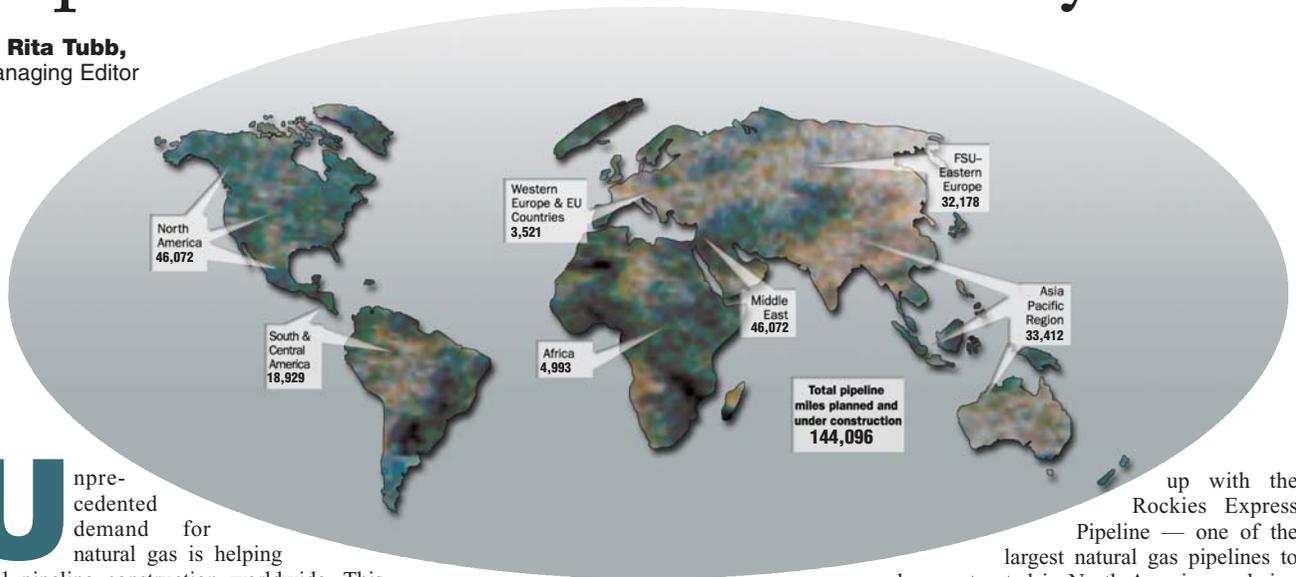


Natural Gas Demand Continues To Drive Worldwide Pipeline Construction Activity

By **Rita Tubb**,
Managing Editor



Unprecedented demand for natural gas is helping fuel pipeline construction worldwide. This is reflected in *P&GJ's* latest worldwide survey figures that indicate 144,096 miles of oil and gas pipelines are under construction and planned. Of these, North American companies are planning, designing and building 46,072 miles of pipelines.

North American Projects

In looking at where significant efforts are under way to expand U.S. natural gas pipeline capacity, the Rocky Mountain states of Colorado, Utah and Wyoming are high on the list. They account for nearly 22% of the total natural gas reserves in the U.S. Pipeline capacity that exports natural gas from Colorado, Utah and Wyoming was 8.489 Bcf/d in 2005. Efforts to increase pipeline infrastructure there are expected to add roughly 1.5 Bcf/d of capacity by the end of 2008.

Another key area is northeast Texas. In *Natural Gas Year-In Review 2006*, the Energy Information Administration (EIA) notes new pipeline mileage grew by 44% in 2006. This increase in construction activity was primarily driven by the needs of natural gas producers in Colorado and Wyoming and in the Barnett Shale of northeast Texas. Continuing development of new natural gas supplies has increased the need for pipeline capacity from these areas to Northeast and Midwest regional markets.

The EIA report states that almost half — or 21 of the 45 — natural gas pipeline projects completed in the U.S. during the year were located in the Rockies or northeast Texas. Projects completed in the Rocky Mountain area accounted for 25% of all new natural gas pipeline capacity (3.2 Bcf/d) installed during the year while those completed in northeast Texas constituted 25% (3.1 Bcf/d).

Following is a discussion of some of the major projects under construction and planned throughout North America. Information is provided in *P&GJ's* sister publication, *Pipeline News*.

North American Construction

One plan to expand capacity from the Rocky Mountain region is a National Fuel Gas Co. proposal to build the \$700 million West-to-East Pipeline that would stretch 324 miles from southeastern Ohio to Corning, NY. This is one of several projects under consideration to link

up with the Rockies Express Pipeline — one of the largest natural gas pipelines to be constructed in North America — being developed by KinderMorgan Energy Partners, Semptra Energy and ConocoPhillips to carry gas to eastern markets.

Rockies Express (REX) is a \$4.4 billion, 1,678-mile pipeline designed to link natural gas producers in the Rocky Mountain region near Rio Blanco County, CO with customers in the eastern U.S.. The first 328-mile segment, from the Meeker Hub in Rio Blanco County to the Wamsutter Hub in Sweetwater County, WY to the Cheyenne Hub in Weld County, CO is in service with capacity of 500,000 Dth/d. REX West, the segment from the Cheyenne Hub to Audrain County, MO is on schedule for an in-service date of Jan. 1, 2008. Construction on REX East, from Audrain County, MO to Clarington, OH is in the permitting stage with a scheduled in-service date of Dec. 31, 2008.

The National Fuel pipeline will also link up with the Millennium Pipeline being developed by affiliates of NiSource, KeySpan and DTE Energy. Precision Pipeline Solutions is building the 187-mile Millennium in two phases. Phase one involves a 182-mile, 30-inch pipeline from Corning to Ramapa, NY which replaces and upgrades an existing pipeline.

Phase II will involve crossing the Hudson River to provide a link to the New York City metropolitan market. The cost is estimated at \$350 million and will have a capacity of 524 MMcf/d. The pipeline is planned to be in service by November.

The National Fuel proposal also faces competition from other major pipeline projects, including the 375-mile Northeast Express Project proposed by the operators of the Rockies Express pipeline. That extension would run from Clarington, OH to Princeton, NJ and open in 2011.

Williams has proposed the 250-mile Rockies Connector Pipeline from Clarington to York County, PA. As planned, it would carry about 688 MMcf/d of gas and could be open by late 2010.

Spectra Energy is proposing to a natural gas pipeline system — the Bronco Pipeline — to connect Rocky Mountain supplies with underserved western markets. The proposed interstate system will be more than 650 miles long and have an initial capacity of more than 1 Bcf/d. It is expected that construction will cost in excess of \$3 billion. The planned route will access supply basins in Wyoming, Utah and

Colorado and stretch westward, interconnecting with several pipelines en route to its terminus near Malin, OR.

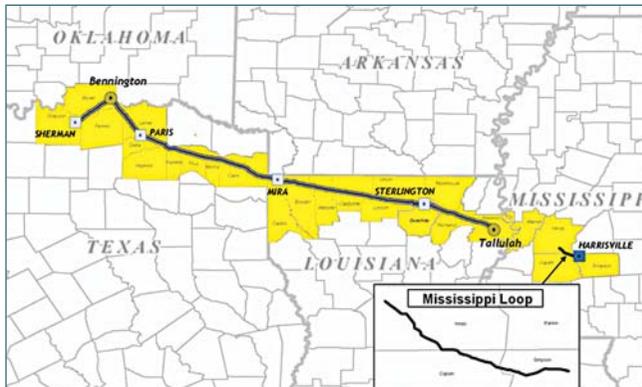
Based on preliminary market needs and assessments, the project could be in-service by 2011.



Other significant projects include the Southeast Supply Header (SESH) that is being built for Southeast Supply Header LLC, a joint venture of Sempra Energy and CenterPoint Energy. Consisting of 270-miles of 42- and 36-inch pipe, the SESH will begin near the Perryville Hub in northeast Louisiana and connect with the Gulfstream Natural Gas System LLC pipeline in Mobile County, AL. The new line's capacity is projected to reach 1 Bcf/d and begin service by mid-summer 2008.

Willbros U.S. Construction was awarded a contract by Midcontinent Express Pipeline LLC — a joint venture between Kinder Morgan Energy Partners and Energy Transfer Partners — to construct 257 miles of the Midcontinent Express Pipeline through Oklahoma and Texas. The remaining 303 miles of the 560-mile project have not yet been awarded.

The pipeline will run from north-central Texas, crossing Oklahoma and Arkansas before terminating in Coahoma County, MS at a new interconnect with Texas Gas Transmission. As proposed, the pipeline will have an initial capacity of up to 1 Bcf/d. The project is expected to be completed in late 2008.



Boardwalk Pipeline Partners, Energy Transfer Partners and ONEOK Partners have formed a joint venture to construct the Gulf Crossing interstate natural gas pipeline that will originate in southern Oklahoma and extend through northern Texas and terminate in northern Louisiana. This \$1.1 billion project consists of 355 miles of 42-inch pipeline with design capacity of 1.5 Bcf/d and could be in service later this year.

Massive Crude Line



While North American natural gas pipelines continue to make news, TransCanada has entered into contracts or conditionally awarded approximately \$3 billion for major materials and pipeline construction that will start in the spring on its 2,148-mile Keystone Pipeline. Designed to transport crude from Hardisty, Alberta, to U.S. Midwest markets at Wood River and Patoka, IL and Cushing, OK, the project involves conversion of 537 miles of existing Canadian mainline pipeline facilities from natural gas to crude oil transmission service and construction of 232 miles of pipeline, pump stations and terminal facilities at Hardisty. The U.S. portion includes construction of 1,379 miles of pipeline and pump stations. It is expected that on start-up in late 2009 the pipeline will be capable of delivering 435,000 bopd to Wood River and Patoka. It will be expanded to 590,000 bopd and extended to Cushing in 2010.

Construction is also under way to complete Minnesota Pipeline Company's MinnCan Project. The \$300 million, 304-mile pipeline will deliver Canadian crude to Minnesota refineries. The line, which follows an existing pipeline right-of-way, starts in Clearbrook, MN, and extends south-southeast to Rosemont, MN. Completion is scheduled later this year.

International Activity

The international sector accounts for 12,357 miles of new oil and gas pipeline in various stages of construction that will be placed in service over the next few years. Planned projects total 79,763 miles.

This year's planned pipeline mileage figures show a dramatic rise from a year ago, increasing from 51,247 to 79,763. Most of the increase is due to the growing demand for natural gas in key markets throughout Europe and the Asia Pacific region.

With natural gas consumption projected to grow to 26.1 Tcf in 2030, new supplies remain a top priority for a number of areas, including India, China, Japan, Central and South America and of course Russia, the world's largest exporter of natural gas.

Pipeline construction and planned mileage totals by area are: Asia Pacific, 33,412; Africa, 4,991; South and Central America, 18,929; Middle East, 4,993; Western Europe and the European Union, 3,521; FSU and Eastern Europe, 32,178.

Asia Pacific Region

The 33,412 miles of new and planned pipeline in the Asia Pacific Region shows promise for a significant upturn in near-term construction activity. At this time, however, the region accounts for only 4,755 miles of actual pipeline construction.

Many of the delays are due to long-awaited transnational natural gas pipelines being pursued by China and India with neighboring countries. Unfortunately, several of China's planned natural gas pipelines from Russia's Far East are increasingly uncertain, which has led China to look elsewhere for supplies.

Analysts expect India's natural gas import demand will increase in coming years. Several import schemes including LNG and pipeline projects have either been implemented or considered.

Work is under way on the \$3.8 billion Kakinada (East-West) Pipeline. Reliance Industries awarded a contract to China Petroleum Pipeline to build the 882-mile, 48-inch system that will link West Bengal and Kakinada on India's east coast. The pipeline is scheduled to begin trans-

porting 40 MMcf/d of gas starting in early 2009.

In India, Punj Lloyd is working under contract to Reliance Gas Transportation to build a portion of the 870-mile Kinada-Bharuch Pipeline. The work has been split into four spreads which cover the states of Gujarat and Maharashtra. Work under Punj Lloyd's \$124 million contract involves laying 177 miles of 48-inch diameter pipeline in addition to developing associated facilities.

Bharat Petroleum Corporation Ltd. has awarded contracts for the supply and construction of the Vadinar - Bina Pipeline in Madhya Pradesh. Jindal Saw and PSL won the first contracts to supply the pipe for the entire 586-mile crude line. Construction of the pipeline was also divided into two segments: Essar Construction won \$45 million contract to lay the pipe from Vadinar port to Gujarat, while Kalpataru Infrastructure won a \$35 million contract to lay the section in Madhya Pradesh. The pipeline is scheduled for completion in 2009.

As to planned projects, Iran, along with Pakistan and India, reportedly have signed sales and purchase agreements and will now decide the lead sponsors to build different sections of the long discussed 1,298-mile Iran-Pakistan-India Gas Pipeline Project. Gazprom wants to take part in construction and operation of the \$7.4 billion pipeline to deliver 5.3 Bcf/d of gas from southern Iran to Pakistan and India. As proposed, the country sections will be built separately to avoid the effects of U.S. sanctions aimed against Iran and any companies that participate in Iranian projects. The schedule calls for completion of the project in 2014.

Sinopec says construction of the China National Petroleum Corporation's pipeline to transport 170 Bcm of natural gas from the Middle East to southwest China over the next 30 years will begin this year. The 788-mile Sino-Myanmar Oil Pipeline will provide an alternate route for China's crude imports from the Middle East and Africa and will reduce traffic through the Straits of Malacca.

Western Europe & EU

While many Western European and European Union countries remain heavily dependent on oil and gas imports from Russia, the Middle East, Norway and Algeria, this has not translated into new pipeline construction as the region accounts for only 3,521 miles of new and planned pipeline project.

Medgaz awarded a turnkey contract to Saipem for detailed engineering, pipelay and quality testing of a 130-mile pipeline from Almeria, Spain to the Algerian coast. In Algeria, it will hook up to the Hassi R'Mel-Beni Saf gas pipeline operated by Sonatrach; in Spain, it will link to the Almeria-Albacete gas pipeline belonging to ENAGAS, thereby facilitating its connection to the Spanish and European gas grid. Work is expected to get under way this year.

FSU-Eastern Europe

The FSU and Eastern Europe again account for more planned pipeline miles than actual mileage under construction. Of the 32,178 miles of new and planned pipelines, less than 5,000 miles represent work in progress.

One notable project is the Eastern Siberia-Pacific Ocean (ESPO) pipeline to move Russian crude to China and Japan. Construction has been awarded mostly to Russian contractors using a Russian-trained workforce. The first phase will run 1,690 miles with 42 and 48-inch pipe from the eastern Siberian town of Taishnet to Skovorodino near the Chinese border. After the section becomes operational at the end of 2008, a line to the Chinese city of Datsin will be added. The main line will continue another 1,071 miles to the Pacific coast near Vladivostok to enable shipment to other markets. The last stretch is expected to be complete by 2015. Work on a 570-mile section near Taishnet represents the start of construction. The project will cost an estimated \$11.5 billion.

In Russia's Far East, Sakhalin Energy achieved several milestones at its Sakhalin II development including production of 12.4 million barrels of oil from the Molikpaq platform. In the 2007 production season 189 cargoes of Vityaz crude were delivered to Japan, Korea and the U.S.

Sakhalin Energy also undertook a significant amount of additional commissioning during the 2007 season. This centered around new equipment installations on the Molikpaq platform to allow the hook up of a new off-shore pipeline system which will allow year round production next year.

The FSU and Eastern Europe continue to account for a high number of pipeline miles awaiting a construction start. An example is the KoRus Sakhalin Pipeline. Lead developer FSI Energy continues to seek interested partners. South Korean development partners have agreed to participate in construction and operation of the 1,575-mile pipeline to connect Far East Russian gas at Sakhalin with the Korean peninsula and Japan. The project

cost will be about \$3 billion and will begin operation in 2008 or 2009.

Awaiting a construction start is the Nabucco Pipeline. Although it doesn't completely kill the proposal, Gazprom has said it doesn't see the resources or gas reserves to build the project. Nabucco Gas Pipeline International Ltd., comprised of Bulgaria's Bulgargaz, BOTAS of Turkey, TransGas of Romania, Hungary's MOL and Austria's OMV, continues to push for the project or a replacement. The European Commission still considers the Nabucco Pipeline a priority. As planned, the 2,142 mile pipeline will transport natural gas from Turkey to Austria. The project has an estimated cost of \$6.2 billion. The projected date for a construction start is 2009. Based on that date, completion is slated for 2012. The five partners reportedly are seeking a sixth.

Middle East

Middle East nations deal with a multitude of problems as terrorists pose a threat to oil and gas operations, pipelines and export facilities. New and planned pipeline construction totals only 4,993 miles.

Of the pipelines slated for near-term completion, Stroytransgas should complete a 135-mile expansion of Shaybab 2 Pipeline in June. Apart from this project, a 224-mile pipeline carrying oil from the United Arab Emirates to Fujairah is planned by the Abu Dhabi's International Petroleum Investment Co. The line would carry 1.5 million bopd or about 55% of the Emirates' production.

Caribbean/South And Central America

While there have been proposals to build pipelines in several countries, of the 18,929 miles of new and planned pipelines, only 2,836 represent actual construction mileage. Most of the mileage reflects new projects being developed by Petrobras in Brazil, Table 1.

Bolivia and Argentina are stepping up plans to build a 932-mile natural gas pipeline to move Bolivian gas to Argentine markets. The Gasoducto del Noresta Argentina (GNA) line will extend from southern Bolivia to Argentine provinces of Salta, Formosa, and Chaco, terminating in the province of Santa Fe. The estimated cost is \$2 billion. Construction is scheduled to start in March with completion in 2009.

Much grander is the planned Gasoducto del Sur pipeline. However, there seems to be some doubt if the proposed \$20 billion project that Venezuela estimates would extend some 9,320 miles, (starting in Venezuela, crossing Brazil and ending in Argentina), will actually be

PETROBRAS PIPELINE PROJECTS SCHEDULED FOR SERVICE 2008-09

Project	Type	Length (mile)	Dia. (inch)	In-Service Date
Plangas C5+	Products	47	8	Dec. 08
Plangas GLP	LPG	47	8	Dec. 08
Campo Grande - Cuiaba	Oil products		10 to 18	N/A
Sao Sebastiao-Guararema	Crude/Oil prod.	56	24	Nov. 09
Japeri-Reduc	Natural Gas	25	28	Nov. 08
Paulinia-Jacutinga	Natural Gas	50	14	Aug. 08
Expansao Do Gasbel	Natural Gas	190	16 to 18	Oct. 08
Gasduc II	Natural Gas	114	38	May.09
Gaspal II	Natural gas	40	22	Dec. 09
Gastau-Caraguatatuba-				
Taubate	Natural gas	64	28	July.09
Gasán II	Natural Gas	24	22	Dec. 09
Anel De Gas Da Reduc	Natural Gas	60	12	Jun. 08
Fafen/Se (Ramal)	Natural Gas	14	8	Oct. 08
Pilar-Ipojuca	Natural Gas	112	24	Nov. 09
Urucu-Manaus	Natural Gas	414	18 to 20	Apr. 08
Acu-Sera Do mel	Natural Gas	20	14	Jan. 08

Total Mileage 2,206

built any time soon. Several factors have conspired to slow the project, including recent presidential elections, Bolivia's nationalization of hydrocarbons and a cabinet reshuffle in Venezuela.

Africa

For several years, civil unrest has depressed construction activity which is reflected in new and planned pipeline mileage figures totaling only 4,991. Saipem is the most active contractor in the area, accounting for some 450 mile of on and offshore pipeline construction.

Among its projects is a 214 mile pipeline for Shell Petroleum Development to connect Gbaran oil and gas fields in Bayelsa State in Niger Delta with the processing facility in the area. Work is expected to be completed at the end of 2008. **P&GJ**

Study Forecasts Massive Spending On Onshore Pipeline Projects Through 2012

A study by analysts Douglas-Westwood titled *The World Onshore Pipelines Report 2008-2012* forecasts that \$180 billion will be spent on onshore pipeline projects worldwide through 2012.

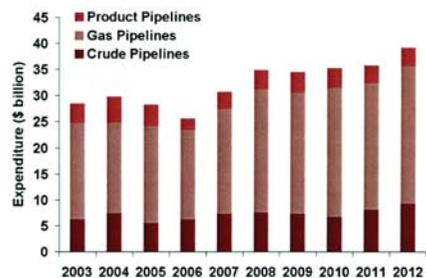
The report estimates a 16% increase in the pipeline mileage installed from 2008-2012 compared to the historic five year period 2003-2007. Nearly 75% of this expenditure is expected to be spent in Asia, Eastern Europe, the FSU and North America. Almost 70% is projected to be spent on gas pipelines. Asia stands out as the largest forecast market — by length of pipeline construction — accounting for \$42 billion of forecast capital expenditure.

The status of forecast pipeline projects shows a split between planning (47%), under construction or ordered (40%) and approved (13%).

The report notes that inevitably some of the projects in the planning phase will be canceled. Analysis on a project-by-project basis has resulted in more than 55,925 miles of announced pipeline projects being "slipped out" of the forecast period. Likewise some new projects will certainly come to fruition over the forecast period — compensating somewhat for project slippage.

The report also reviews all aspects of onshore oil and gas pipelines from design, materials, techniques and components through to construction, operations and maintenance. It describes pipeline design and how routes are selected, safety considerations, sizing, flow and pressure control and storage. The choice of pipeline materials is discussed and major pipeline components are reviewed from coatings and fittings to pumps and compressors. Construction techniques

A \$180 billion market for Onshore Pipelines Projects through to 2012



Onshore Pipelines Market - Total Project Costs by Product 2003-2012 (\$ billions)

Source: "The World Onshore Pipelines Report 2008-2012" - Douglas-Westwood Ltd

and associated issues are explained from stringing, welding and trenching to backfilling, cleaning, sizing, quality control and testing. Operations and maintenance content includes a review of control, integrity, corrosion protection and repairs.

The study identifies existing pipeline projects then examines the market drivers and prospects. Expenditure is broken down into the main areas of land and right-of-way, line pipe and fittings, pipeline construction, pump station and equipment and other (including delivery systems, communications, vehicles etc.)

The report is available from Douglas-Westwood Limited and additional material, including charts and tables on countries, sectors and markets is available from Publications Manager Georgie MacFarlan at georgie.macfarlan@dw-1.com Web: www.dw-1.com/products. **P&GJ**