pullback from exploration. The 10% downstream investment will be for maintenance "and not really much for growth."

Disposition targets include ConocoPhillips's 9% interest in the Syncrude oil sands operation in Alberta; 10% of its North American upstream interests; US pipelines and terminals; and interests in the southern North Sea, mainly gas.

Mulva said refineries aren't part of the sales program because "it is not a very good market to part with or sell refineries."

Asked about four of the company's largest projects, Mulva made only one, an Australian coalbed methane and LNG joint venture with Origin Energy, sound immune to change.

He said spending probably will be deferred on an upgrade of the 260,000-b/d refinery in Wilhelmshaven, Germany.

And decisions will be made next year about a venture with Abu Dhabi National Oil Co. to develop sour gas and condensate in giant Shah field and another with Saudi Aramco to build a 400,000 b/d refinery in Yanbu.

While "essentially shrinking to grow," Mulva said, ConocoPhillips mainly is reorienting toward returns and away from growth.

He said international companies face a changing business model.

"How do they participate in work with national oil companies and sovereigns with respect to this issue of access and development of returns?" he asked. "If it is not there, well, then obviously the companies will get somewhat smaller."

(Online Nov. 6, 2009; author's e-mail: bobt@ogjonline.com)

Market Journal

by Sam Fletcher, Senior Writer

DB: Markets are between recessions

The recession appears to have ended in June, "although not officially declared yet," said analysts with Deutsche Bank AG, London. But before rejoicing spreads throughout the world economy, the bank's analysts warn another recession is coming in just 3 years, making the period in between "one of the shortest economic expansions in the last 55 years."

Deutsche Bank analysts explained, "Historically, the beginning of the end for US gross domestic product growth comes as soon as the Federal Reserve starts to embark on a new monetary tightening cycle. Over the past 50 years the duration of every US expansion has been directly proportional to the amount of time the Fed provides monetary stimulus to the economy."

For example, they said, "When we first presented this analysis in January 2005, we stated the next US recession would begin in December 2007. This reflected the fact that the US left recession in November 2001, but it was not until June 2004, 32 months later, that the Fed started to raise interest rates. Based on the historical correlation, a prime rate lag of 32 months would imply an economic expansion of 72 months."

Bank officials said, "Since our US economics team expects the Fed to embark on a new monetary tightening cycle in August 2010, and if we assume the US recession ended in June 2009, then it would imply a prime rate lag of 14 months." Based on the historical correlation this would imply "an economic expansion of just 40 months," with another recession starting in November 2012.

Volatile prices

Meanwhile, Deutsche Bank analysts said, "We believe the next decade may herald a significantly more volatile macroeconomic environment than we have seen in the past. However, given the significant provision of liquidity by the US Fed, concerns over a double-dip next year are probably misplaced."

They said, "For the time being we remain optimistic that US GDP growth will continue to surprise to the upside. However, our concerns have focused on the risks that with a weak housing sector and labor market, the US economy may be challenged when the benefits of the fiscal stimulus start to fade." They expect the fiscal stimulus to "work against growth" in 2011.

"This may not cause the US difficulties given the provision of unlimited central bank liquidity by the Fed," analysts said. "In fact we believe central banks have created the conditions for another minibubble to form in financial asset prices heading into next year." Global oil demand began to improve in the second quarter but is still running at a slightly negative rate on a year-over-year in the current quarter. "We expect this situation to improve dramatically in the first quarter [of 2010] with oil demand up at least 1 million b/d and possibly as much as 1.5 million b/d," said Deutsche Bank analysts. The remaining quarters of 2010 should show relatively steady improvement "of about the same absolute amount," they said.

Inventory imbalance

Meanwhile, imbalances in the US oil market have been sorting themselves out "very slowly indeed," said Paul Horsnell, managing director and head of commodities research at Barclays Capital in London.

A key part of that adjustment is the "winnowing away" of the crude overhang. "Producers have had to constrain supplies enough so that reductions in refinery runs have been covered by lower imports in such a way as not to further bloat inventories," he reported the first week of November.

Horsnell said, "However, beyond that reduction, an even greater degree of import compression has been needed to get the overhang to fall simultaneously with lower runs. In the latest data release [for the week ended Oct. 30], the US crude overhang (i.e., the amount of inventory above 5-year average levels) fell to 21.5 million bbl, the lowest this year."

Horsnell noted, "The crude overhang peaked at the end of April at close to 50 million bbl, had shown signs of ballooning out again in August, but has been brought back into line more sharply in recent weeks. Since the peak was reached, the reduction in US crude oil inventories relative to the 5-year average has averaged 150,000 b/d. That is not a very fast rate of overall improvement, but having been sustained over more than 6 months the cumulative effect has now become significant."

In terms of international demand, he said, "Gasoline and North America remain strong, while Europe and diesel remain weak." Middle East demand is surging, with Saudi Arabian demand "a very strong dynamic."

(Online Nov. 9, 2009; author's e-mail: samf@ogjonline.com)