

**Review of
Natural Gas Pipeline Activity
in Selected Regions
of the World**

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EXECUTIVE SUMMARY

The outlook for natural gas pipeline construction has never been brighter.

Natural gas consumption has increased significantly over the years. Since 1985, world consumption of natural gas has increased 26%. World demand is now about 75 Tcf per year. The increase would probably have been higher had the economies of the Former Soviet Union not fallen dramatically during this period. Clearly, the value of natural gas is being recognized in both the developed and developing parts of the world. Nowhere is this more apparent than in the Asia Pacific region, where consumption of natural gas has doubled over the past ten years.

Supplies of natural gas are plentiful. Worldwide proven reserves approach 5,000 Tcf and represent over 65 years of supply at current rates of production. Moreover, significant discoveries continue to be made increasing the likelihood that supplies will be abundant well into the 21st century.

Most natural gas is supplied from regional production close to the area of consumption. However, there has been a significant increase in worldwide trading of natural gas. International trade now represents 14% of consumption, increasing by 11% in 1995. The largest natural gas trade is still between Canada and the U.S. Nevertheless, all major consuming regions are creating growth in international trade, spurred on by the desire to develop large deposits of natural gas from regions that are now accessible because of recent political and economic changes, as well as technological advances that have been driving development costs downward.

Some of the increase in demand will be supplied via LNG tankers, particularly to the markets of Japan, South Korea, and Taiwan. However, pipelines will dominate transportation to all other markets. Large undeveloped natural gas reserves exist in the North Sea, North Africa, Russia (both west and east Siberia), Turkmenistan, Iran, Qatar, Indonesia, China, and Australia. New pipelines are being planned to bring these resources to market.

These trends became evident in our research, which uncovered a total of 266 natural gas pipeline projects outside of North America representing 82,131 miles (see table below). More than 75,000 miles are planned for 1997 and beyond, enough to circle the earth three times! Currently, about 7,000 miles of natural gas pipelines are under construction. Most of the projects under construction are in Europe and Australia.

NATURAL GAS PIPELINE PROJECTS (as of March 1, 1997)
(Miles)

	Under Construction		Planned		Total		Number of Projects
	Miles	%	Miles	%	Miles	%	
Asia Pacific Total	1,428	21%	20,077	27%	21,505	26%	100
Far East	35	1%	4,888	7%	4,923	6%	
Indian Subcontinent	215	3%	1,133	1%	1,348	2%	
Pacific Rim	1,178	17%	14,056	19%	15,234	18%	
FSU	372	6%	11,913	16%	12,285	15%	20
Europe	2,870	42%	4,227	5%	7,097	9%	49
Africa	894	13%	3,714	5%	4,608	6%	24
Middle East	110	2%	10,810	14%	10,920	13%	16
South America	1,078	16%	24,638	33%	25,716	31%	57
TOTAL	6,752	100%	75,379	100%	82,131	100%	266

Almost 25,000 miles of pipelines are planned for South America. Much of this total is to bring natural gas from Argentina and Bolivia to Brazil, Paraguay, Uruguay, and Chile. Both Chile and Colombia will be making significant additions to their gas transmission systems. About 1,000 miles of pipeline construction are contemplated to bring Peru's huge Camisea Field to market.

The Asia Pacific region stands out with 100 projects planned for a total length of over 20,000 miles. Most of these projects are to bring remote discoveries to populated areas of Australia, Indonesia, and Thailand. Australia is moving closer to a national grid with pipeline projects designed to connect the states. Indonesia, Malaysia, and Thailand are respectively planning pipelines across Java, Sumatra, the Malay Peninsula, and Southern Thailand to the Bangkok area. When completed, this will form the main part of the Trans-Asean system. Gas fields in Myanmar and Vietnam will also connect to this system.

In China, several projects have been proposed to take gas from the Ordos basin to Beijing and other nearby cities. There are plans to connect the offshore Ping Hu Field to Shanghai by way of a 249-mile pipeline.

Large transmission projects have been proposed to take the vast reserves from the countries of the Middle East and FSU to consuming areas in Europe, India, and Japan. Most of these projects are likely to take five to ten years before construction begins.

A total of 49 projects were found in Europe, totaling around 7,000 miles. Competition between distributors has led to an expansion of national grids in Northwest Europe utilizing natural gas from the North Sea and Russia. Italy, Spain, and Portugal are adding transmission lines to accommodate the increase in natural gas imports from Algeria. Several projects have been proposed to carry natural gas through Turkey. Turkey is at a strategic crossroad between the major reserves of the Middle East and Central Asian Republics, and the major consuming markets of western Europe.

Most of the pipeline projects planned in Africa are located in North Africa to connect gas fields to the trunklines that bring gas to southern Europe. There are also projects to carry natural gas to South Africa from Namibia and Mozambique.

INTRODUCTION

Gaffney, Cline & Associates (GCA) was requested by INGAA to prepare a report detailing specific information about natural gas pipeline expansion projects by country for the following regions:

- Europe
- Former Soviet Union (FSU)
- South America
- Pacific Rim (including Australia)
- Far East (including China)
- Indian Subcontinent
- Middle East and Africa

GCA was not asked to include any projects in North America. In addition to preparation of this report, GCA was requested to present an executive briefing of the Asia Pacific portion to members of the INGAA Foundation at a meeting in Houston on March 4, 1997. Color copies of the slides presented at that meeting were provided to the attendees.

GCA reviewed the available industry literature to compile a list of recently completed pipelines, pipelines under construction, and planned gas pipelines in these regions. Emphasis was placed on the more significant projects that created new pipeline systems, rather than small expansions of existing distribution grids. Generally, such projects are defined as those with pipelines in excess of 100 miles, with diameters typically in excess of 16". We believe that we have captured all the projects of this type from announcements through the end of February 1997. We have also included some shorter, smaller pipelines that were prominently announced. GCA's main sources of data were the standard industry publications, including *Oil and Gas Journal*, *Pipeline and Gas Journal*, *Offshore and World Oil*. In addition, current data was also extracted from *Platt's Electronic Oilgram*, and such regional magazines as *Petromin*, *Asian Oil & Gas*, and from GCA library files. A compilation of the data surveyed is presented, by country, in the following report, as well as in the data spreadsheet located in the Appendix.

For each pipeline project, we have listed the sponsor, starting point and destination, length and status. If available, we also noted pipeline diameter, completion date and contractor. This information is often not available, or subject to change, for projects in the planning stage.

Magazine surveys are fairly relaxed in how they characterize industry activity by simply adding mileage announcements. To add rigor, we counted only the mileage for the most likely pipelines among competing alternatives. Further, we assigned the pipeline length for international pipelines to the country of origin or, when a route was specified, broke down the length by country. This is why mileage is not always shown for each pipeline. We also added notes to some of these projects to assist the reader in understanding each project.

Regional and country maps of selected gas pipeline projects have been prepared and are presented in the Figures section of this report. These maps present the reader with a general geographic situation of the pipeline project illustrated and is not meant to represent an accurate route-specified layout.

DISCUSSION

1. EUROPE

Europe can be divided into at least two parts, the western industrialized Europe and the eastern emerging economies. Both parts of Europe are expected to increase their need for energy over the next several years. Every country in Europe is expanding their domestic gas grid and many are looking for ways to diversify their gas resources.

With the opening of the former Soviet Union, several countries are looking toward Russia and the other republics as sources of energy. Several gas line projects address this very issue; one of the biggest being the 2,500-mile Yamal to Europe pipeline that will bring gas from Siberia through Russia, Belarus and Poland to a connection with the German gas distribution network.

Another major gas pipeline, the Magreb-Europe pipeline which has just gone into operation, runs from the Hassi R'Mel gas field in Algeria across Morocco under the Straits of Gibraltar to Spain and from Spain to France and Portugal.

Norway is still the major supplier to Europe and is extending its gas trunkline system by building several new pipelines to transport gas from North Sea and Norwegian Sea fields to Germany, France and then the rest of Europe. Norway with her 47.5 Tcf of natural gas and extensive exploration and development plans will be a major supplier of natural gas to Europe for the foreseeable future.

The U.K.'s North Sea acreage contains an estimated 23.3 Tcf of natural gas reserves. The U.K. uses much of the natural gas it produces, but does export some to the continent. A pipeline connecting England and Belgium, which is to be completed in 1998, will extend the exports of natural gas to Europe. In 1994, legislation was passed which will end the monopoly of British Gas by the year 1998. This has led to a complete restructuring of the natural gas business in the U.K. The start up of the Central Area Transmission System in 1993 was the beginning of a natural gas grid for the U.K.'s North Sea acreage.

Germany is the hub of natural gas transportation in Europe. Many of the major Norwegian trunklines connect with the German gas distribution system, and now the pipelines from Russia are expected to connect with the German system. Even the Magreb-Europe line from Spain, and the trans-Med pipeline from Italy are expected to connect with the German system. The German gas grid is expanding due to competition between Ruhrgas, the largest German gas distributor, and Wingas, a joint venture between Gazprom and Wintershall. Wingas has been building its own gas grid in Germany and elsewhere in Europe in order to compete against the larger Ruhrgas.

In the Netherlands, gas production and consumption have remained relatively level over the last ten years. In 1985, 3.01 Tcf of natural gas was produced, 2.69 Tcf in 1990 and 2.95 Tcf in 1994. In 1985, 1,613 Bcf of natural gas was consumed, 1,538 Bcf in 1990 and 1,667 Bcf in 1994. The natural gas pipeline system from the offshore fields to the gas processing facilities on land was designed to handle gas from sections of the Dutch North Sea that have never been developed. The Netherlands is currently one of the few countries in Europe with under-utilized gas pipelines. To correct this situation, most of the exploration and development

in the Dutch offshore is being concentrated near the offshore grid, especially in Blocks K, L, and P. Another development in the Dutch gas industry is the emerging competition between local gas distribution companies and Gasunie. Several of the local gas distribution companies are planning to purchase gas directly from a provider rather than Gasunie.

Located in southern Europe, and very close to the Caspian Sea countries of Turkmenistan, Azerbaijan, Kazakhstan, and Iran, Turkey is another major transportation center for natural gas. Turkey is not only a major transporter, but also a major consumer of natural gas. The current supply arrangements in Turkey will only cover about one-third of Turkey's natural gas needs in the next 10 to 15 years. Most of this gas will be used by industry and for power generation. Numerous pipeline projects are planned to deliver gas to Turkey, and then transport additional gas to Europe. Turkey is strategically situated to transport gas from the Middle East to Europe. Turkey is also increasing its use of LNG.

Among the eastern European countries, Hungary and Poland have made the most progress in integrating their systems with other European systems. Hungary received all of its natural gas from Russia until recently when a pipeline from Austria gave Hungary another source of natural gas through the Austrian and German gas grids. This was the first time that a central European country has established a connection with western Europe for energy since the fall of the Soviet Union.

Poland is on the route of the Yamal-to-Europe pipeline and, in fact, part of the pipeline in Poland is already in operation. Poland still receives most of its natural gas from Russia and will increase its dependence on Russia as more gas flows through the Yamal-to-Europe pipeline. In order to ameliorate this dependence somewhat, Poland is increasing natural gas storage facilities, and investigating the use of LNG from Qatar, Norway, Nigeria or Algeria.

Country Overview

ALBANIA

Albania continues to be one of the poorest countries in Europe, with much of the urban population depending on humanitarian aid to meet basic needs.

In July 1996, the Albanian prime Minister announced the total privatization of the country's economy, including the oil and gas sectors.

In November of 1995, Albania held its second international onshore licensing round; ten blocks were offered in this round.

Fountain Oil, as part of a joint venture with Albpetrol, the state oil company, is planning to drill two horizontal wells in the Gorischt-Kocul Field. Initially the heavy oil from this field will be sold to local refineries, but it may be exported after the refurbishing of one of the two pipelines running to the port of Vlore.

Alliance Resources also has a joint venture to enhance production from the Kucova/Arrza Field. Other companies operating in Albania include INA-Naftaplin, Croatia's state oil company, Shell, Coparex, and Premier Oil.

Natural Gas Pipeline Activities

Gazprom has selected a route that runs from Russian port of Tuapse under the Black Sea to Trabzon in Turkey, and from there gas will be delivered to Greece, Macedonia and Albania.

Country Overview

AUSTRIA

Exploration activity in Austria is concentrated on finding natural gas. The Vienna Basin remains an attractive province. In 1996, OMV made three discoveries in five wildcats. The discoveries include:

- Wienerherberg South 1 found gas in eight different zones at 2,788 feet;
- Bernhardsthal South 2 cut 131 feet of sandstone pay between 5,576 and 6,560 feet;
- Spannberg South 1 found gas in three of four target areas.

Austria's location between eastern Europe and the former Soviet republics and western Europe makes it a natural consideration for extension and enlargement of its gas grid into a gas transportation center.

Natural Gas Pipeline Activities

- In October 1996, the Austrian Bavarian Gas line (ABG), a 150-meter (93 mile) pipeline running under the Salzach River from Puchkirchen, Austria, to Burghausen, Germany, opened. This link brings gas from Russia via Slovakia and Austria to Germany. The pipeline has two strands and is capable of moving 8 billion cubic meters per year, but only a fraction of that capacity will be used at first. The Austrian company OMV owns the pipeline in Austria.
- The Hungary-Austria Gas line (HAG), a 28", 75-mile line which runs from Baumgarten, Austria, to Gyor, Hungary, opened October 1, 1996. MOL will purchase gas from Ruhrgas under a long-term agreement signed in May 1995. The pipeline can deliver up to 4.5 billion cubic meters of gas per year and cost US\$20 million to build. **Figure 1 - Pipeline 1**

Country Overview

BELGIUM

The construction of the Interconnector pipeline from Bacton, England, to Zeebrugge, Belgium, is the moving force behind the expansion of the natural gas grid within Belgium. In January 1996, Distrigaz sent a memorandum of terms and conditions under which Distrigaz would ship gas from the Interconnector to other parts of Europe. As a result of the transit contracts resulting from this memorandum, Distrigaz will be spending US\$360-450 million on improving the gas grid. Construction on the gas grid projects is to begin in the spring of 1997, and be completed by October of 1998.

Natural Gas Pipeline Activities

Germany's Wingas, a joint venture between Wintershall and Gazprom, has the rights to transmit 1 billion cubic meters of gas from the Interconnector pipeline through Belgium via Distrigaz's network to Aachen, Germany. At Aachen, the gas will enter the Wedal pipeline system being built by Wingas. The gas will be transmitted approximately 140 miles within Belgium.

Distrigaz is expanding the gas grid within Belgium and is planning numerous additional projects.

Zeebrugge, Belgium, will be the continental terminal for the Interconnector which runs from the U.K. under the English Channel to Belgium.

Country Overview

BULGARIA

Bulgaria has poor prospects for supplying its natural gas needs from domestic sources. Production in 1995 was 700 BOPD of oil and 5 MMcfd of natural gas. Both Maxus and Edison Gas have relinquished their rights to exploration and production in the country. Enterprise Oil has acquired the six Ropotamo offshore blocks and is planning minimal exploratory drilling. Texaco has preliminary plans to develop the Galata Field where gas was found in 1993. Texaco is planning a 50 MMcfd production facility and a 31-mile pipeline.

In January 1997, Bulgargas, the Bulgarian gas company, and Gazprom signed an agreement whereby Gazprom will supply 3.34 billion cubic meters of gas annually. From January 1997 through May 1997, the gas will be supplied at a reduced cost; after June 1, 1997, the gas will be supplied at full market rate and paid for up front. The reduced price is part of a compensation package to Bulgaria for construction work done in Russia by Bulgarian companies. Transit fees for gas piped through Bulgaria to third countries are still to be negotiated.

Natural Gas Pipeline Activities

None

Country Overview

CROATIA

Due to the continuing war in neighboring Bosnia-Herzegovina, Croatia had to resist exploratory efforts to the Pannonian Basin in northern Croatia. Several seismic projects were undertaken and an appraisal well confirmed an earlier gas discovery. One wild cat well also found oil.

INA-Naftaplin, the state oil company, did not have production from the Deletovci, Ilaca and Privalaka oil fields because they were occupied by Serbian troops. An estimated 3,050 BOPD were shipped by these troops back to Serbia. In the overall peace plan for the former Yugoslavia, these oil fields are to be returned to Croatia. Production from other fields in Croatia averaged 31,236 BOPD in 1995.

Natural Gas Pipeline Activities

None

Country Overview

CZECH REPUBLIC

The Czech Republic is trying to diversify its sources of energy. Currently, coal accounts for about 60% of Czech energy demand, followed by oil at 16%, natural gas at 15%, and non-fossil fuels at 8%. Except for coal, the Czech Republic produces very little of its energy and is, therefore, dependent on energy imports, primarily from Russia.

Energie Klado (EK), a privatized state company, holds eight coalbed methane licenses and has formed a joint venture with Marine & Mercantile Securities to develop these resources.

Moravske Naftove Doly (MND), the state oil company, continues to explore for oil and natural gas, both in the Czech Republic and in Turkey, India, Pakistan, and Bangladesh.

Presently, the Czech government is considering several alternative natural gas supply contracts and a decision may not come until April 1997. Among the parties submitting contracts are Norway, Germany, and the Netherlands. Gazprom, which currently supplies all the natural gas to the Czech Republic, has also submitted a contract which may contain a clause allowing the Czech Republic to pay for part of the gas supplies with products produced in the Czech Republic.

Natural Gas Pipeline Activities

None

Country Overview

DENMARK

Denmark continues to develop its offshore petroleum industry. In 1996, the Fourth Offshore Licensing Round was held and nine exploration awards were made to seven consortia. Just two exploration wells were drilled in 1995; however, both wells appraised or discovered notable reserves.

Amerada Hess drilled an appraisal well in the South Arne structure and is now planning for first production in 1998.

Statoil's Siri 1 discovery may be the largest oil discovery off Denmark since 1977. It is thought to hold reserves of 150 million barrels of oil, plus associated gas. Statoil is investigating a floater development of Siri, with production to begin in 1998. Statoil is also planning the development of the Amalie gas field.

Maersk is developing the Elly gas field and the Alma gas condensate field.

Natural Gas Pipeline Activities

Amerada Hess is planning to build a pipeline from the South Arne Field to Kaergard on the Danish coast. This pipeline will be able to transport about 4 billion cubic meters per year and will cost approximately US\$260-430 million to build. Gas deliveries from Germany or the U.K. could be tied into this pipeline, as well as it could provide gas transportation for other small fields in the area.

In order to meet Denmark's natural gas needs, Dansk Olie & Naturgas AS (DONG) is negotiating with Norway for increased imports of Norwegian gas. Additional pipelines between Norway's offshore fields and Denmark may be necessary to handle these additional gas requirements.

Smaller pipeline projects:

- Harald West Field to Tyra East Field (48-mile, 24" pipe);
- Expansion of the Danish-German Deudan gas pipeline was completed in October 1996.

Country Overview

FINLAND

The fall of the Soviet Union had a profound impact on Finland. Russia had supplied about 80% of Finland's crude oil requirements, or about 9 million metric tons in 1988; in 1995, Russia supplied only 3 million metric tons. Finland had to diversify their petroleum supply by looking primarily to the North Sea. Neste, the Finnish state-owned energy company, has interests in several Norwegian projects, including Smoerbukk, South Smoerbukk, Midgard, and Heidrun. Neste also has interests in the U.K. North Sea and Oman.

Gasum, Finland's natural gas distributor, is a joint venture between Gazprom and Neste. While Gazprom was included in the joint venture to guarantee continued gas supplies from Russia, Gasum is diversifying the sources for gas supplies.

Natural Gas Pipeline Activities

Gasum plans to double the capacity of the pipeline between Russia and Finland with a US\$160 million project.

Long-term plans include a pipeline from Haltenbanken, offshore Norway, through Sweden north of Stockholm to Helsinki.

Another pipeline in the long-term plan is one from Helsinki to Copenhagen, Denmark, and then on to Berlin, Germany.

In December 1996, the European Union Council of Ministers approved a proposal to include the Nordic Gas Grid in the Trans-European Energy Networks (TEN). The Nordic Gas Grid will integrate the natural gas networks of Finland, Sweden, and Denmark with diversified supplies and create a northern transmission route to continental Europe. The Nordic Gas Grid may eventually include the Baltic states. The first feasibility study, which will study various alternatives to link the Nordic states networks, will be carried out in 1997 at a cost of about US\$1.5 million.

A 160-mile, 20" pipeline running from Gaule, Sweden, into Finland is in the final planning stage.

Country Overview

FRANCE

France continues to have limited exploration; drilling activity increased from 17 wells in 1994 to 19 wells in 1995 and approximately 23 wells in 1996. Of the 19 wells drilled in 1995, Coparex International completed one gas well and two oil wells, Exxon completed four oil wells, and Canyon Energy continues to explore the Paris Basin after testing the La Vielle Borde-1 well at a rate of 18 BOPD. Elf will not develop the Anatares-3 well.

Natural Gas Pipeline Activities

The NorFra pipeline, which runs from the Sleipner gas field in the North Sea to Dunkerque, France, will be the largest trunkline in the Norwegian system. The 534-mile, 40" line will extend from the 16/11-E complex riser platform through Dutch and Belgian waters before turning southwest toward northern France. This trunkline could be operational by October of 1998, with an expected annual throughput of 12 Bcm. Figure 1 - Pipeline 2

Gaz de France will build a 115-mile gas pipeline and gas handling stations between Dunkerque and Gournay sur Aronde at a cost of US\$211 million.

There are several gas distribution pipeline projects in various stages of development in France:

- A 110-mile, 32" pipeline running from Toulouse-Lias to Nabonne-Argeliers has obtained all of the necessary right of way clearances and should be operational in 1997.
- Gaz de France is building a 250-mile gas transmission line this summer. This pipeline which will carry 10 Bcm/y will allow the French national gas grid to operate as a loop and meet the rising energy demand in the southern part of the country. The commissioning of the pipeline is planned to coincide with the installation of a gas compression station at Saint-Martin-Crau.

Country Overview

GERMANY

Drilling activity in Germany continues at a moderate level. In 1994, there were 30 wells drilled, and 42 wells were drilled in 1995. Of the three exploratory wells drilled, two were successful. BEB found oil in the Imbrock Z1 well, and Mobil found gas in the Krusenhausen T2A well.

Germany continues to increase its imports of natural gas and to be a major natural gas transmission center in Europe. In 1995, the sources of natural gas supplies in Germany were domestic (21%), Netherlands (26%), Norway (14%), and Russia (37%). By the year 2000, natural gas supply sources are expected to be domestic (16%), Netherlands (20%), Norway (27%) and Russia (34%). Because of its increasing demand and its importance as a gas transmission center, many new and proposed pipelines end or connect in Germany.

Natural Gas Pipeline Activities

Europipe I runs from 16/11 riser complex near the Sleipner gas field to Emden in Germany. This 40" diameter, 186-mile trunkline was opened in 1995.

Europipe II, which has been approved by Norway's parliament, will run from Kaarsto, Norway, to Dornum, Germany. The 394-mile pipeline will cost US\$1.1 billion and will be built by Statoil. It should be operational by October 1999.

Wingas, a joint venture between Gazprom and Wintershall, is developing a gas grid throughout Germany. Pipelines in this gas grid include:

- The Wedal pipeline, which will extend from Bielefeld in central Germany to Aachen near the German/Belgian border. This 186-mile line will run through the Ruhr industrial area and allow gas from the U.K. to be supplied to this area via the Interconnector and Distrigaz lines in Belgium. The flow can also be reversed in the future so that Russian gas could be supplied to the U.K. if the need arises. The Wedal pipeline will connect with the 745-mile Megal/Stegal pipeline system;
- A 51-mile segment of the pipeline from the connection with the existing pipelines to Soest and Lippstadt has been completed and deliveries of gas began in January 1997. The additional 137-mile stretch to Aachen is to be completed by autumn 1998;
- Wingas is studying the possibility of reactivating a used portion of the Marseilles, France, to Karlsruhe, Germany, SPLSE (Southern European Crude Pipeline) as a gas pipeline that would permit deliveries to southern France via the Wingas pipeline system. The SPLSE would connect with the Wingas Midal pipeline at Karlsruhe;
- The Midal pipeline system runs the 397 miles from Emden on the North Sea to Karlsruhe and has been in operation about two years;
- Wingas is studying the possibility of extending their pipeline system to Basel on the border of Switzerland, and from there supply natural gas to Italy;
- Wingas is also studying the possibility of supplying gas to Austria via Bavaria to the OMV pipeline system.

The first section of the Yamal-to-Europe pipeline system to be completed runs from Szamotuly, Poland, to Frankfurt an der Oder, Germany. December 1996 marked the start up of the 75-mile section, which was built at a cost of US\$184 million. Initial deliveries of 600 million cubic meters per year will come from already producing Siberian gas fields with connections to Germany. As the Yamal-to-Europe pipeline is finished, the deliveries will come from the Yamal Peninsula gas fields. For more information on the Yamal-to-Europe pipeline, please refer to the Russia section of this report. **Figure 1 - Pipeline 3**

In October 1996, the Austrian Bavarian Gasline (ABG), a 93-mile pipeline running under the Salzach River from Puchkirchen, Austria to Burghausen, Germany, opened. This link brings gas from Russia via Slovakia and Austria to Germany. The pipeline has two strands and is capable of moving 8 billion cubic meters year, but only a fraction of that capacity will be used at first. The Austrian company, OMV, owns the pipeline in Austria.

Expansion of the Danish-German Deudan gas pipeline was completed in October 1996.

In 1997, Ruhrgas plans to begin operation of a 100-mile, 36" diameter gas transmission line to run from Breitbrunn to Anwaiting.

In 1997, Wingas plans to begin operation of a 186-mile, 30" diameter gas distribution system in the North Rhine and Westphalia districts of Germany.

As of 1995, Ruhrgas was operating a 125-mile, 1,200-mm diameter gas transmission line between Wardenberg and Werne.

Numerous short-distance gas distribution projects are in various stages of development in Germany.

Country Review

GREECE

In late 1995, Greece held an international licensing round under revised petroleum laws that bring Greece into compliance with the European Union Hydrocarbon Licensing directive. The licensing round included three onshore and three offshore blocks. Four out of the six blocks were awarded to Enterprise and its partners, Union Texas and Triton. The Public Petroleum Corp of Greece (DEP-EKY) hopes to conclude agreements by March 1997.

The European Union is contemplating legal action against Greece for placing barriers in the way of petroleum imports. Certain aspects of Greek law on the stocking, transportation and distribution of petroleum products are in opposition to the EU legislation on free movement of goods.

Natural Gas Pipeline Activities

The Public Gas Corp. of Greece (DEPA) has been constructing a high-pressure natural gas transmission and distribution system since 1990. This system includes construction of an LNG reception terminal for planned imports of Algerian LNG and a high-pressure pipeline running from Kula on the Greek/Bulgarian border to Athens and then to Lavrion. This 342-mile, 30" diameter pipeline will import gas from Russia. The gas transmission and distribution system is expected to be completed by 1999. Delays in converting coal-powered electricity generation plants into natural gas-powered electricity generation plants left DEPA with a financial crisis over how to pay for the natural gas deliveries from Gazprom. Natural gas power generation was to have been the driving force behind demand growth. In October 1996, the European Investment Bank loaned DEPA US\$254 million to complete the construction and to begin operation of the pipeline system.

Country Overview

HUNGARY

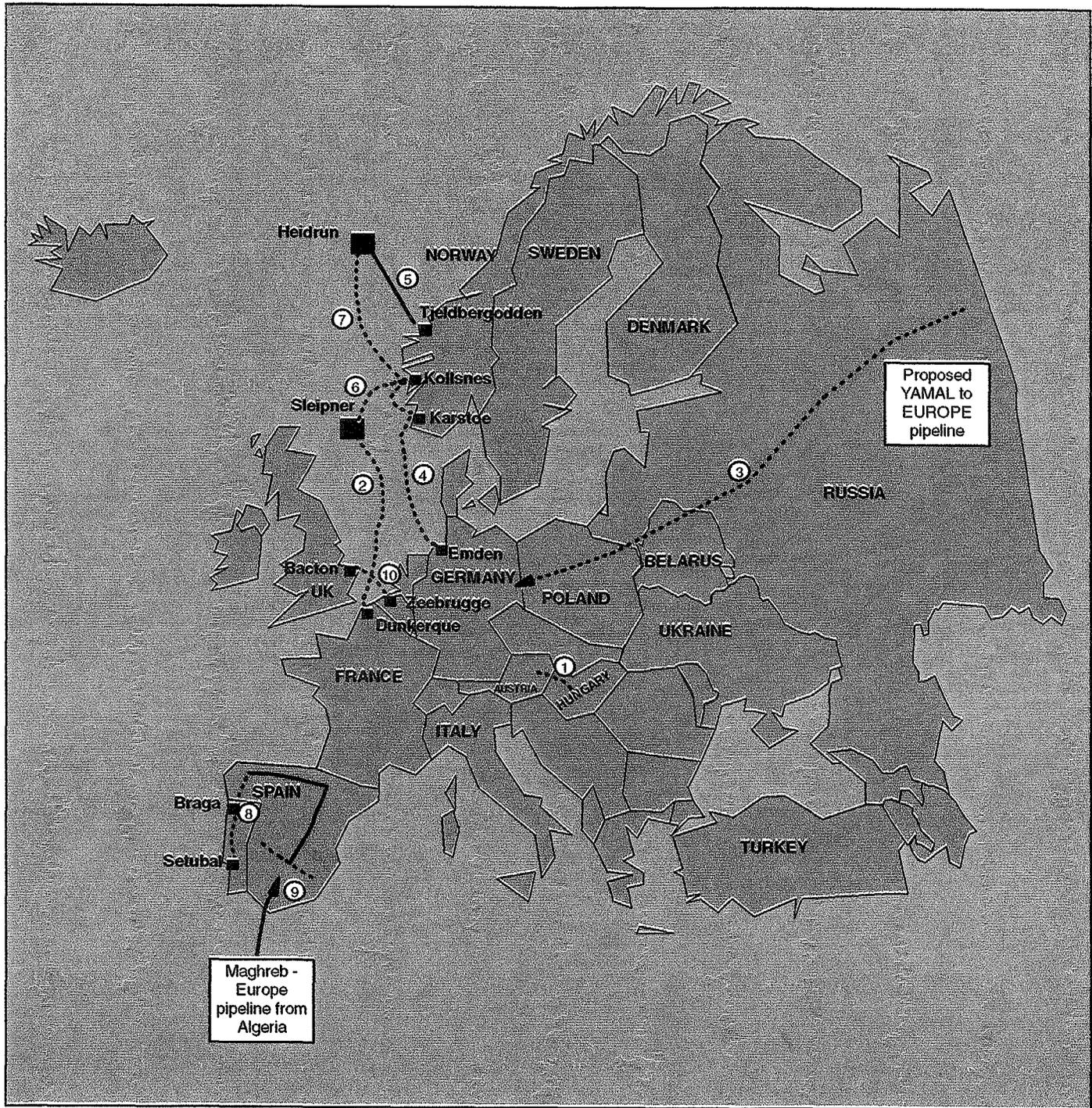
Hungary is actively trying to expand its limited oil and gas resources. Use of 3D seismic to reexamine mature basins and offering concessions to foreign oil companies are just two of the methods being used to expand Hungarian oil and gas production. Four foreign companies currently hold licenses awarded in 1994; they are Mobil, Occidental, Coastal Oil & Gas, and Blue Star Corp.

MOL, the state oil company, accelerated development of two large gas fields, Devavanya and Totkomlos. Totkomlos went onstream in 1996, with an average daily production of 8.4 MMcf; Devavanya is to come onstream in 1997. Natural gas consumption in Hungary is expected to grow at the rate of 4.4% per year for the next five years.

Additional privatization of MOL was delayed from October 1996 until early 1997. MOL is already about 42% in investors' hands, with plans to make another 10% available.

Natural Gas Pipeline Activities

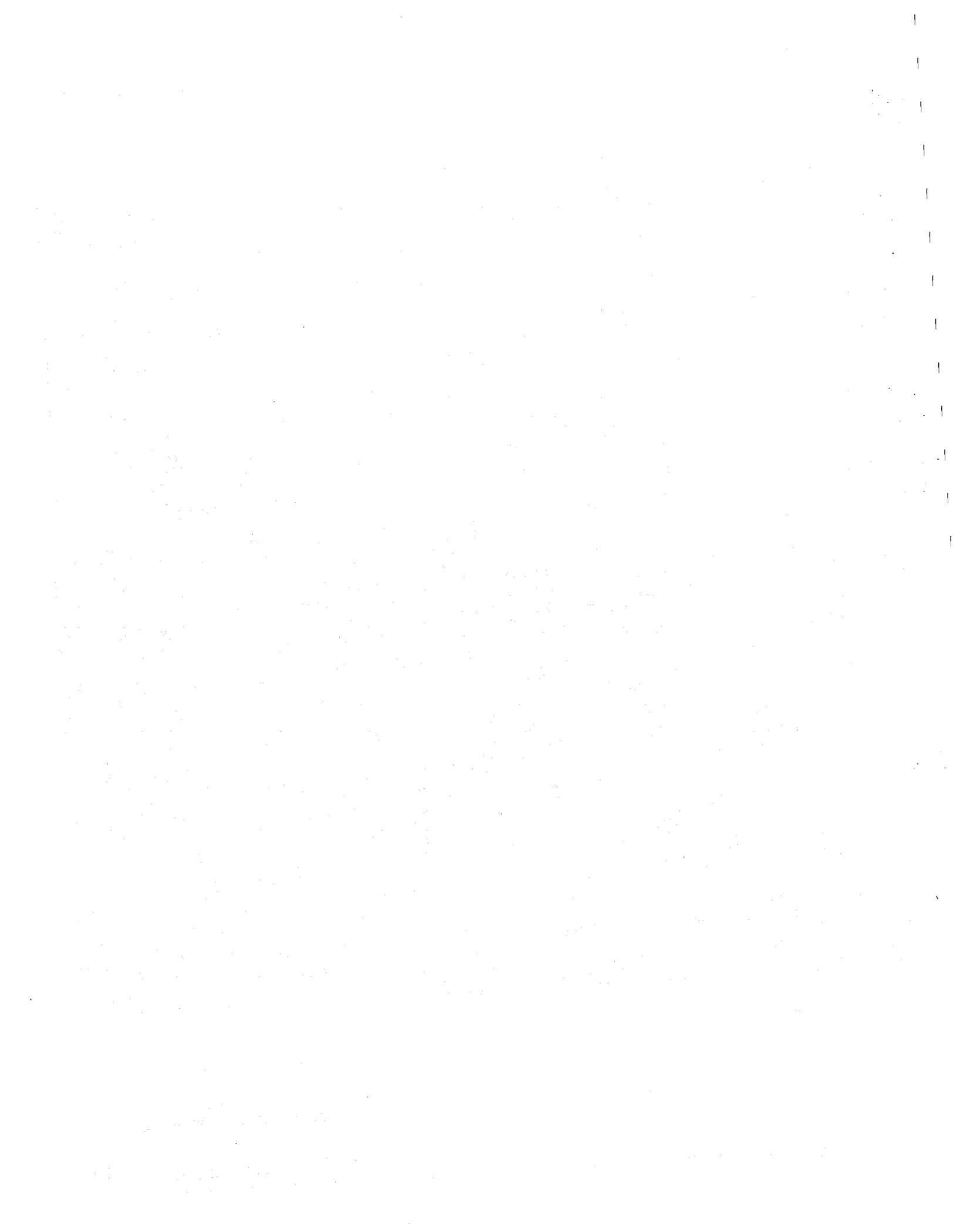
Trying to lessen its dependence on Russian natural gas, Hungary began importing gas from Europe through a spur running from Baumgarten, Austria, to Gyor, Hungary. This 75-mile, 700-mm pipeline can deliver up to 4.5 Bcmy. This new connection, known as the HAG, or Hungary Austria Gasline, represents a significant development for Hungary and other central European countries because this pipeline gives Hungary and other central European countries an alternative to Russian natural gas supplies. **Figure 1 - Pipeline 1**



LEGEND
 ——— EXISTING GAS PIPELINE
 - - - - - PLANNED or UNDER CONSTRUCTION PIPELINE

EUROPE
Selected New Gas Pipelines

Proj. A965 March 97	Checked:	Fig. 1
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Country Overview

IRELAND

Ireland held the largest offshore licensing round in Europe since Norway's first licensing round in 1965. In the Rockall Trough, 615 complete blocks and 35 partial blocks were offered. The closing date for the licensing round is March 26, 1997. This area is virtually unexplored, with only 3,720 line-miles of seismic having been run. The blocks are in water depths ranging from 1,640-8,200 feet.

Several oil companies are active in Ireland. Marathon discovered natural gas at its 48/25-3 well; an appraisal well tested at 23.3 MMcfd. Enterprise Oil has begun a US\$21 million exploratory drilling program in the Slyne Trough and Statoil is planning a 3D seismic program in Block 26/28a area. Arcon is seeking partners to develop the Helvic oil discovery in Block 49/9.

Natural Gas Pipeline Activities

A feasibility study on linking the gas networks of north and south Ireland has been put on hold until at least March 1997. Currently, there is just one pipeline from the U.K. to Ireland. A pipeline linking the southern gas grid of Ireland to the Northern Ireland pipeline would provide an alternative should there be a disruption in normal gas supplies.

British Petroleum is studying a 50-mile, 6-12" diameter pipeline to run from the Schlehallion Field in the North Atlantic to Ireland. The pipeline may be operational in 1997.

Country Overview

ITALY

The natural gas transmission and distribution infrastructure is growing rapidly because of increased domestic demand and an effort to boost the use of natural gas. Among European countries, Italy is already second to the Netherlands in the percent of natural gas in the energy mix. Natural gas consumption is about 1.7 Tcfy, and according to Agip could reach 2.6 Tcfy by the year 2000. At this rate, natural gas will meet about one-third of Italy's total primary energy demand.

Exploration and production activity has greatly increased as Italy tries to reduce its dependence on imported oil. Agip is planning to spend US\$3.1 billion in the next four years. Much of this expenditure will go to the development of onshore oil fields in the Val d'Agri region of Basilicata and the development of the offshore Aquila oil field in the Adriatic Sea off Brindisi.

Natural Gas Pipeline Activities

Snam, the state gas supply and distribution company, is doubling the throughput of the Trans-Mediterranean gas pipeline system. Also under construction is an extension of the TransMed pipeline system from Mazara del Vallo to Minerbio, Italy. This 924-mile, 26-48" diameter extension will provide deliveries into Slovenia. The initial capacity of the extension will be approximately 75 Bcmy.

Snam is also increasing the throughput on its Trans-Austria Gasleitung (TAG) pipeline for its imports from Russia.

Several gas distribution pipeline projects are in various stages of development in Italy.

Country Overview

MACEDONIA

Generally considered the poorest republic of the former Yugoslav federation, Macedonia can meet basic food and energy needs through its agricultural and coal resources. It must import all of its oil and gas and most of its machinery and parts. Nearby fighting and potential political instability make Macedonia of little interest to foreign investors. Its physical location does make Macedonia a possible transportation corridor between western Europe, the Aegean Sea, and southern Europe.

Natural Gas Pipeline Activities

A 103-mile pipeline is under construction from Kriva Palanka, Bulgaria, to Skopje, Macedonia. This US\$66 million pipeline will have a capacity of 0.8 Bcmy.

Gazprom has selected a route that runs from Russian port of Tuapse under the Black Sea to Trabzon in Turkey, and from there gas will be delivered to Greece, Macedonia and Albania.

A pipeline running from Skopje to Deve Baira, Albania, is a possibility by the year 2000. This would be a 124-mile, 30" diameter pipeline.

Country Overview

THE NETHERLANDS

In 1996, the Netherlands opened their ninth offshore licensing round and offered all open acreage under a new open-door policy. There have been changes to the regulatory regime so that it is in alignment with the European Union Hydrocarbon Licensing Directive. These changes must be approved by the parliament and this has led to delays in awarding concessions.

As of 1995, the Netherlands had natural gas reserves of 66,215 Bcf, which is an increase from the reserves of 6,100 Bcf reported in 1990, but a decrease from the reserves of 68,482 reported in 1985.

Onshore, Hardy Oil & Gas received a concession for the Donkerbroek gas field, but has not released their plans for this field.

NAM was awarded two onshore permits, the IJsselmuiden and the Andrell II. NAM also was awarded a production license for Block L/9a and L/9b which are thought to contain an estimated 340 Bcf of gas. NAM is currently building the largest production facilities on the Dutch continental shelf to process this gas.

Elf was awarded a production license for the J/6-5 blocks and brought this area on production through the Markham Field facilities. Elf also brought two other areas on production through existing facilities; K/5a was connected to the K/5 offshore complex, and Harlingen 101 was connected to the Harlingen production center.

Clyde Petroleum is developing three gas fields, P/2-NE, P/2-SE and P/6-South. P/2-NE and P/2-SE could be in production by the end of 1997; P/6-South could be in production by 1997.

Natural Gas Pipeline Activities

The trunklines from the Netherlands gas fields have been running under capacity; the Nogat line is running at 40% capacity, the Noordgastransport line (NGT) is running at 50-60% of its capacity, and the Westgastransport line (WGT) is running at 75% of its capacity. The original gas pipeline system was designed to handle production from fields that were never developed. In an effort to increase usage, there is discussion of extending the Nogat line northward into the L block since NAM has decided to develop the L/9 prospects. No other extensions or new trunklines are planned.

- There are several gas distribution pipeline projects in various stages of development in The Netherlands:
- The Dutch gas distributor, Delta Nutsbedrijven, has proposed a pipeline that would deliver gas from the U.K. via the Interconnector across Belgium to the southern Netherlands;

- Delta would build a 31-mile pipeline from Zalzate on the Belgian border to Ossendrecht in the southern Netherlands. This pipeline, which must be approved by the Dutch government, would be ready by 1998 when the Interconnector is to be completed;
- Gasunie, the Dutch gas distributor, is studying the possibility of a second U.K.-to-Europe pipeline that would supply Russian gas to the U.K., and take and store U.K. gas during the summer months when gas demand is low. The pipeline is thought to be viable in the next ten years.

Country Overview

NORWAY

Norway is one of the major players in the European oil and gas market with 8.4 billion barrels of proven oil reserves and 47.5 Tcf of natural gas reserves. Norway maintained its position as the largest offshore oil producer in the world by producing 2.7 million BOPD. Currently there are 28 producing oil fields and 28 producing gas fields.

Even though Norwegians voted against joining the European Union (EU), the Norwegian government has adopted EU oil and gas legislation. This will allow Norway to maintain its ties with EU countries and maintain its competitiveness in Europe.

In the 15th licensing round, 18 licenses were awarded covering 46 blocks, 33 in the Norwegian Sea and 13 in the North Sea. The licensing round for the Barents Sea has been postponed until 1997.

Among the recent discoveries, the following are notable:

- Saga's Well 6406/2-1 in the Smorbukk Field could contain 2 Tcf of gas and 120 million barrels of condensate;
- Norsk Hydro's Well 30/8-1aS in the Oseberg Field contains 500 Bcf of gas and 25 million barrels of condensate;
- Esso's Well 25/8d-8S in the Tau Palocene structure could contain 60 million barrels of recoverable oil;
- Norsk Hydro's Well 35/11a-8S in the Bergen High Basin tested at 4,403 BOPD;
- Norsk Hydro's Well 36/7-1 in the Maloy Fault tested at 6,447 BOPD;
- Saga's Well 34 7-25S in the East Shetland Basin tested at 6,604 BOPD;
- Statoil's Well 34/11-2S in the Tampen Spur Basin tested at 6,150 BOPD.

Before the year 2000, 22 new oil and gas fields are expected to be developed, among these are:

- Norne oil field in the Norwegian Sea, with 480 million barrels of reserves;
- The Aasgard group development of Smoerbukk, Smoerbukk South and Midgard Fields located in the Haltenbanken region of the Norwegian Sea and thought to have reserves of 590 million barrels of oil and 7.9 Tcf of gas;
- Balder Field thought to have reserves of 190 million barrels;
- West Sleipner Field thought to have reserves of 345 million barrels.

Norway has an extensive oil and gas trunk pipeline system connecting Norway with markets in Europe. The most important of these trunklines are:

- In 1977, Norpipe built a 279-mile, 36" pipeline connecting Ekofisk with Emden, Germany;
- In 1977, Frigg built a connecting 217-mile, 32" pipeline from Frigg and St Fergus;
- Statpipe built a 496-mile, 28", 30" and 36" varying diameter pipeline in 1985 connecting Statfjord with Karstoe, and then to Heimdal and 16/11S-Ekofisk;
- Zeepipe I built a 373-mile, 40" diameter pipeline in 1993 connecting Sleipner with Zeebrugge, Belgium;

- Europipe built a 373-mile, 40" diameter pipeline in 1995 connecting 16/11 (Sleipner area) with Emden, Germany. Several additions are planned to this trunkline system.

Natural Gas Pipeline Activities

The NorFra pipeline will run from the Sleipner Field (16/11 area) to Dunkerque, France. This 42" diameter, 534-mile pipeline will shadow the route of the Zeepipe I pipeline into Dutch and Belgian waters where it will veer southwest to Dunkerque. Gaz de France specified this route and this pipeline will carry the 40 Bcm of natural gas that Gaz de France will purchase over a 26-year period beginning in the year 2001. Some contracts for the construction of this pipeline have been let and the pipeline is expected to be finished by 1998. **Figure 1 - Pipeline 2**

Europipe II will run from Karstoe, Norway, to Emden, Germany. This 395-mile, 40" diameter pipeline will run parallel to the Europipe I pipeline and supply gas to central Europe by 1999. Statoil is building this pipeline at a cost of US\$1.1 billion. Approval has been given by the Norwegian government and pipe manufacturing should begin in 1997. There is discussion of running the Europipe via Denmark so that gas deliveries could also be made to Denmark and Sweden. This change, of course, would add approximately 31 miles to the total length. **Figure 1 - Pipeline 4**

Haltenpipe, which became operational in December 1996, runs from the Heidrun Field to Tjeldbergodden, Norway. It has a capacity of 4.5 Bcm, allowing for future tie-ins from Draugen and other Haltenbanken fields. It is 152-miles in length and 16" in diameter. **Figure 1 - Pipeline 5**

Zeepipe IIA will run from the Sleipner Field to Kollsnes, Norway, and will carry 16.5 - 18 Bcm. This 186-mile, 40" diameter pipeline is being built by Statoil at a cost of US\$340 million. **Figure 1 - Pipeline 6**

Zeepipe IIB will run from the 16/11 E riser platform to Kollsnes. This 186-mile, 40" diameter pipeline is being built by Statoil and should be ready for use in 1997.

A pipeline running from Kollsnes to the Draupner platform is being built. This 507-mile, 40" diameter pipeline should become operational during 1997.

Haltenlink is a pipeline running from the Aasgard Fields (Smoerbukk, Smoerbukk South, and Midgard) to the Statpipe gas trunkline, and then to a gas treatment plant in Norway. This 295-mile pipeline was agreed to recently by Statoil and Aasgard. **Figure 1 - Pipeline 7**

There are numerous inter-pipeline systems or inter-field pipeline projects in various stages of development in Norwegian waters.

Country Overview

POLAND

Poland has successfully introduced market reforms and the Polish economy has been expanding since 1992. The government is trying to maintain a steady growth of at least 5.5% through the year 2000. As part of this growth, Poland's cabinet has approved reforms in the energy sector, including establishment of an energy regulatory authority, allowing third-party access to the national electricity transmission grid and creation of a competitive energy market through demonopolization and privatization. While Poland's energy policy encourages greater use of petroleum and natural gas, coal is expected to remain the dominant fuel, especially in electricity generation.

In January 1996, Frontier Oil was awarded a license to explore a concession in northern Poland. This was the first license awarded to a foreign company since the fall of communism, and the enactment of Poland's new mining law. In March 1996, Texaco and Tenneco were awarded a license to explore a concession in central Poland. In early 1996, Petrobaltic, the state offshore exploration company, announced a gas find in the Baltic Sea. Amoco is continuing its coalbed methane program. Exxon and Shell are establishing the Polish Petroleum Development Company.

Until recently, all of Poland's oil and natural gas imports have come from Russia. In order to reduce dependence on Russia, Poland has begun importing oil from the North Sea and the Middle East, and has cross-border exchange link to integrate its gas transmission system with that of Germany.

Natural Gas Pipeline Activities

The first section of the Yamal-to-Europe pipeline system to be completed runs from Szamotuly, Poland, to Frankfurt an der Oder, Germany. December 1996 marked the start up of the 75-mile section, which was built at a cost of US\$184 million. Initial deliveries of 600 million cubic meters per year will come from already producing Siberian gas fields, with connections to Germany. As the Yamal-to-Europe pipeline is finished, the deliveries will come from the Yamal Peninsula gas fields. An additional 340-mile segment is under construction and should be finished in 1997. For more information on the Yamal-to-Europe pipeline, please refer to the Russia section of this report. Figure 1 - Pipeline 3

Country Overview

PORTUGAL

Portugal had a moderate growth rate of 3% expected for 1996. The Portuguese government is aiming toward modernizing the economy so that Portugal can reach the productivity and income levels of the more advanced European Union countries. Currently, per-capita income equals only 55% of the EU average.

Natural Gas Pipeline Activities

A 330-mile, 28" pipeline running from Setubal in southern Portugal to Braga in northern Portugal is currently under construction. Also included in this project is approximately 100 miles of a branchline distribution system. The gas for this system will come from Algeria via the Europe-Magreb system. **Figure 1 - Pipeline 8**

Country Overview

ROMANIA

Romania is central Europe's leading oil producer and is believed to have oil reserves of 900 million barrels and gas reserves of 12 Tcf. Production and reserves have been declining in recent years. Romania is making a slow and difficult transition to an open-market economy.

In 1996, Romania held its first licensing round under the new petroleum law and received bids for 8 of the 15 blocks that were offered. Negotiations have begun with the successful bidders and Romania hopes to have contracts signed by May of 1997.

There are currently ten refineries in Romania, and several recent reports have called for drastic change in the methods of controlling the downstream sector. The downstream sector is troubled by overcapacity and over staffing, as well as extensive government interference in the market place. These problems are slowing foreign investment in the Romanian energy sector.

Natural Gas Pipeline Activities

None.

Country Overview

SLOVENIA

Slovenia is by far the most prosperous of the former Yugoslav republics and prospects appear to be favorable in the near future. Economic growth is expected to remain strong, while unemployment and inflation are expected to decline slightly. Privatization is expected to pick up.

Natural Gas Pipeline Activities

Slovenia is considering a proposal from Gazprom to extend its gas line from Hungary across Slovenia into Italy. While Slovenia imports most of its natural gas, it has contracts for gas from Russia through Austria and from Algeria through Italy which should be sufficient through the year 2010. If the pipeline is built, it would be 186 miles and have an annual land rent of US\$50 million.

Country Overview

SPAIN

Spain has recently been in a severe recession, with about 25% unemployment as of 1994. The overall improvement of economic conditions in Europe has led to an upturn in the Spanish economy as well.

Repsol is planning to develop the Poseidon North and South gas fields in the Gulf of Cadiz.

Natural Gas Pipeline Activities

Seville, Spain, is the terminus of the 785-mile Magreb-Europe gas pipeline, which is transporting gas from Algeria's Hassi R'Mel gas field and processing facility through Morocco and Gibraltar to the Iberian peninsula. The initial capacity of this pipeline is 8 Bcmy for the Spanish, Moroccan, Portuguese, German and French markets. **Figure 1 - Pipeline 9**

The natural gas group is greatly expanding the domestic gas pipeline system in Spain as a result of the opening of the Magreb-Europe system. The following pipelines are in various stages of development:

- A 20" pipeline running the 112 miles between Oviedo and Tuy;
- A pipeline varying in diameter from 8-12" running 108 miles between Cordoba and Jean/Granada;
- A pipeline running 259 miles between Valencia and Alicante;
- A 48" pipeline running 180 miles between Tarifa and Corboda.

Country Overview

SWEDEN

While Sweden generally has a high standard of living, recent years have seen an increase in unemployment and a lessening of competitiveness in foreign markets. Sweden does export some petroleum products, but is considered to have one of the least mature natural gas markets in the European Union.

Natural Gas Pipeline Activities

Sydgas plans to build a 16" pipeline covering 100 miles between Hyltebak and Tonkoping at a cost of US\$90 million.

Long-term plans envision a pipeline from Haltenbaken, offshore Norway, through Sweden, north of Stockholm, to Helsinki, Finland.

In December 1996, the European Union Council of Ministers approved a proposal to include the Nordic Gas Grid in the Trans-European Energy Networks (TEN). The Nordic Gas Grid will integrate the natural gas networks of Finland, Sweden, and Denmark with diversified supplies, and create a northern transmission route to continental Europe. The Nordic Gas Grid may eventually include the Baltic states. The first feasibility study, which will study various alternatives to link the Nordic states' networks, will be carried out in 1997 at a cost of about US\$1.5 million.

There are several smaller gas distribution pipeline projects at various stages of development in Sweden.

Country Overview

TURKEY

Turkey is important to the energy sector for two reasons. It is a natural energy bridge between energy-producing countries in the Middle East and central Asia, and the energy consuming countries of Europe. Also, Turkey is considered by many as a major emerging market, with a rapidly growing energy sector.

Energy development is one of Turkey's most important projects. Current natural gas supply arrangements are expected to cover only about one-third of Turkey's needs in the next 10-15 years. While Russia has been Turkey's main supplier for years, Turkey is now trying to diversify its energy suppliers. Turkey has signed a memorandum of understanding with Turkmenistan for 70 Bcm/y of Turkmeni gas beginning in 1998. Turkey is also negotiating with Iran and Egypt for additional gas supplies. LNG is expected to be another important part of the energy mix, and Turkey has agreements with Algeria and Qatar and is pursuing other agreements.

Natural Gas Pipeline Activities

Gazprom has proposed a pipeline running from Mozok, Russia, through Marneulli, Georgia, to the Turkish border. The first 745 miles of this line would utilize existing pipeline, but a new pipeline would be constructed from Marneulli to the Turkish border. This pipeline would give Gazprom another route for gas from the Astrakhan Field, which is currently routed through Chechnya to Bulgaria to Turkey. [Figure 2 - Pipeline 1](#)

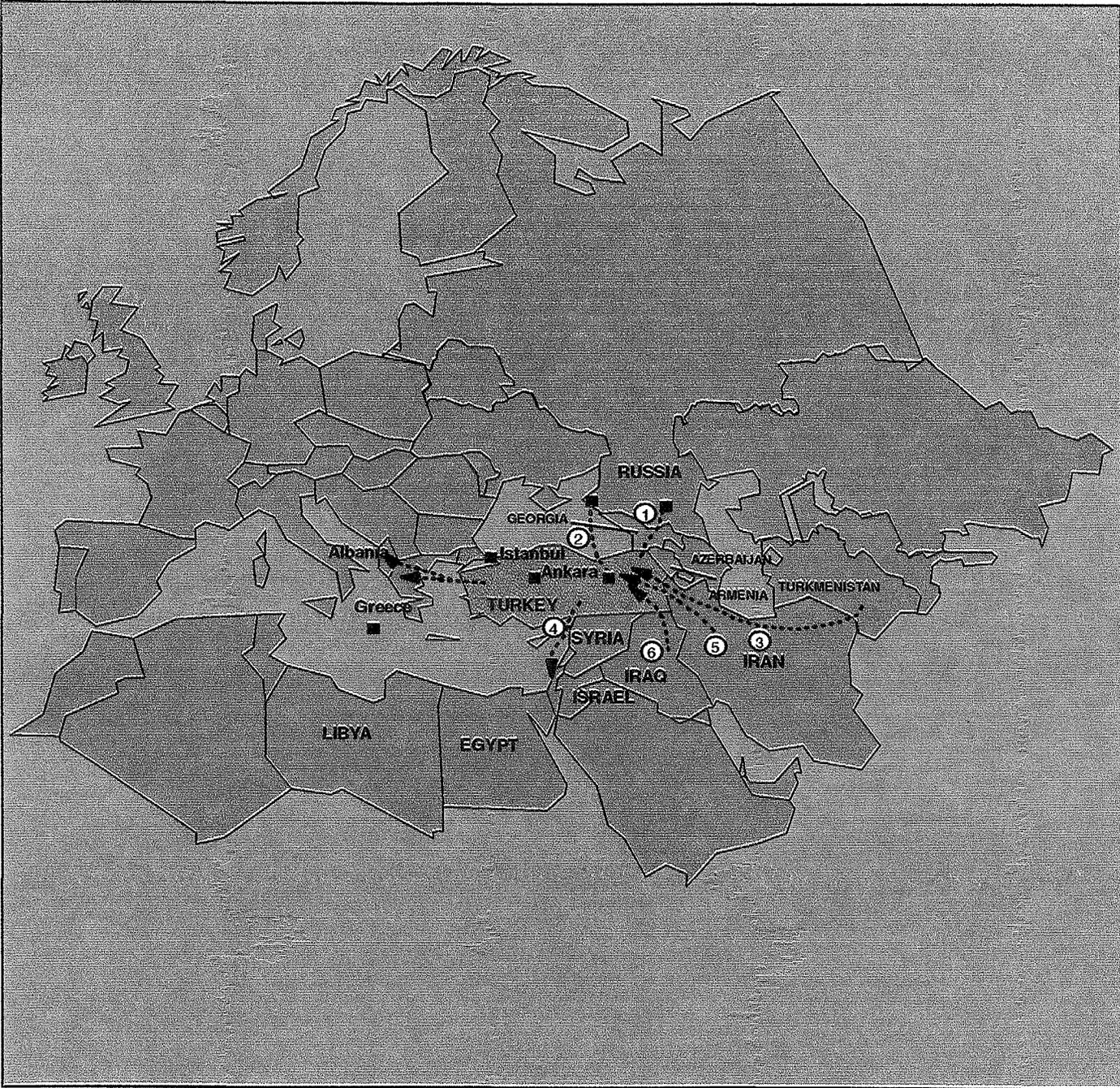
Gazprom has selected a route that runs from the Russian port of Tuapse under the Black Sea to Trabzon in Turkey, and from there gas will be delivered to Greece, Macedonia, and Albania. [Figure 2 - Pipeline 2](#)

In January 1997, it was reported that Shell proposed a pipeline to carry Turkmeni and Iranian gas to Europe via Turkey and connecting with a pipeline from Qatar. Eventually the pipeline could even carry Syrian and Iraqi gas. [Figure 2 - Pipeline 3](#)

In a separate development, there reportedly is a plan to sell gas to Israel proposed by a consortium comprised of Russia's Gazprom, Turkey's Botas, TransCanada Pipelines, and Israeli partner, Del-Men. This proposal will require a 300-mile gas pipeline from southern Turkey to Israel via the Mediterranean Sea. This project will be an extension of the proposed pipeline from Russia to Turkey. The consortium claims that gas can be delivered by 1999. [Figure 2 - Pipeline 4](#)

Turkey's gas company, Botas, has initialed an agreement for the import of gas from Iran. Plans call for the delivery of some 200 MMcfd by the year 2000, increasing to nearly 1 Bcfd by the year 2020. The full scope of this project is to extend the export pipeline to Greece, incorporating a total distance of some 4,000 miles, with a reported estimated cost of US\$10 billion. [Figure 2 - Pipeline 5](#)

Iraq has agreed to discuss the potential of exporting gas to Turkey. This US\$2 billion project calls the delivery of 1 Bcfd of gas through 850 miles of gas transmission pipelines. [Figure 2 - Pipeline 6](#)



LEGEND
— EXISTING GAS PIPELINE
..... PLANNED or UNDER CONSTRUCTION PIPELINE

TURKEY and Adjacent Countries Selected New Gas Pipelines		
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Country Overview

UNITED KINGDOM

The U.K. is considered to have one of the world's most favorable fiscal regimes for oil and gas investment. This is due to several factors, including the relatively low corporate tax rate, the government's revocation of the Petroleum Revenue Tax on new oil fields and the reduction of the Petroleum Revenue Tax on existing fields. Development costs in the U.K. are generally very low.

The U.K.'s portion of the North Sea contains an estimated 23.3 Tcf of gas reserves. Key producing gas fields include Amoco's 5.7 Tcf Leman, Shell's 1.7 Tcf Indefatigable, and 0.8 Tcf Clipper. The 2.6 Tcf Britannia Field is expected to come on production in the year 1998. Another important gas development is BHP's 1.2 Tcf Hamilton and Hamilton North Fields. During the 1995-1996 period, the following notable gas discoveries were made in the U.K.'s portion of the North Sea:

- Talisman's discovery 50/26B-6 is thought to contain 150 Bcf of gas reserves;
- Amoco's discovery 49/18-5 Indefatigable N is thought to contain 100 Bcf of recoverable gas;
- BP's discovery 47/9A-8Z Flowers is thought to contain 80 Bcf of recoverable gas;
- Arco's discovery well 48/17c-s12 in the Sola Pit Basin tested at 37,000 Mcfd;
- Enterprise Petroleum's discovery well 53/5b-5 in the Anglo-Dutch Basin tested at 12,600 Mcfd;
- Shell's discovery well 49/24-20 in the Anglo-Dutch Basin tested at 26,000 Mcfd.

Natural Gas Pipeline Activities

The Interconnector is the largest natural gas pipeline project in the U.K. The 150-mile, 40" pipeline will run from Bacton, England to Zeebrugge, Belgium, and transport 2 Bcfd to European markets. It is to be operational in October 1998, which is approximately the beginning of production from the Britannia Field. The Interconnector is designed to carry gas to Europe and also to carry gas to the U.K. if necessary. **Figure 1 - Pipeline 10.**

The Central Area Transmission System (CATS), which began operations in 1993, is continuing to grow and attract other shippers. Among the fields that will start sending gas through CATS in 1997 are Armada and the East Trough Area Project.

British Gas built a 100-mile pipeline from Castle Douglas in Scotland to the Ballylumford power station near Larne in Northern Ireland and then on to Belfast. Initially the gas line will only transport 100 MMcfd, but usage is expected to increase threefold by the end of the century.

A 112-mile, 26" pipeline is to run from the Murdock Field in the North Sea to the Theddlethorpe processing center on the English coast.

A 121-mile, 26" pipeline is planned from the Britannia Field to St. Fergus and should be operational in 1997.

2. FORMER SOVIET UNION

This vast region, once a super power, is now composed of 15 independent countries, each trying to establish a market economy. The safety net of the Russian system is gone, and gone with it are controlled prices and a planned economy. The energy industry has felt the strains of the changing economy as much as any other industry. In those countries with hydrocarbon deposits, development of a petroleum law and the opening of the industry to foreign investors has been a struggle. The countries without hydrocarbon resources have found that the cost of energy has greatly increased as oil and natural gas prices have risen in response to a free market. This area is still very much in flux and the continued existence of several of the newly independent states is questioned.

Currently, the newly independent states are still dependent on Russia for their natural gas supplies, even those countries with extensive reserves still depend on Russia for natural gas for some parts of their country. Each of the newly-independent states is looking for ways to lessen their dependence on Russia and to diversify their energy sources.

Many of the countries, which must purchase natural gas, have great difficulty in paying for it and, in some cases, barter arrangements have been established whereby natural gas is exchanged for a commodity that the seller needs. The countries whose primary resources are hydrocarbon products are trying to export them to other nations where they can receive hard currency, and dependable payment. Many of the newly-independent states have mounting national debts just trying to meet their energy needs.

The natural gas infrastructure is not in good condition. Finding the funds to refurbish the existing system, and to build the necessary new pipelines, compressor stations, and gas processing plants is proving very difficult for the FSU republics.

In the natural gas industry, one almost overpowering entity is Gazprom. While the Russian oil industry has split into several pieces, the Russian gas industry is still intact as Gazprom. Gazprom controls the natural gas fields in Russia and the transportation system within Russia. Gazprom is involved in almost all of the joint ventures dealing with natural gas in the FSU and supplies gas to all of the former republics. Gazprom is also very active in Europe and is aggressively pursuing the European gas market.

Russia is still the major power in the region, and with its gas reserves of 1,700 Tcf, can be a major player on the world scene. Changes in the Petroleum Law are slowly making their way through the Duma and foreign companies are engaged in joint projects from Sakhalin Island to Siberia to the Caspian Sea. The biggest natural gas project in Russia is the Yamal-to-Europe pipeline which will carry natural gas from western Siberia to Europe. In Poland, parts of this 2,500-mile pipeline are finished, and Gazprom is arranging the remainder of the US\$40 billion cost. It is hoped that the pipeline will be finished by 1999.

Turkmenistan, with its 101 Tcf of natural gas reserves, ranks third worldwide in natural gas reserves behind Russia and Iran. The economic development of Turkmenistan depends on the development and transportation of these gas resources. There are several major pipeline projects being considered to transport Turkmeni gas to Asia and to Europe.

Azerbaijan is a country with extensive oil and natural gas reserves. Several joint ventures have been signed and are now in operation. At the present time, Azerbaijan uses all of the natural gas that it produces, but this country should be an exporter of natural gas by the year 2000. Beginning in 1997, Azerbaijan's gas industry is being renovated and reconstructed with funds provided by the World Bank.

Kazakhstan contains 83 Tcf of natural gas and about half of this gas must be processed at a Russian gas processing plant. From time to time, Russia will refuse to process Kazakh gas, which accentuates Kazakhstan's lack of infrastructure. Because Kazakhstan's gas producing regions are far removed from the gas consuming regions, Kazakhstan must export gas to Russia, while importing gas from Uzbekistan. Kazakhstan currently owes Uzbekistan US\$50 million for these imports.

Uzbekistan is the only FSU republic not suffering a decline in production after the dissolution of the Soviet Union. Even though Uzbekistan is the largest consumer of natural gas in central Asia, enough gas is produced for them to be a net exporter. It is beginning to develop new gas resources, and can become a major provider of natural gas to central Asia. Uzbekistan's major problem is that many of her central Asian neighbors have difficulty in paying for natural gas; a recent agreement with Kyrgyzstan will allow payment half in currency and half in sugar and wheat.

Country Review

ARMENIA

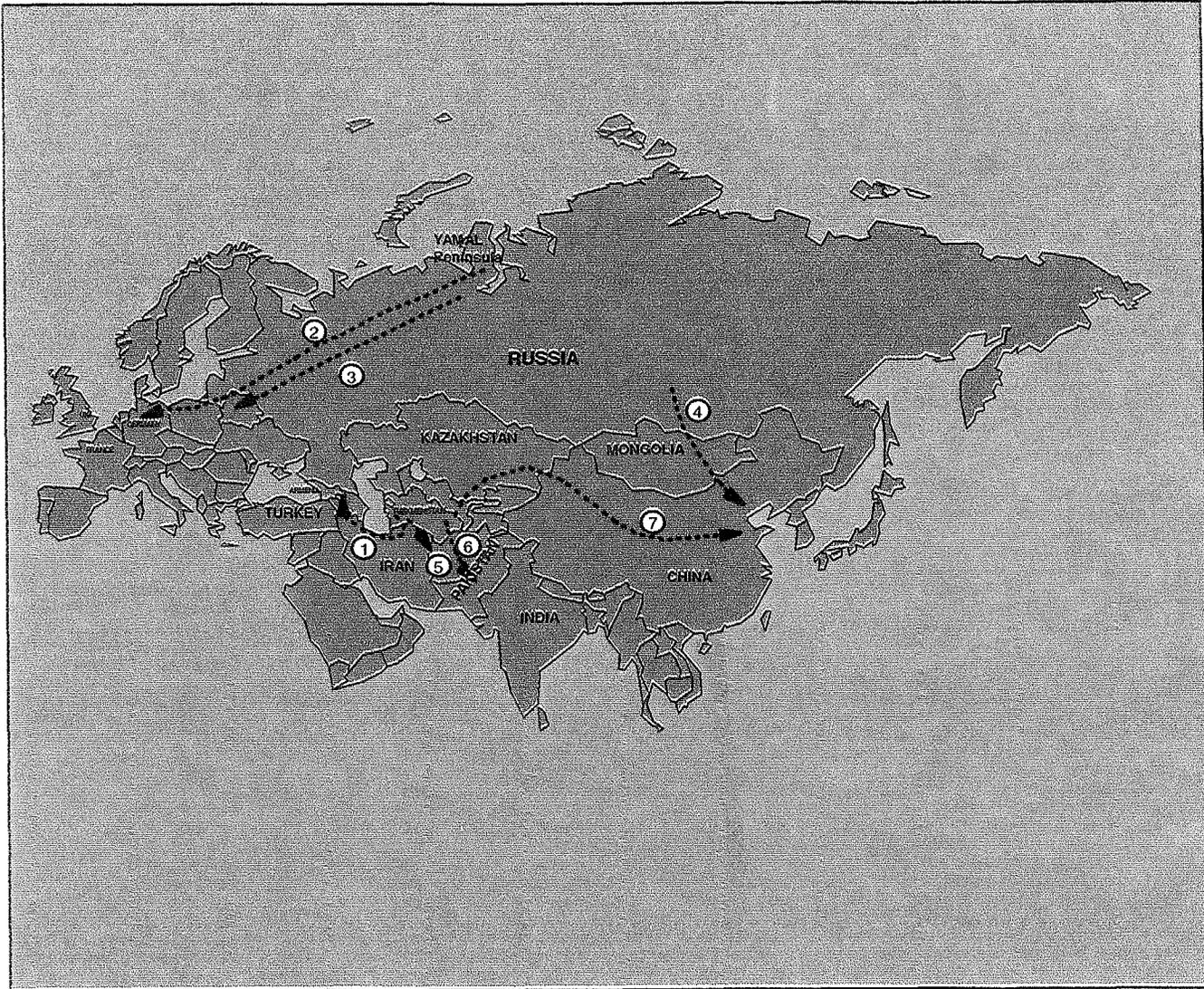
Armenia was designated a heavy industrial region under the USSR's central planning system and received natural gas from Russia and Turkmenistan from pipelines running through Georgia and Azerbaijan. Since breaking away from the USSR, Armenia's natural gas deliveries have been severely limited. The strife and conflict that have existed between Armenia and her neighbors for centuries is the major reason for curtailment of natural gas deliveries to Armenia. War broke out between Armenia and Azerbaijan over the Nagano-Karabakh region of Azerbaijan, which Armenia now controls. The terrorist uprising in Georgia has disrupted the natural gas pipelines running through Georgia into Armenia. Turkey and Armenia have been antagonists for centuries and Turkey is unlikely to ship natural gas to Armenia.

According to a study done by MPC Inc., Armenia's geological prospects indicate possible reserves of 6 billion barrels of oil and 6 Tcf of natural gas. In 1995, DEP-EKY, the Greek state oil company, reportedly was conducting a preliminary exploration program. In February 1997, the Rand-Paulson Exploration Company signed a joint venture agreement with the Armenia Energy & Fuels Ministry to more fully explore the republic's hydrocarbon resources.

Natural Gas Pipeline Activities

Negotiations were started in April 1995 for a pipeline that would run from Turkmenistan through Iran to Armenia and then to Ukraine. Armenia and Ukraine will find it difficult to fund their share of the US\$1 billion price tag. There will probably be some type of barter or exchange agreements involving projects in Iran. **Figure 3 - Pipeline 1**

In January 1997, Armenia again proposed a north-south pipeline running from Azerbaijan through Armenia to Turkey. In the past, Azerbaijan has vehemently opposed such a pipeline.



LEGEND
— EXISTING GAS PIPELINE
- - - - - PLANNED or UNDER CONSTRUCTION PIPELINE

FORMER SOVIET UNION (FSU) Selected New Gas Pipelines		
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Country Review

AZERBAIJAN

In the early 1900's, Azerbaijan was the world's largest oil-producing province and has the potential to once again become a "hot spot" for oil and gas exploration and production. Recent activity in Azerbaijan has centered on the oil industry and the building of an oil pipeline to export production to western markets. The final route of this pipeline has not been determined.

In the past, Azerbaijan has imported all of its natural gas from Russia, Turkmenistan and Iran. In March 1996, Azerigaz, the state gas distributor, announced that it would no longer import gas from Turkmenistan, but would develop the gas fields in the Caspian Sea. The Azeri, Chirag and Guneshli Fields are thought to contain 2.5 Tcf of natural gas. The Umid structure is believed to contain the largest natural gas deposits in the country. It is expected that by the year 2005 Azerbaijan will be able to meet all of its natural gas demands from domestic sources. An overhaul of the gas distribution system could advance this date, and within the next few years Azerbaijan could become an exporter of natural gas.

The World Bank is funding a gas system rehabilitation project which will include:

- improvements in gas treatment;
- rehabilitation of underground storage;
- gas metering;
- pipeline cathodic protection and maintenance;
- laboratories for gas and appliance analysis; and
- technical assistance for investments in project preparation, institutional strengthening and training.

Natural Gas Pipeline Activities

- AIOC (Azerbaijan International Oil Company) is constructing a 143-mile oil and gas pipeline system to connect the Azeri, Chirag and Guneshli Fields with the shore at Sangachali via the Neftyanie Kamni Field. The cost of this pipeline system is US\$24.5 million and the construction is contracted to Saipem. The pipeline system should be finished by mid-1997.
- The largest gas compressor in the Caspian region is to be brought online at the Bakhar Field during the first quarter of 1997. The increased yields realized by this compressor should allow Azerbaijan to begin exporting natural gas.

Country Overview

BELARUS

Belarus is experiencing difficulties arising from the breakdown of monetary and trade relationships between the countries of the FSU. One particular problem for Belarus is the rapid escalation of fossil fuel prices as these prices are allowed to rise toward world market levels. Belarus produces only a small amount of its necessary energy requirements and must import both oil and natural gas, primarily from Russia. Belarus has at times been unable to pay for its necessary energy supplies and Russia has forgiven parts of the debt by retaining ownership of the two refineries in Belarus.

It is felt that Belarus oil and gas production could be improved with the implementation of Western technology. Proved reserves in Belarus are 508 million barrels of oil and 163.5 Bcf of gas.

Belarus is an important transportation route for oil and natural gas exports from Russia to Europe. Belarus is to be part of the Yamal-to-Europe pipeline.

Natural Gas Pipeline Activities

The Yamal-to-Europe pipeline is a multi-line system that will cover 2,550 miles from the Yamal Peninsula in Russia through Belarus and Poland to connect with the German gas transportation system. For a complete discussion of this pipeline, please see the section on Russia. Figure 3 - Pipeline 2

The Belarus section of this system will consist of a 130-mile double pipeline from Nesvizh to Kondratki where the pipeline would then connect with the Northern Lights system into Poland. This part of the pipeline system is projected to cost about US\$500 million and to be completed in 1997.

Country Overview

ESTONIA

One of the first countries to declare its independence from the Soviet Union, Estonia has the second highest per-capita income among the FSU, republics and has benefitted from extensive investment in the country, especially from the Scandinavian countries.

Estonia produces some oil shale which is used to generate electricity. Estonia imports oil and natural gas primarily from Russia.

Natural Gas Pipeline Activities

A natural gas pipeline from Norway across Sweden and Finland to Estonia and Latvia is mentioned from time to time, but there are no firm plans for such a pipeline.

Country Overview

GEORGIA

Georgia, which once had one of the strongest economies in the Soviet Union, has faced a number of debilitating problems since declaring its independence. It has suffered from years of civil strife, including separatists struggles in Abkazia and Ossetia and a civil war in 1992. While the economy is beginning to rebound, Georgia still faces many problems, including difficulties in the energy sector.

Georgia produces some oil, but no natural gas. Production from a gas deposit near Tbilisi is expected to begin soon. Among the joint ventures currently working in Georgia, British Gas, Pecten, and Gruzneft are exploring three blocks in the Black Sea adjacent to the coastline in the Kartii depression. The Ninotsminda, Shromis-Ubani, Supsa, and East and West Rustavi Fields are part of a rehabilitation project by the GOOC joint venture. The IVOG joint venture is rehabilitating the Samgori Field.

Georgia's location makes it a logical transportation hub for oil and gas from Russia and the Caspian region to Turkey and Europe.

Natural Gas Pipeline Activities

Gazprom has proposed a pipeline running from Mozok, Russia, through Marneulli, Georgia, to the Turkish border. The first 745 miles of this line would utilize existing pipeline, but a new pipeline would be constructed from Marneulli to the Turkish border. This pipeline would give Gazprom another route for gas from the Astrakhan Field, which is currently routed through Chechnya to Bulgaria to Turkey. Grutransgas, a Georgian gas pipeline company, is trying to form a joint venture with a Swiss company to build the new section of the pipeline. The existing section is in need of modernization and upgrading.

Country Overview

KAZAKHSTAN

Among former Soviet republics, Kazakhstan ranks second in area, fourth in population and third in both energy production and consumption. Kazakhstan suffers from many of the same problems as other newly independent republics, including civil strife between ethnic Russian and ethnic Kazaks, declining GDP, and a dependence on trade with Russia.

In January 1995, Kazakhstan and Russia signed a series of accords which included agreements to establish customs-free trade between the two countries, and to jointly develop the Karachaganak gas field. Kazakhstan is open to foreign investment and several major oil companies are active in Kazakhstan.

Kazakhstan contains around 83 Tcf of natural gas reserves. The Karachaganak gas field, which is being developed by Agip, British Gas and Lukoil, contains 46 Tcf of natural gas. Gas from this field is sent to the Orenburg gas processing plant in Russia, however, at times Russia refuses to receive gas from this field. The Tengiz Field contains 13 Tcf of natural gas; Chevron is developing this field. Gas from this field may enter either the national gas grid for Kazakhstan or be exported. Oil from this field is destined for the Caspian Pipeline Consortium system which will run either to Novorossiysk, Georgia, on the Black Sea or through Turkey to the Black Sea.

The Kazak gas sector has a lack of infrastructure, especially pipelines, connecting the gas producing areas of the northwest with the gas consuming areas of the south and east. Therefore, Kazakhstan is forced to export much of its gas production to Russia, while importing most of its natural gas consumption from Russia, Turkmenistan and Uzbekistan. Expanding the national gas grid is a major emphasis for the Kazak government.

Natural Gas Pipeline Activities

- Kazakhstan has tendered its transit pipelines for gas from Russia, Uzbekistan and Turkmenistan. The 15 concessions offer the investor management control and transit fees in return for investments and upkeep of the pipelines. The tender includes a 248-mile portion of the Soyuz pipeline that exports gas from Russia to Europe, 310 miles of the Bukhara-Ural pipeline connecting Uzbekistan to Russia, and 372 miles of the Central Asia-Centre pipeline that connects both Uzbekistan and Turkmenistan to Russia. Only about 25% of the capacity of the pipelines is used, and many sections are in disrepair. Enron, Gaz de France, Bidas, Nacosta, and Saipem are among the firms considering the tender.
- Kazakfragaz is considering expanding gas storage in southern Kazakhstan.
- Kazakhstan is planning to expand their national gas grid, but no details are available.

Country Overview

KYRGYZSTAN

Kyrgyzstan is a mineral-rich country with insignificant amounts of petroleum and natural gas and, therefore, must import large quantities of both fuels to meet its energy demands. The government would like to reduce the dependence on imported fuels. Hydroelectric energy appears to be the only viable fuel option. Currently, hydroelectric energy supplies about one fourth of Kyrgyzstan's energy needs.

Kyrgyzstan has seven developed oil fields and two oil and gas fields, which have low recovery rates due to difficult geological structures and water encroachment. Natural gas is imported in the northern part of the country through the Bukhara-Tashkent-Bishkek-Almaty pipeline. In the southern part of the country, natural gas comes from Turkmenistan and Uzbekistan. Uzbekistan's decision to charge world prices for its natural gas has led to a payment crisis in Kyrgyzstan. From time to time, Uzbekistan terminates deliveries to Kyrgyzstan because of delinquent payments.

A tender call for seven blocks in the Fergana Basin was slated for 1995, but no award details have been released.

Natural Gas Pipeline Activities

None

Country Overview

LATVIA

Latvia, like its Baltic neighbors, has been very successful in attracting foreign investment. Most of the investments are in the area of electronics and automotives.

In 1995, Amoco and Olje Prospektering signed an agreement to explore and develop the Dalders prospect in the Baltic Sea. Lithuania was angered by this move because of outstanding border claims between the two countries. Latvia claims that the deal does not cover the disputed area, and that Latvia would not develop the field until the dispute was settled. Amoco says that implementation of the agreement is contingent on the resolution of the border dispute, and also stressed that the quantity of the reserves was highly uncertain.

Latvia is totally dependent on imports to satisfy its energy demands, and all of the imports come from Russia.

Natural Gas Pipeline Activities

A pipeline running from Norway across Sweden and Finland to Estonia and Latvia is discussed from time to time, but presently there are no plans to build this pipeline.

Country Overview

LITHUANIA

Lithuania was the first Soviet republic to declare its independence and Russia responded, in part, by temporarily cutting off oil supplies to the country. Lithuania is totally dependent on imports to meet its oil and natural gas demands. The Mazeikiai refinery in Lithuania operates at near-peak capacity. It receives oil by pipeline from western Siberia, and provides refined products to the other Baltic republics.

A border dispute between Lithuania and Latvia was intensified when Latvia signed an exploration and production agreement with Amoco and Olje Prospektering. Lithuania responded to the signing of the agreement by recalling their ambassador to Latvia.

Gargzdal State Oil Enterprise (GSOE) and Petroleum Exploration AB of Sweden formed a joint venture to operate and further exploit the Genciai Field. A joint venture between Minijos Nafta of Denmark and Naftos Geologijos Imone of Lithuania will develop the Gargzdai oil field, which is thought to contain 18 million barrels of in-place oil reserves.

Butinge Nafta, Lithuania's state controlled oil company, has contracted with Fluor Daniel to build a buoy-type import-export oil terminals.

Natural Gas Pipeline Activities

None known

Country Overview

MOLDOVA

Moldova, like most other FSU republics, is still highly dependent on Russia. Russia also has a strategic interest in Moldova's Trans-Dniester region. For centuries, Russia has had military bases in this region, the threshold of the Balkans, and is demanding that Moldova give permanent basing rights. In 1992, Russia backed a rebellion against Moldova and keeps an estimated 6,000 troops in the Trans-Dniester region despite an agreement to withdraw them.

Despite cutting its gas use to a minimum last winter, Moldova owes Russia US\$400 million for gas. Russia is forgiving parts of the debt by retaining ownership of Moldova's gas pipelines.

Moldova has granted a concession to the Resources Development Co. (REDECO) to develop the oil and gas fields of Valansk and Viktorov.

The World Bank has developed an energy project for Moldova which would include:

- an overhaul of the Chisinau No. 2 combined heat and power plant;
- repair approximately 180 leaky gas distribution points;
- gas meter installation;
- upgrade of accounting and billing systems and financial management;
- project management and implementation services.

Natural Gas Pipeline Activities

None

Country Overview

RUSSIA

Russia contains the world's largest reserves of natural gas with 1,748 trillion cubic feet of proved reserves and 7,500 trillion cubic feet of potential reserves. Seventy five percent of Russia's reserves are located in 20 giant fields in the Tyumen region. While production from Russia's gas fields has been declining since the break up of the Soviet Union, observers expect the production will level off and then reach a level of 22.9 Tcf by the year 2000.

Development of the new fields on the Yamal Peninsula and in the Sakha region is a prime objective of Russia. The fields on the Yamal Peninsula have estimated reserves of 350 Tcf; the largest of these fields, Bovanenkov, has estimated reserves of 127 Tcf, and a projected production of 3 Bcfd. Gas from the Yamal Peninsula will be shipped to Europe via the Yamal-to-Europe pipeline which runs through Russia, Belarus, and Poland to Germany.

Gazprom controls more than 95% of Russia's gas production in the 100 largest fields, oversees eight production associations, owns and operates Russia's 86,000-mile gas pipeline system, and runs 26 trading houses and marketing joint ventures in 13 European countries. The company controls one-fifth of the world's natural gas reserves. In October 1996, Gazprom sold 1% of the company's stock on the international markets for US\$373 million, which will aid in financing the Yamal-to-Europe Pipeline.

Gazprom is currently involved in a massive rehabilitation of its gas trunkline system, including pipelines and compressor stations. About half of the pipeline system is more than 30-years old and has exceeded its original design life.

Natural Gas Pipeline Activities

- The Yamal-to-Europe pipeline is one of the biggest pipeline projects in Russia. It will run for over 2,485 miles from the Yamal Peninsula in Siberia across Russia through Belarus and Poland to connect with the German gas distribution system. Three 56" pipes would run the 1,531 miles from the Yamal Peninsula to Torzhok and will handle a throughput of 83 Bcmy. From Torzhok to Frankfurt an der Oder, Germany, two 56" pipes will be able to carry 67 Bcmy. For part of the route in Belarus, the pipeline will be fed through a connection with the Northern Lights system. In November 1996, a 75-mile portion of the pipeline running from Szamotuly, Poland, to the German border began deliveries of gas. Initial deliveries of gas are coming not from the Yamal gas Fields, but from already producing Siberian fields with pipeline links to the West. The 413-mile section running from Belarus to Germany is slated to open in 1999. The 357-mile section through Belarus and the 1,780-mile section in Russia will be completed on a step-by-step basis, with construction continuing into the next century. Part of the Belarus section could be completed this year. The total cost of this pipeline system is projected to be US\$40 billion. **Figure 3 - Pipeline**

- A 142-mile pipeline from Sakhalin Island to Sekasti is under consideration.
- A 2,812-mile, 56" pipeline from Yanburg through Zahavkazye to Gorky is planned by Gazprom.

- A 1,959-mile, 56" pipeline from Gorky through Talla to Kiev, Ukraine, is planned by Gazprom. **Figure 3 - Pipeline 3**
- Chinese and Russian leaders are expected to sign an agreement for a gas pipeline running from the Irkutsk region of Siberia through Mongolia to the Chinese coast, and this pipeline could be extended to South Korea. An oil pipeline running from eastern Siberia to China is already under construction. **Figure 3 - Pipeline 4**
- Gazprom has selected a route that runs from the Russian port of Tuapse under the Black Sea to Trabzon in Turkey, and from there gas will be delivered to Greece, Macedonia, and Albania.
- Gasum, a joint venture between Gazprom and Neste, is proposing to double the capacity of the Russian pipeline into Finland. This project is projected to cost US\$160 million.

Country Overview

TURKMENISTAN

Turkmenistan is the second largest natural gas producing country of the FSU republics and is the third largest producer in the world after Russia and Iran. Proven natural gas reserves total nearly 100 Tcf. The largest natural gas fields are Dauletabad-Domez and Yashlar.

Turkmenistan would like to export more natural gas, and especially to export gas without going through Russia. At present, all Turkmeni gas must use the Russia pipeline system.

Several countries, including Azerbaijan, Uzbekistan, Ukraine, Georgia, and Kazakhstan owe money to Turkmenistan for gas supplied. From time to time, Turkmenistan shuts off supplies to these countries. Turkmenistan and Ukraine have agreed on a barter deal in which Ukraine supplies Turkmenistan with flour and wheat in exchange for natural gas.

Bridas is reported to have discovered a major gas field in its offshore properties.

Natural Gas Pipeline Activities

In October 1996, construction began on a 87-mile pipeline from Turkmenistan's Korpedeh Field to Kurtkue in Iran. This pipeline, costing US\$192 million, will be able to supply 8 Bcmy, and much of this gas will be sold to markets in the West. **Figure 3 - Pipeline 5**

Unocal and Delta Oil Co. of Saudi Arabia have a contract to design, build, and maintain a pipeline that would run from Turkmenistan's Dauletabad Field through Afghanistan to the Sui gas field in Pakistan. Gazprom and TRAO Turkmenrosgaz, a joint venture between Gazprom and the Turkmeni government, have also joined the consortium. The 900-mile pipeline will cost US\$3 billion to build, and will carry 1.5 to 2 Bcfd. Unocal and Delta have suggested extending the pipeline into India, but this is just a proposal and no talks have been held on the extension. **Figure 3 - Pipeline 6**

Esso China, China National Petroleum Corp. (CNPC) and Mitsubishi are studying the feasibility of laying a 3,700-mile pipeline from Turkmenistan across Kazakhstan and major petroleum basins of China to China's Pacific coast. From there, the pipeline could be extended another 1,200 miles to serve Japan. The route to Japan could possibly run through South Korea. This pipeline is expected to carry an initial 18 Bcmy, increasing to 36 Bcmy. **Figure 3 - Pipeline 7**

In January 1997, it was reported that Shell proposed a pipeline to carry Turkmeni and Iranian gas to Europe via Turkey and connecting with a pipeline from Qatar. Eventually the pipeline could even carry Syrian and Iraqi gas. The pipelines would run to loading terminals at Ceyhan, Turkey. Shell is reported to have asked for marketing rights to the gas in exchange for its financial backing.

Negotiations were started in April 1995 for a pipeline that would run from Turkmenistan through Iran to Armenia and then to Ukraine. Armenia and Ukraine will find it difficult to fund their share of the US\$1 billion price tag. There probably will be some type of barter or exchange agreements involving projects in Iran. **Figure 2 - Pipeline 3**

Country Overview

UZBEKISTAN

Uzbekistan is the only FSU republic not to suffer a decline in natural gas production after declaring its independence and is, therefore, in position to supply its Central Asian neighbors. In 1996, Uzbekistan reached agreement with Kyrgyzstan on repayment of its US\$12 million gas debt. Uzbekistan will continue to supply gas, and Kyrgyzstan will pay its debt in sugar and wheat. Future gas supplies will be paid for half in hard currency and half in food stuffs.

A joint venture between Uzneftgas, Uzbekistan's national oil corporation, and Enron will develop fields in the Surkhandarya district, estimated to hold 60 Tcf of natural gas.

Natural Gas Pipeline Activities

Uzbektransgaz is studying the feasibility of a 57-mile, 30" pipeline to run from Bukhara Field to Khorezm.

3. SOUTH AMERICA

This region, compared with the other areas of the world, contains the least volume of natural gas reserves. Led by Venezuela, which has traditionally been known for its vast oil resources, South America is fast awakening and joining the rest of the world with respect to the growing importance of natural gas. Many countries have declared national policies for maximizing the benefits of their indigenous natural gas resources. Individual country's plans for increased domestic utilization include the use of natural gas as fuel for local power plants, as feedstock for manufacturing petrochemical products, by exportation of pipeline gas or, in the case of Trinidad, exportation of LNG.

With the privatization of YPF and Gas del Estado, Argentina continues to expand its domestic regional and local gas distribution networks. Argentina recently started exporting pipeline gas from its Neuquen province to Santiago in Chile. There are also plans for additional export pipeline gas routes to Concepcion further south and to Mejillones in northern Chile. Exporting gas to neighboring Uruguay, Paraguay, and southern Brazil is also being contemplated.

Bolivia, which has been exporting gas to Argentina for many years, is forging ahead with its 'capitalization' program and among the programs highlighted is the export pipeline gas project to Brazil. This significant project will soon start and may spur additional export gas pipeline projects to Paraguay and Uruguay on the southeast and to Chile on the southwest. These pipeline schemes will clearly be competing with similar projects from Argentina in the south.

Brazil, with nearly 50% of the region's population, is the target of several regional pipeline export projects. First among these import gas pipelines is the one from Bolivia, which will deliver gas to Campinas where a local transmission and distribution line will transport the gas to end users. In addition, there are several domestic trunklines planned that will be associated with the import gas, as well as from indigenous gas supply.

Chile, with limited gas resources located in its far southern region, recently started to import gas from Argentina. Future increase in import gas is anticipated from Argentina and perhaps from Bolivia.

Colombia has declared a national policy for increased local gas utilization, and is in the final stages of construction of a national transmission gas pipeline grid. There are also discussions of possibly importing gas from neighboring Venezuela.

Peru is still in the process of restructuring its petroleum industry, and has also made progress regarding the development of the Camisea gas field, a major gas discovery by Shell. In addition to creating a local transmission pipeline from Camisea to Lima, there is also the potential of exporting gas to Brazil, with a connection to the Bolivian gas system at La Paz.

In Trinidad, just off the northeast coast of Venezuela, expansion of its well-established petrochemical industry continues, and is highlighted this year by the start of construction of the Atlantic LNG project, a 450 MMcfd facility that will market its gas to the U.S. and Spain. This will be the first LNG project in the western Hemisphere outside of the smaller Alaskan LNG facility.

Uruguay has no gas resources and is planning to import gas from neighboring Argentina. Possibilities also exist for the importation of gas from Bolivia via Paraguay.

Venezuela dominates the region with its vast reserves of oil and natural gas, and is in the process of re-opening its petroleum industry to the international petroleum community. Current emphasis is heavily focused on oil projects, however, with plans to expand its petrochemical industry, as well as to support the ongoing light and heavy oil recovery projects. The importance of natural gas will no doubt be significantly increased in the near future.

Country Review

ARGENTINA

With the successful privatization of its energy industries, Argentina is now the focus of operations for many international petroleum companies. Field development and new exploration are progressing, with particular emphasis on new gas developments. The export of pipeline gas is now a reality as the Nova group successfully laid its GasAndes pipeline from Mendoza to Santiago.

Argentina has a reserves base of some 2.2 billion barrels oil and 18.6 Tcf of natural gas, with corresponding production of 715 Mbopd and 2.4 Bcfd.

There are many gas producing regions in Argentina, most important of which are the Northwest and Neuquen Basins. Argentina imports some 200 MMcfd from Bolivia's southern gas fields.

Natural Gas Pipeline Activities

Nova Corporation recently completed the GasAndes export gas pipeline, covering some 288 miles from the La Mora compressor station (Mendoza, Argentina) to Santiago (Chile). This pipeline cost some US\$350 MM and presently carries 123 MMcfd. Plans are to increase deliveries to 212 MMcfd by 2000 and 600 MMcfd by the year 2007. **Figure 4 - Pipeline 1**

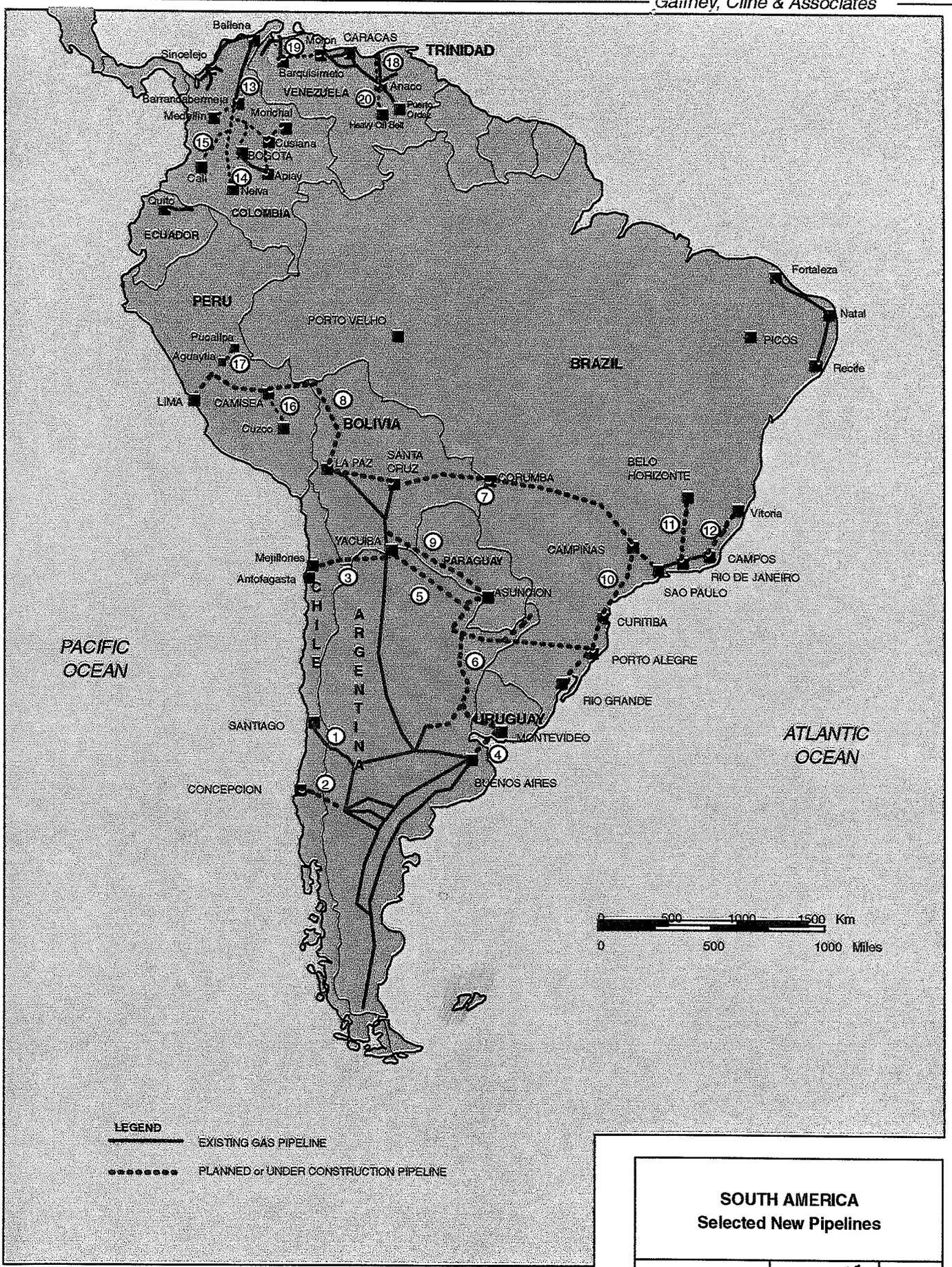
From the southern portion of the Neuquen Basin, YPF plans to construct a second export gas pipeline to Chile from Loma la Lata to Concepcion. This 300-mile pipeline will transport some 175-200 MMcfd. **Figure 4 - Pipeline 2**

CMS and its partners are planning an additional gas export pipeline to Chile, the Gas Atacama pipeline from Argentina's Northwest Basin to Chile's northern cities, Mejillones, Antofagasta and Tocopilla. This will be a 509-mile, 24" pipeline that will transport some 180 MMcfd. Nova recently withdrew from this project and CMS is having difficulties in attracting new partners. **Figure 4 - Pipeline 3**

YPF and Uruguay are discussing the construction of an export gas pipeline from Buenos Aires to Montevideo. This 150-mile, 12" line is planned to transport some 35 MMcfd, with an estimated costs of US\$100 MM. **Figure 4 - Pipeline 4**

A similar, but larger, gas export project calls for:

- 2,020-mile pipeline from the Campo Duran area, Northwest Basin to Paraguay and Uruguay; **Figure 4 - Pipeline 5**
- 336-mile pipeline and laterals from Argentina (San Jeronimo) to Brazil's Southern states Parana, Rio Grande del Sol, and Santa Catarina. **Figure 4 - Pipeline 6**



LEGEND
 ——— EXISTING GAS PIPELINE
 - - - - - PLANNED or UNDER CONSTRUCTION PIPELINE

0 500 1000 1500 Km
 0 500 1000 Miles

SOUTH AMERICA Selected New Pipelines		
Proj. A965 March 97	Checked:	Fig. 4



In addition to the above proposed pipeline systems, reportedly there are several other domestic reported gas pipelines in varying stages of planning, discussion and implementation. These are:

- Bariloche to Esquel 231-mile, 4-8"
- Pergamino to Bragado 10-mile, 6-12"
- Santa Rosa to Gral. Pico 69-mile, 8"

- Northwest Argentina Grid 1,522-miles, YPF
- Northern Loop Nova Corp.

Country Review**BOLIVIA**

The recapitalization of YPFB has finally moved ahead, and the proposed Bolivia-to-Brazil pipeline has advanced further. There are also additional regional export pipeline gas being considered to neighboring countries.

Bolivia has a reported 108 MMbo and 4.5 Tcf reserves, with production of some 29 MMbopd and 300 MMcfd. There are some concerns regarding Bolivia's ability to export the volumes of gas currently discussed. Some of the new projects may not be realized in the near term unless additional gas reserves are discovered.

Natural Gas Pipeline Activities

The focus of interest in Bolivia is the proposed gas pipeline to Brazil. The overall plan is to export gas from the Santa Cruz area to Campinas, near Sao Paulo in Brazil, a distance of over 1,900 miles. This pipeline will be a 28-32" system and will transport some 3.7 Tcf per year for 20 years, and its estimated cost is some US\$1.8 billion. The Bolivian portion of the pipeline, owned by Transportadora de Hidrocarburos (YPFB, Enron and Shell) will take the gas from Santa Cruz to Corumba on the Bolivian/Brazilian border. **Figure 4 - Pipeline 7**

In addition, there are alternative gas export/import routes contemplated that could be significant:

- **Bolivia to Peru** With Shell as a partner in the Bolivia/Brazil pipeline, it is postulated that a possible outlet for Camisea gas may be to Brazil via Bolivia. The Peru-Bolivia connection would require some 1,000 miles of pipeline over the Andes mountain range; **Figure 4 - Pipeline 8**
- **Bolivia to Paraguay** A gas supply agreement between Bolivia and Paraguay governments that calls for the export of 88 MMcfd of gas to Paraguay was signed. This calls for a 621-mile, 18" pipeline that is estimated to cost some US\$300 MM; **Figure 4 - Pipeline 9**
- **Bolivia to Chile** A competing (with a northern Argentina) pipeline to the northern portion of Chile is also contemplated. This project is planned by YPFB, BHP and ENAP and would require a 700-mile pipeline from Santa Cruz to Antofagasta.

Country Review**BRAZIL**

Brazil continues to move slowly towards a more open petroleum industry and Petrobras will operate more independently with less state support. Current reserves are on the order of 4.2 billion barrels of oil and 5.2 Tcf, with corresponding production of 695 Mbopd and 440 MMcfd.

Brazil's gas resources are located mainly in the offshore deep waters, or in the remote Amazon basins. With increasing local gas demand, the current major development is the move towards importing gas from Bolivia and the ancillary local distribution lines.

Natural Gas Pipeline Activities

The 1,900-mile, US\$1.8 billion, 300 MMcfd, Bolivia-to-Brazil gas transmission pipeline has moved ahead with the privatization of the Bolivian gas pipeline sector now owned by the consortium of YPFB, Enron and Shell. The Brazilian pipeline sector is owned by the BTG consortium of British Gas, Tenneco, BHP and Petrobras. This gas supply pipeline between Bolivia and Brazil will extend from the border town of Corumba, Brazil. The first phase 700-mile, 28" pipeline will be built to Campinas, near Sao Paulo. Petrobras recently received bids for this phase of the pipeline construction and work is expected to start in the near future.

Phase II of the Bolivia-to-Brazil pipeline will be for the regional distribution of the gas within Brazil and will include the following segments:

- Campinas to Guararema 250 miles, 20"
- Campinas to Curitiba 225 miles, 22" **Figure 4 - Pipeline 10**
- Curitiba to Itaiai 100 miles, 16"
- Itaiai to Criciuma 200 miles, 14"
- Criciuma to Porto Alegre 150 miles, 14"

In addition, Petrobras has several other local gas transmission lines planned, including

- Rio de Janeiro to Belo Horizonte 250 miles, 16" **Figure 4 - Pipeline 11**
- Duque de Caxias to Campos/Vitoria 290 miles **Figure 4 - Pipeline 12**
- Duque de Caxias to Betim 221 miles
- Guamara to Fortaleza 290 miles

There are also some additional regional gas transmission pipelines to bring gas to the populated east coast of Brazil, among these proposals are:

- Bringing Amazon gas to the populated east Brazilian coast area, however, such a massive project involves over 2,000-miles of pipelines through tropical forest;
- Import gas pipeline from Argentina's Northwest basin to Southeastern Brazil.

In view of the current Bolivia-to-Brazil pipeline activity, the likelihood of these projects advancing is remote at this time.

Country Review

CHILE

Chile has an increasing energy demand, particularly for natural gas, and its indigenous supplies are located in the far southern Austral Basin, and transportation costs to metropolitan areas are prohibitive. Consequently, the importation of pipeline gas from neighboring gas-rich countries is the option adopted by Chile to meet its gas needs.

Chile has reserves of some 300 MMbo and 3.5 Tcf, with corresponding production of 10 Mbopd and 410 MMcfd, a significant portion of its gas production (70%) is used to produce Methanol at the Punto Arenas plant in southern Chile.

Natural Gas Pipeline Activities

Nova Corporation's Gasducto Gas Andes SA recently completed the GasAndes export gas pipeline, covering some 288 miles from the La Mora compressor station (Mendoza, Argentina) to Santiago (Chile). This pipeline cost some US\$350 MM and presently carries 123 MMcfd. Plans are to increase deliveries to 212 MMcfd by the year 2000 and 600 MMcfd by the year 2007. **Figure 4 - Pipeline 1**

From the southern portion of the Neuquen Basin, YPF plans to construct a second export gas pipeline to Chile from Loma la Lata to Concepcion. This 300-mile pipeline will transport some 175-200 MMcfd. **Figure 4 - Pipeline 2**

CMS and its partners are planning an additional gas export pipeline to Chile, the Gas Atacama pipeline from Argentina's Northwest Basin to Chile's northern cities, Mejillones, Antofagasta and Tocopilla. This will be a 509-mile, 24" pipeline that will transport some 180 MMcfd. Nova recently withdrew from this project and CMS is having difficulties in getting new partners. In this northern portion of Chile, there are potentially competing import gas pipelines from Bolivia and possibly Peru to the north.

In addition to these regional gas import pipelines, Chilectra Metropolitan has plans for some 5,000 miles of various gas distribution lines to be constructed through the 1998 period.

Country Review**COLOMBIA**

Colombia has significant petroleum resources, with reserves of 3.5 billion barrels of oil and 10 Tcf, and corresponding production of 585 Mbopd and 534 MMcfd.

Colombia's main gas resources are located on the Llanos Basin to the east, Middle Magdalena Valley Basin in the center, and the Guajira Basin on its northern Caribbean coast. Colombia is moving ahead with its gas utilization plans for the country, and is continuing to expand its regional and local gas transmission lines. This plan calls for the increasing of domestic gas consumption to 800 MMcfd by the year 2000, and is expected to cost some US\$3 billion for pipeline infrastructure, as well as compressed natural gas stations.

Natural Gas Pipeline Activities

The gas utilization plan adopted by Colombia has activated the construction of a significant number of gas pipeline projects. The basic plan is to connect the gas fields on the northern Caribbean coast to the population centers on the central portions of the country around Bogota and as far south as the Dina/Nevia/Pitalito area close to the Ecuadorean border. The main portion of this Centragas pipeline system was recently completed by Enron and comprised a 357-mile, 18" pipeline from Ballena to Barrancabermeja. This pipeline will have the capacity of some 150 MMcfd and will be operated by Ecopetrol. **Figure 4 - Pipeline 13**

Other contracts for this major gas transmission pipeline are:

- Barrancabermeja to Puerto Serviez 93-mile, 16-20 ", Ecopetrol
- Vasconia to Mariquita 76-mile, 20", Ecopetrol
- Mariquita to Dina 173-miles, 12", Ecopetrol **Figure 4 - Pipeline 14**

In addition, there are several ancillary spur lines that will connect major cities along the main pipeline route, these pipeline projects are:

- Sebastopol to Medellin 97-mile, 12", Minminas
- Vasconia, to La Belleza -Bogota 128-mile, 22", Ecopetrol (includes part conversion of oil-to-gas pipeline)
- Barrancabermeja to Bucaramanga 68-miles, 6-10", Minminas

Other major pipeline system contracts are:

- Mariquita to Cali (Occidente line) 214-mile, 20", TransGas de Occidente (Trans Canada, BP, Fluor, et al) **Figure 4 - Pipeline 15**
- Cusiana - Apiay 94-mile, 12", Ecopetrol
- Opon to Barrancabermeja 55-mile, 20", Amoco

Country Review

ECUADOR

Ecuador has a reported 2.1 billion barrels of oil and 3.8 Tcf of reserves, with corresponding production 392 Mbopd and 65 MMcfd of gas, the majority of which is flared. Ecuador's main focus is on oil development and production.

Natural Gas Pipeline Activities

There is no significant gas pipeline activity reported for Ecuador.

Country Review

PARAGUAY

Paraguay, located inland between Argentina, Bolivia, Uruguay, and Brazil has no indigenous petroleum resources.

Current plans are for the importation of natural gas from its neighboring countries, Argentina and/or Bolivia.

Natural Gas Pipeline Activities

A gas supply agreement was signed between the Bolivia and Paraguay governments that calls for the export of 88 MMcfd of gas to Paraguay. This calls for a 550-mile, 18" pipeline that is estimated to cost some US\$300 MM. The Paraguay government has applied to the IDB and FONPLATA for joint funding, and tender for its construction is expected mid-1997. **Figure 4 - Pipeline 9**

Country Review

PERU

Peru's efforts to privatize its petroleum industry continues, as well new licensing activity. Peru has substantial reserves, some 700 MMbo and 7 Tcf, with production rates of 130 Mbopd and 342 MMcfd.

Peru's gas areas are located in the interior Ukayali Basin and the coastal Talara Basin, with the majority of the gas resources associated with the Camisea Field, found in the Ukayali Basin. After many years of negotiations, the Shell and Mobil consortium, which discovered Camisea, recently signed an agreement with the Peruvian government to develop this huge gas field, with reported potential in excess of 10 Tcf and 700 MMb of condensate.

Natural Gas Pipeline Activities

Peru's gas pipeline activity is focused on the development of the Camisea Field, and present plans are for the construction of a 373-mile, 18" gas transmission pipeline to transport the gas from the field to the end users in Lima. This project is estimated to cost some US\$2.8 billion, as it would route the pipeline across the Andes mountain range. Shell and Mobil are the operators of this field. This development is expected to have a capacity of some 200 MMcfd, and may take as long as seven years to complete.

An additional pipeline from the field to the city of Cuzco will be a 170-mile, 12" pipeline. **Figure 4 - Pipeline 16**

A smaller development in this basin is the Aguaytia pipeline to the town of Pucallpa, which will require a 52-mile, 6" gas Magreb pipeline. Maple Gas is the field operator. **Figure 4 - Pipeline 17**

In addition to the domestic market gas pipeline infrastructure discussed above, there are also some plans for an export gas pipeline connection from Camisea to La Paz in Bolivia where it will connect with the proposed Bolivia-to-Brazil gas pipeline system. Such a pipeline will be approximately 500 miles, and could avoid the mountainous terrain for most of its route. **Figure 4 - Pipeline 8**

Country Review

TRINIDAD

Trinidad continues to aggressively pursue development of its natural gas resources, and construction of the region's first LNG project has started. In addition, the country's petrochemical industry is expanding, with plans for more ammonia and methanol plants.

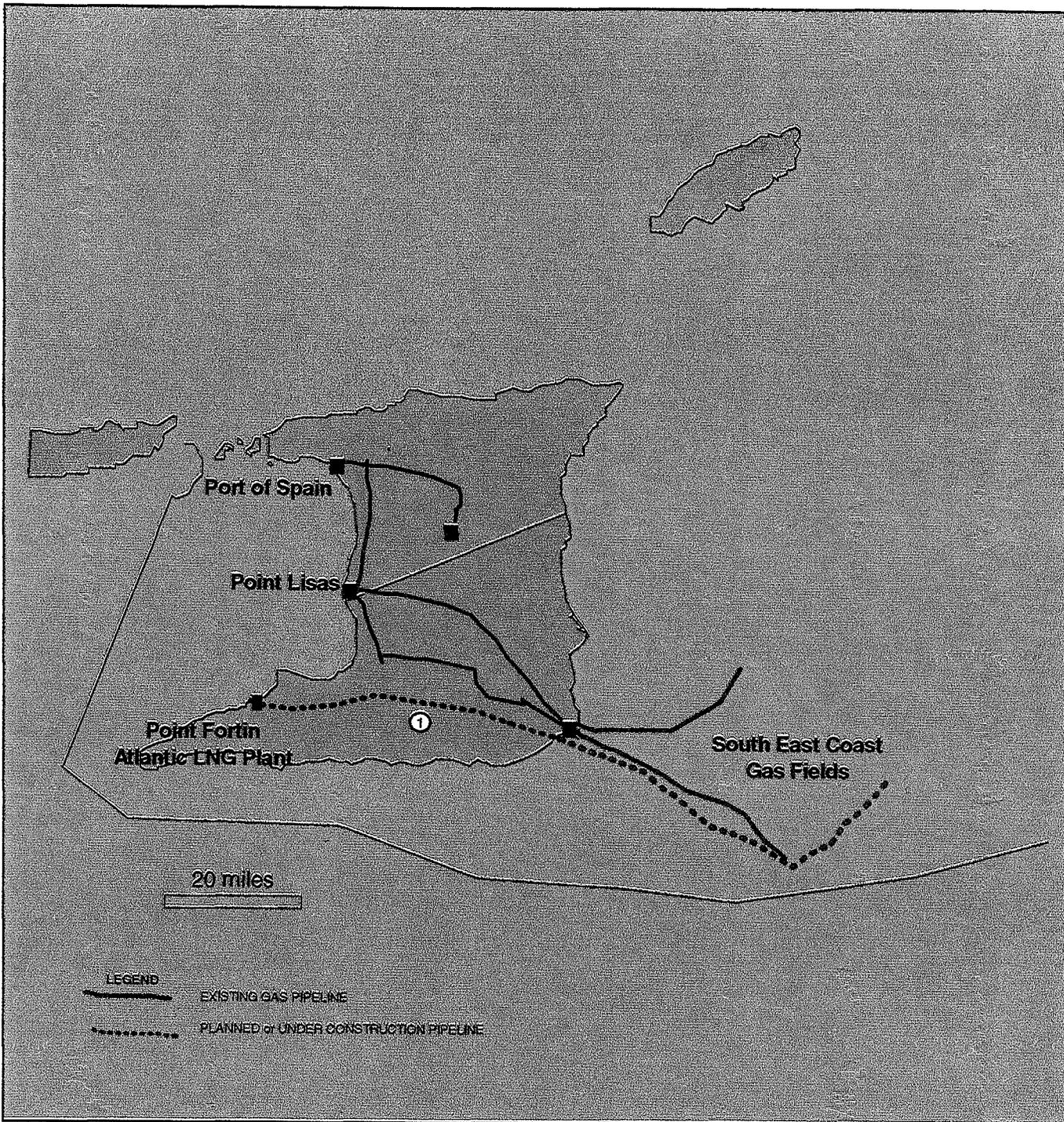
Trinidad petroleum reserves are some 560 MMbo and 12 Tcf, with production at the rate of 130 Mbopd and 800 MMcfd. Trinidad's gas resources are located in the offshore southeast coast and north coast. Present development and production are focused on the southeast coast resources.

Natural Gas Pipeline Activities

The main gas pipeline construction activity is on the 112-mile, 36" and 40" gas transmission pipeline from the offshore SSEG Field to landfall near Galeota Point, then onshore to the LNG plant at Point Fortin. This pipeline will transport some 475 MMcfd and will be owned by NGC (National Gas Company of Trinidad). The Atlantic LNG plant is expected to be operational in 1999. **Figure 5 - Pipeline 1**

There are also some smaller inter-field connecting gas pipeline projects planned by field operators, Amoco and British Gas.





TRINIDAD
Atlantic LNG and Gas Supply Pipeline

Proj. A965 March 97	Checked:	Fig. 5
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Country Review

URUGUAY

Uruguay, located on the South American east coast between Argentina and Brazil, has no indigenous petroleum resources.

Current plans are for the importation of natural gas from the neighboring countries, Argentina and/or Bolivia.

Natural Gas Pipeline Activities

YPF and Uruguay are discussing the construction of an export gas pipeline from Buenos Aires to Montevideo. This 150-mile, 12" line is planned to transport some 35 MMcfd with an estimated cost of US\$100-130 MM. Bids have been called for this project. **Figure 4 - Pipeline**
4

It has also been reported that the proposed Bolivia-to-Paraguay gas pipeline may be extended from Paraguay (Asuncion) to Uruguay, a distance of some 600 miles. The relative cost of such a pipeline may be prohibitive, and thus will favor the Argentina-to-Uruguay gas pipeline.

Country Review

VENEZUELA

Venezuela has the largest petroleum resources in South America, with reserves of 64.5 billion barrels and 140 Tcf (a significant portion of which is associated gas). Production levels in Venezuela are 2.7 MMbopd and 4.3 Bcfd.

Venezuela's main gas areas are in the Eastern Venezuela Basin (75%) (Anaco/Maturin Area), with the remainder located in Western Venezuela (Lake Maracaibo area), and the new offshore area resulting from recent exploration which has located potentially significant gas reserves offshore in the northeast coast (Rio Caribe, Patao, Mejillones, and Dragon Fields).

Natural Gas Pipeline Activities

Venezuela gas utilization is mainly oil-industry application (gas injection, refinery usage), as well as for electricity generation (especially in Eastern Venezuela). Future consideration for expanding the use of gas in Venezuela includes:

- Feedstock for petrochemical production at the new Jose Petrochemical complex. This may require additional gas transmission pipeline from the gas fields to Jose, a distance of some 100 miles; **Figure 4 - Pipeline 18**
- For additional oil field and refinery use in Western Venezuela. This would require the connection of the eastern Venezuela pipeline system with the western Venezuela pipeline system, a distance of some 200 miles; **Figure 4 - Pipeline 19**
- For steam generation to enhance heavy oil production from the vast Orinoco Heavy Oil belt. Such projects may require 100-500 miles of gas pipelines, depending on the number of heavy oil projects implemented; **Figure 4 - Pipeline 20**
- Development of future LNG projects may be possible, despite the failure of the current Cristobal Colon LNG project that was to be located on the eastern portion of the Paria Peninsula. The Cristobal Colon LNG project called for a US\$5.6 billion, 730 MMcfd, two-train plant. Long-term future LNG projects may require 100-200 miles of pipeline depending on where the project(s) are located.

In addition to the above, there has been some discussion regarding export gas from Venezuela into Colombia. A 900-mile trans-Venezuela gas transmission pipeline was proposed together with an additional delivery spur of 320-miles of gas pipeline. However, with the development of the discoveries on the Caribbean coast of Colombia and the construction of the CentraGas pipeline by Enron, the likelihood of this project moving forward in the foreseeable future appears to be in doubt.

4. ASIA PACIFIC REGION OVERVIEW

The Asia Pacific region, comprising the Pacific Rim countries, the Far East and the Indian Subcontinent, constitutes over half the world's population, with an apparent hunger for more energy as these countries undergo tremendous programs aimed at modernizing their respective societies as the new millennium approaches. The region contains substantial petroleum reserves, and in spite of having a very old oil industry, its gas industry is relatively new. This "newness" of the natural gas industry is not to be mistaken with its sophistication, having both export pipelines and LNG components. The Asia Pacific region natural gas usage is only a 8.8% of its total energy consumption, compared with 23.2% worldwide, and 27.2% for North America. The region, as a whole, is increasing the natural gas proportion of its energy mix, and this trend is projected to continue in the future, leading to an increasing demand for natural gas infrastructure.

For most of these countries, particularly the more populous China and India, the traditional fuel is coal, which accounts for some 45.7% of the energy consumed, and is a resource which is relatively abundant and cheap. Crude oil usage is some 38.6% of all fuel consumption, and is relatively expensive for most countries. There is a relatively small amount of nuclear and hydroelectric fuel consumption that is limited to few countries. The relative abundance of undeveloped natural gas resources in the region, as well as environmental concerns, play an important role in this shift to natural gas as the fuel of choice for power generation, as well as for industrial and residential usage in this region.

This region, reflecting the tremendous potential for gas demand and pipeline construction, accounts for some 26% of the current and planned pipeline potential reviewed.

4.1 PACIFIC RIM (INCLUDING AUSTRALIA)

The Pacific Rim, as identified in this report, comprises the Southeast Asian countries, Australia and New Zealand. This region is characterized by its strong and competing gas suppliers, Indonesia, Australia, Malaysia, Brunei, and now Myanmar. The first four on this list represent 69.4% of the world's LNG production, the majority of which is exported to the neighboring Far East countries, Japan, Taiwan, and South Korea.

Within the Pacific Rim, there is an increasing demand for local natural gas usage among gas resource rich countries, Australia, Indonesia, Brunei, and Malaysia, as well as in rapidly developing Thailand. This increase in local demand has triggered the expansion of existing local gas distribution infrastructure, as well as the introduction of new regional and local gas transportation and distribution systems. These individual countries are in varying stages of developing their natural gas infrastructure.

Malaysia has now completed its Peninsula Gas Utilization (PGU) project for West Malaysia, and plans to increase the capacity of the system by adding additional pipeline loops. The development of new discoveries in East Malaysia with the MLNG II (in progress), and the new MLNG III project are being advanced and will be the focus of their efforts in this coming period.

Brunei continues as the stable LNG producer, and reports of some new gas discoveries in this small country could result in new gas pipeline activity in the near future.

Indonesia is steadily developing its Trans-Java and Trans-Sumatra pipeline systems, and is wrestling with the enormous development associated with the gigantic Natuna Field gas resources. The development of Natuna could spawn significant gas pipeline needs, including piping gas to Arun in Northern Sumatra, or to Duri in Central Sumatra. In addition, the significant gas discoveries at Wiriagar in Irian Jaya has provided a new potential competing LNG project.

Australia is on the verge of installing a "Trans-Australia" pipeline network, as well as the potential of importing gas from its neighbor, gas-rich Papua New Guinea.

Thailand continues to increase its gas demand, and will soon be supplied with gas from the new gas resources discovered in the Malaysia/Thailand Joint Development Area (MTJDA).

Neighboring Myanmar on the west would soon be exporting gas to Thailand from its Yadana and Yetagun gas discoveries. There has also been some speculation that Myanmar gas may also be exported west to the Indian subcontinent.

The Philippines is reportedly making some progress towards the development of its Malampaya/Camago project.

Current and planned projects for these countries will go a long way towards the development of these major national pipeline grids. As a consequence of these individual countries developing their own natural gas pipeline infrastructure to supply power plants, industrial and other end users, there have been increasing discussions among these countries, particularly the ASEAN countries of Southeast Asia, for a regional natural gas pipeline system. Such a system will connect the ASEAN countries to a regional gas transportation system that will facilitate the gas-rich countries exporting gas to user countries. While such a massive regional pipeline project remains a remote possibility at this time, it is anticipated that a critical pipeline mass could be built during the foreseeable future that would eventually lead to its realization.

Country Review**AUSTRALIA**

Regional gas pipeline activity continued apace in 1996 and is expected to continue through 1997. It is estimated that there is potential of some 7,624 miles of gas pipeline for this country, made up of 987 miles of current and 6,637 miles of future projects. Major regional trunklines are the main focus of the pipeline activity, and it is expected that with a critical mass of gas pipelines developed, a national grid linking the major supply to user areas will be achieved in the near future.

Australia has a reported 20 Tcf of gas reserves, with annual production of 1 Tcf. Local consumption is approximately 700 Bcf, with the remaining 300 Bcf exported as LNG. There are some 30 sedimentary basins in Australia, but its gas resources are found in four main areas, Offshore Northwest shelf (Canarvon/Bonaparte Basins), Offshore Bass Straits (Gippsland/Otway Basin), Onshore Cooper/Eromanger and Amadeus Basins. In addition to existing undeveloped gas discoveries on the Northwest shelf (Gorgon, West Tryl, Spar), Bonaparte (Petrel, Term) and other discoveries, recent exploration has led to the discovery of significant gas reserves in the following areas:

Canarvon Basin	WAPET	Chrysaor (63 MMcfd)
Barrow Sub Basin	Ampolex	Wonnich (27 MMcfd)
Otway Basin	Caltus	Skull Creek (20 MMcfd)

Future development of these fields will result in additional gas pipeline construction in these respective areas. Additional LNG facilities are contemplated, as well as possible linkage to the Trans-Asean pipeline system when this opportunity is realized.

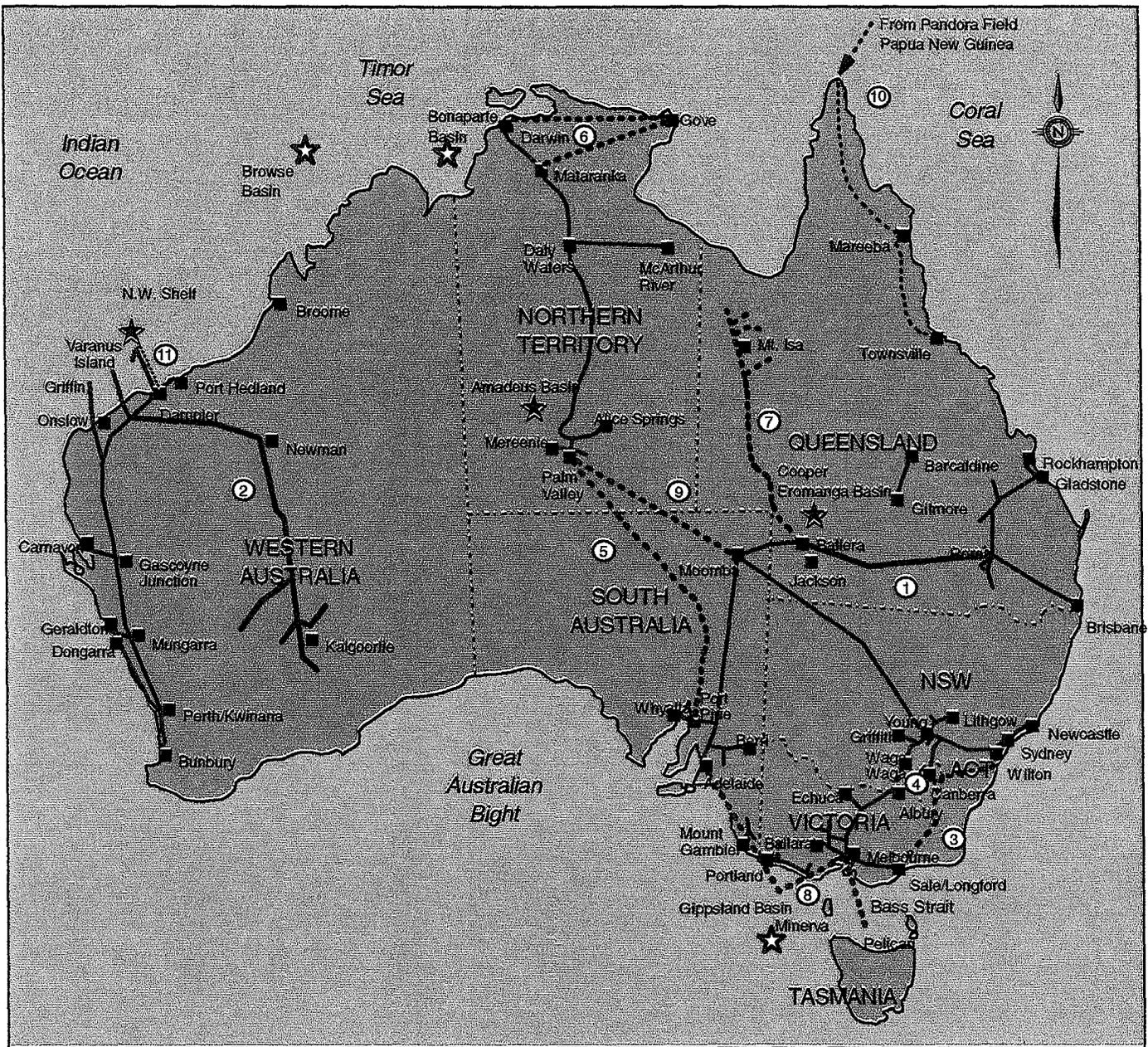
Natural Gas Pipeline Activities

Tenneco became a major gas pipeline participant with the recent acquisition of the Pipelines Authority of South Australia (PASA), which included PASA's 488-mile, 22", 81 Bcfy gas line from Moomba to Adelaide. Tenneco is also nearing completion of the Southwest Queensland pipeline system, which will feature a 470-mile, 16", 43 Bcfy from the Cooper Basin (Ballera) to Wallumbilla (connects to Roma and Brisbane), in Queensland. **Figure 6 - Pipeline 1**

Another significant regional pipeline completion is the 870-mile, 14" to 16", Goldfields Gas Pipeline, which transports gas from the offshore Northwest Shelf area (Karratha) to the mining towns and enroute power stations, with the pipeline terminating at Kalgoorlie, located inland and on the southern portion of Western Australia. This US\$400 million project was recently (January 1997) reported to be in operation. **Figure 6 - Pipeline 2**

The following are summaries of the more significant regional gas transmission pipeline systems presently reported for Australia:

- BHP and Canada's Westcoast Energy Inc. plan to construct a 435-mile gas transmission pipeline from Longford in Victoria to Sydney in New South Wales, with completion on or about late 1997; **Figure 6 - Pipeline 3**



LEGEND

- State / Territory Boundary
- Existing Pipelines at January 1997
- Planned or Proposed Pipelines
- City / Town
- ★ Natural Gas Area
- ★ Developed Gas Area
- ① Pipeline Projects



AUSTRALIA
Selected New Gas Pipelines

Proj. A965 March 97	Checked:	Fig. 6
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- A 83-mile, 12" link between the East Australian Pipeline at Wagga Wagga (New South Wales) and the Gas Transmission Corporation pipeline at Albury (Victoria) is proposed; **Figure 6 - Pipeline 4**
- Tenneco plans to build a 800-mile, 14" gas transmission pipeline from the Amadeus Basin (Palm Valley) to South Australia at Port Pirie. This pipeline is estimated to cost some US\$200 million; **Figure 6 - Pipeline 5**
- There are two reported pipeline projects aimed at transmitting gas to Gove in the Gulf of Carpentaria. Magellan Petroleum Australia proposes a 375-mile line from Darwin to Gove, while the Northern Territory Power and Water Authority plans a 367-mile, 12" pipeline from Mataranka (where it taps into the Palm Springs to Darwin Pipeline) to Gove; **Figure 6 - Pipeline 6**
- In Queensland, Australian Gas Light has been selected to construct a 522-mile pipeline to transmit Cooper/Eromanga Basin gas to the mining towns around Mount Isa; **Figure 6 - Pipeline 7**
- Offshore Bass Straits, a 375-mile pipeline is planned by PASA to bring Minerva gas to onshore Melbourne and/or South Australia (Adelaide); **Figure 6 - Pipeline 8**
- The Northern Territory and South Australia authorities have plans to connect Amadeus Gas at Palm Valley (Northern Territory) to Moomba (Southern Australia). This will be a 746-mile, 16" gas transmission line estimated to cost some US\$200 million; **Figure 6 - Pipeline 9**
- Chevron/IPC plan to export gas from Papua New Guinea to Australia from their Kutubu and Pandora Fields. Some 820 miles of pipeline will be required to transport gas from Cape York to Willa/Townsville via Mareeba; **Figure 6 - Pipeline 10**
- Woodside has announced a second gas pipeline project to transport Northwest shelf gas to processing facilities at the Burrup Peninsula. This will be a 100-mile gas pipeline. **Figure 6 - Pipeline 11**

Country Review

BRUNEI

Limited pipeline activity is reported and expected for this small Sultanate. Brunei, the first LNG producer in Southeast Asia, has reported oil reserves of 1.4 billion barrels and gas reserves of some 14 Tcf. Production of oil and gas is 160 Mbopd and 900 MMcfd, respectively. Brunei exports some 275 Bcfy (750 MMcfd) of gas as LNG.

Petroleum activity in Brunei is dominated by Brunei Shell Petroleum (BPS), which is responsible for all current petroleum production activities. Recent exploration activity by BPS and other operators have resulted in additional gas discoveries:

BPS	Enggang and Selangkir (near the Iron Duke Fields), tested 16 MMcfd
Elf	Maharaja Iela, structure retained
Fletcher	Perdana and BCS-1, tested 30 MMcfd

Natural Gas Pipeline Activities

Future development of these discoveries will require some limited pipeline construction. However, because of the small area involved, new pipeline mileage is not expected to be significant.

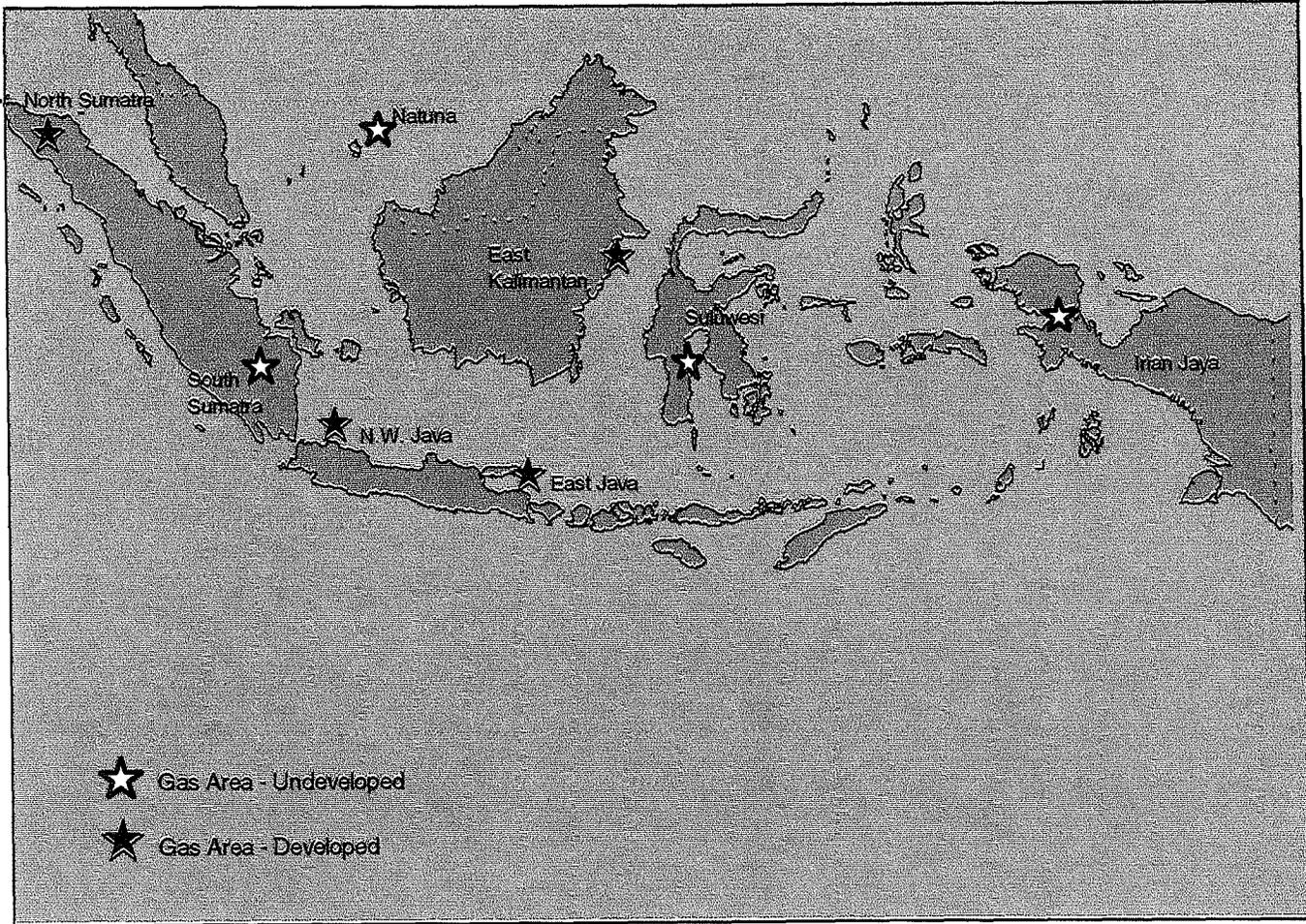
Country Review

CAMBODIA

Cambodia has not reported petroleum reserves and production. There is limited petroleum activity in this country, mainly some exploration work focused on the offshore areas in the Gulf of Thailand. No significant gas discoveries have been reported.

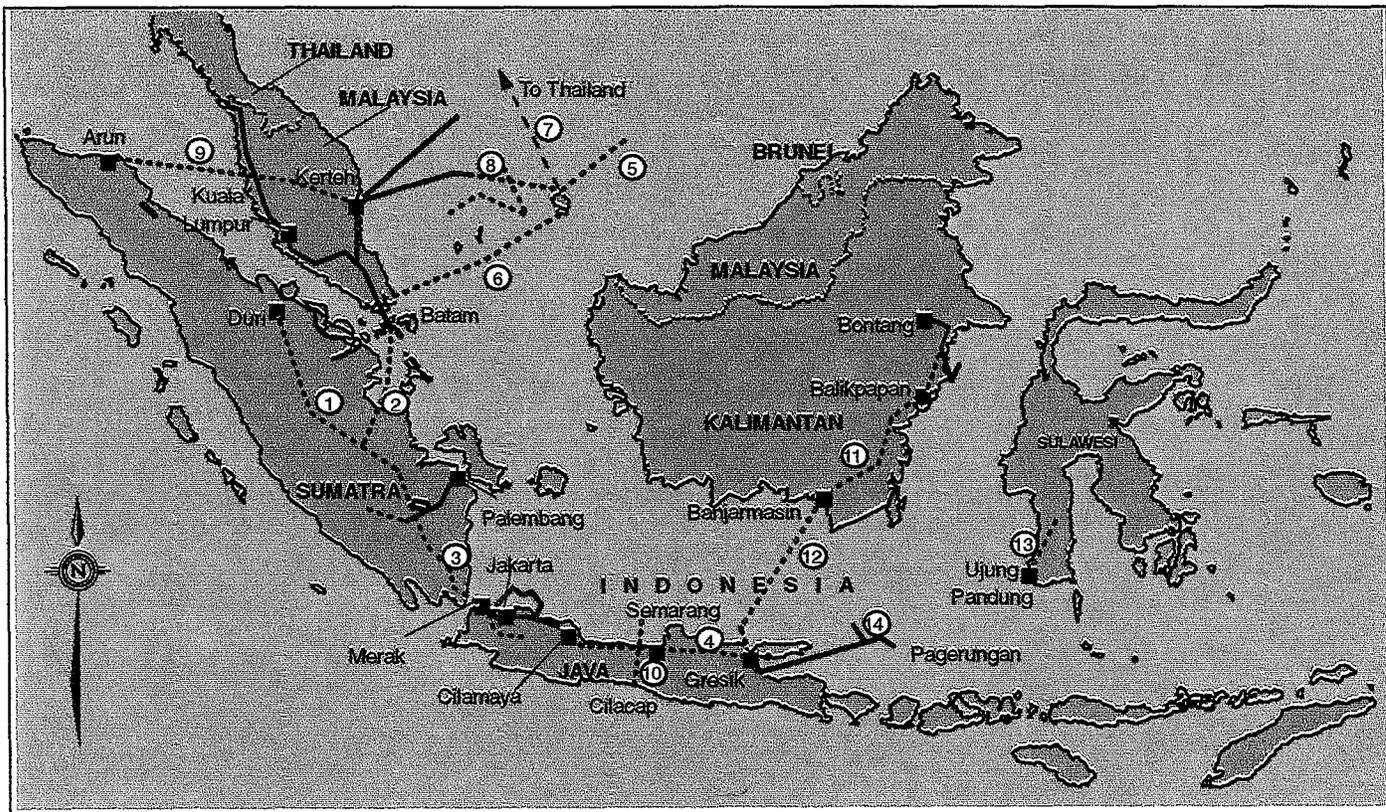
Natural Gas Pipeline Activities

No significant gas pipeline activity is expected for this country in the short term. For the longer term, it is possible the regional Trans-Asean gas pipeline may have a link to Cambodia.



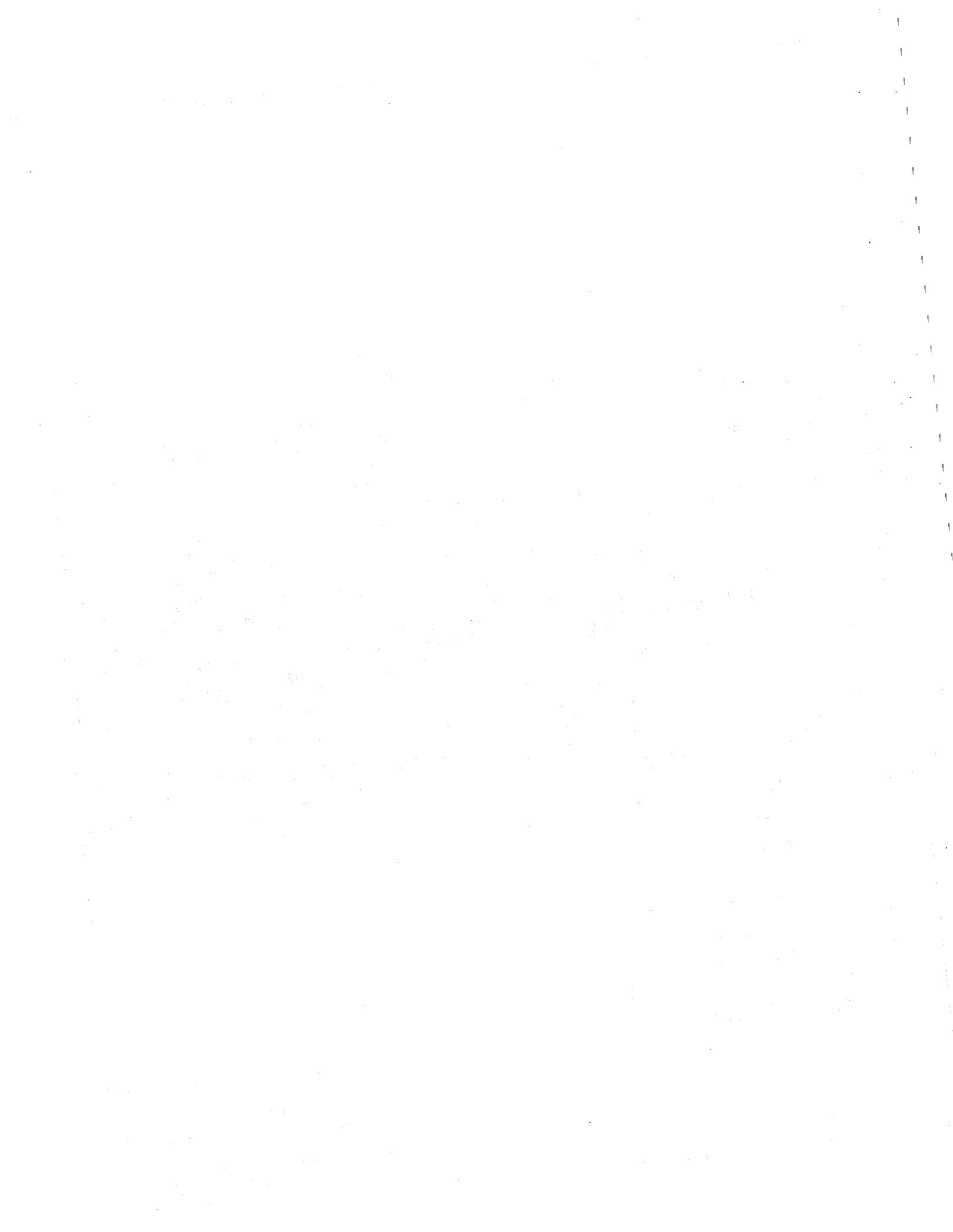
**INDONESIA
MAIN GAS AREAS**

Proj. A965 March 97 | Checked:  | Fig. 7



LEGEND	
	Existing Pipeline
	Planned / Proposed Pipeline
	City / Town
	Pipeline Projects

WEST INDONESIA Selected New Gas Pipelines		
Proj. A965 March 97	Checked:	Fig. 8



Country Review

INDONESIA

Indonesia is a major player in the Asian/Far East gas market, being the largest LNG exporter in the world. This country has significant petroleum resources, with oil reserves of 5.2 billion barrels and gas reserves of 69 Tcf. Corresponding production is 1.5 million barrels of oil and 6 Bcfd. Indonesia exports some 1.3 Bcfd of LNG.

As expected, petroleum activity is high for Indonesia, with numerous operators active in the 60-plus basins of the country. Significant gas resources and new gas discoveries are located in nine main regions of the country, of which LNG facilities are developed for two of the areas, and discussions are being made to develop two new areas with LNG facilities.

Figure 7.

- North Sumatra, Arun LNG
- South Sumatra, Bungkal (Asamera) - 36 MMcfd, Pilau Gading (Saga) - 33 MMcfd
- NW Java, Les (Arco)
- East Java, Kubu and Batur (Arco)
- East Kalimantan, Bontang LNG, Peciko (Santa Fe)
- Kutei Basin, Stupa (Total) 28 MMcfd
- Sengkang Basin, Sulawesi, Subur (Unocal)
- Natuna Area, reported 45 Tcf, proposed Natuna LNG
- Salawati/Bintuni Basins, Wiriagar (Arco), reported 8 Tcf, proposed Wiriagar LNG

Future development of these fields will result in additional gas pipeline construction in these respective areas. In addition, Indonesia has actioned the major planned Trans Java-Sumatra gas pipeline system which, when completed, could become part of the Regional Trans-Asean pipeline system.

Natural Gas Pipeline Activities

Perum Gas Negara (PGN), the state gas company, has major plans for a Trans Java-Sumatra gas transmission system, which is now in its Stage II development phase. This proposed pipeline will link the two main Indonesian islands and eventually will be part of the Regional Trans Asean system. A connection between Java and South Kalimantan and between Central Sumatra and Batam-Singapore are also contemplated. Estimates of the costs involved for the planning and construction of these pipelines are reportedly in excess of US\$1 billion. These pipelines are in varying stages of study and implementation, and financing for them is reportedly arranged between PGN and World bank, as well as between PGN and the ADB.

PGN planned main pipeline systems are summarized as follows:

South Sumatra to Central Sumatra (Corridor Gas Project-Duri Field)	335 miles	Figure 8 - Pipeline 1
Central Sumatra to Batam Island/Singapore spur	175 miles	Figure 8 - Pipeline 2
South Sumatra (Prabamulih) to West Java (Cilegon)	300 miles	Figure 8 - Pipeline 3
Gresik (East Java)/Yogyakarta to Jakarta	335 miles	Figure 8 - Pipeline 4

In addition to the PGN trunk transmission gas pipelines referenced above, there are several major projects contemplated with involvement of PGN and private contractors. Specifically in the private sector, much discussion has been centered around the postulated development of the huge Natuna gas reserves. This project reportedly could include the construction of a large-scale LNG facility, as well as pipeline sales to nearby Singapore, and possibly to fuel the massive Duri steam injection project in Central Sumatra.

A summary of the Natuna gas pipeline projects currently contemplated (including some in very preliminary concepts), are presented as follows:

Natuna Field to Natuna Island	140 miles, Esso Indonesia Figure 8 - Pipeline 5
Natuna Area to Singapore	295 miles, Pertamina Figure 8 - Pipeline 6
Natuna Field to Thailand	932 miles, Pertamina/PTT Figure 8 - Pipeline 7
Natuna Area to Malaysia (Duyong area)	200 miles, Pertamina Figure 8 - Pipeline 8
Extension of the Natuna/Duyong line across Peninsula Malaysia-Malacca Straits to Arun (N. Sumatra)	900 miles, Pertamina, et al Figure 8 - Pipeline 9

Other significant regional gas pipeline projects presently contemplated are:

Kepodang Field to Central Java (Semarang)	128 miles, Shell
Central Java to Cilacap (South Java)	280 miles, Shell Figure 8 - Pipeline 10
Banjarmasin (So. Kalimantan) to Balikpapan	300 miles, Pertamina Figure 8 - Pipeline 11
Banjarmasin (So. Kalimantan) to Gresik	500 miles, Pertamina Figure 8 - Pipeline 12
Kampong Baru area to Ujung Pandang	100 miles, BP Figure 8 - Pipeline 13
East Java additional field development/connections	100 miles, Arco Figure 8 - Pipeline 14
Wiriagar/Mogoi Deep developments, Irian Jaya	200 miles, Arco, BG, Statoil

Intra-field developments - East Kalimantan (Kutei Basin) areas

Intra-field development - South Sumatra and Northwest Java areas

Country Review**MALAYSIA**

The development and utilization of its natural gas resources has been a priority with the Malaysian authorities. The Peninsula Gas Utilization project (PGU) is well into Stage III and connects gas supply to users across the length and width of the peninsula, with an overall capacity of some 2 Bcfd. In addition, the second LNG expansion of its Bintulu facilities, the MLNG II project, is progressing and a third LNG project (MLNG III) is also contemplated.

Malaysia has substantial hydrocarbon resources, and its reserves of oil and gas are 4.3 billion barrels and 68 Tcf, respectively, with corresponding production of 682 Mbopd and 2.9 Bcfd. Approximately 272 Bcfy of gas are exported as LNG.

Malaysian gas resources are found in three main areas:

Offshore Peninsula Malaysia

Petronas	Duyong/Sotong Fields - gas supply to PGU
Petronas	Berganding Deep 131 MMcfd (total)
Esso	Lawit (1.7 Tcf) to be developed and piped onshore

JDA CTOC

Bulan (36 MMcfd), Cakerwala East (22 MMcfd), Suriya (56 MMcfd)

Offshore Sarawak

Shell fields - E and F - 13 Tcf - MLNG I
Shell fields - M and B - 9 Tcf - MLNG II
Oxy fields - Jintan/Sedari - 6 Tcf - MLNG III

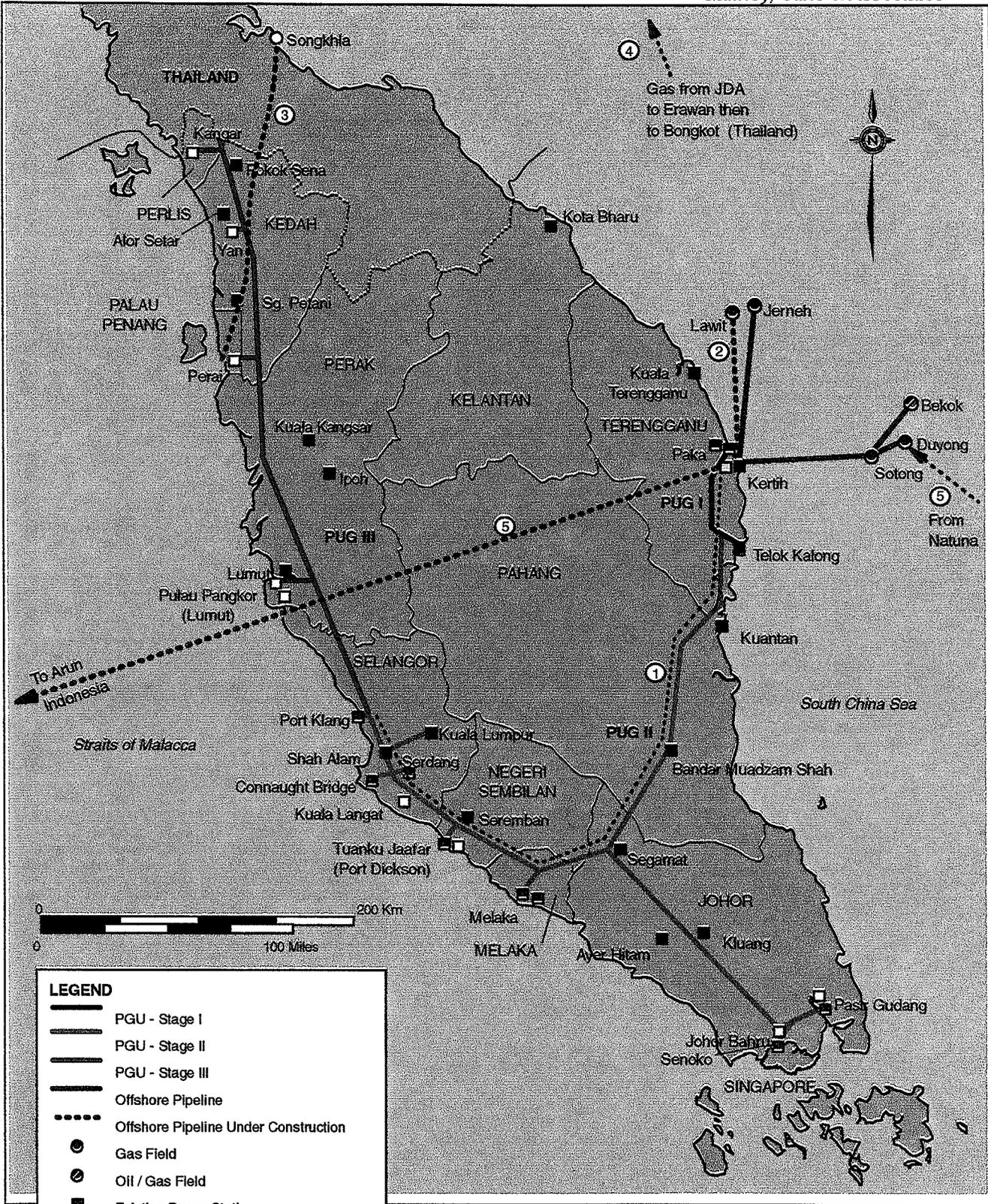
Offshore Sabah

Shell field, Kinabalu, 2.1 Tcf, future consideration

Natural Gas Pipeline Activities

In West Malaysia, there are two main pipeline projects:

- The major Peninsula Gas Utilization (PGU) project is now into Stage III with pipeline connection from Klang in Selangor State to Kangar in Perlis State. This completes the connection from the gas supply on the east coast at Kertih and will have the capacity of some 2 Bcfd to commercial and residential users along the route. The PGU I and II comprised some 530 miles of 36" pipeline and PGU III comprises some 340 miles. With the completion of this initial PGU system, plans for secondary loops along sections of this massive system call for connections from Kertih to Segamat and then on to Meru in Klang, a total of some 530 miles of pipeline; **Figure 9 - Pipeline 1**
- The development of Esso's offshore Lawit gas discovery calls for a 200-mile, 30" gas transmission line to bring the gas to shore. **Figure 9 - Pipeline 2**



Gas from JDA to Erawan then to Bongkot (Thailand)



To Arun Indonesia

Bekok
Duyong
Sotong
From Natuna

South China Sea

Straits of Malacca



LEGEND

- PGU - Stage I
- PGU - Stage II
- PGU - Stage III
- Offshore Pipeline
- Offshore Pipeline Under Construction
- Gas Field
- Oil / Gas Field
- Existing Power Station
- Future / Proposed Power Station
- Gas Processing Plants
- City / Town
- State Boundary
- Maritime Boundary
- Pipeline Projects

NOTE:
Location of Offshore Lines / Fields
Not to Scale

WEST MALAYSIA
Selected New Gas Pipelines

Proj. A965 March 97	Checked:	Fig. 9
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In addition to the above projects, there are two other projects that may be realized in this area:

- E.W. Bridge Corp. and Chiyoda are planning a 120-mile gas transmission from the Penang area in west coast of West Malaysia to Songkhla on the east coast of Thailand; **Figure 9 - Pipeline 3**
- From the offshore Joint Development Area (JDA) between Malaysia and Thailand, the development of the recent gas discoveries from this area will most likely be connected to the nearby (estimated 50 miles) Bongkot facility in Thailand for sales to Thai end-users; **Figure 9 - Pipeline 4**
- A proposal for transporting Natuna gas via West Malaysia to Arun in Indonesia is also being discussed. **Figure 9 - Pipeline 5**

In East Malaysia, there are three main potential pipeline projects:

- Bintulu MLNG II project is on the way and will connect an estimated 150-mile gas transmission line from the fields to the onshore processing facility;
- Should the MLNG III project mature and proceed, some 200 miles of gas transmission pipelines will be required to transport the offshore gas to the Bintulu processing facilities;
- Should the Sabah gas discoveries be developed, intra-field connection will require some 150 miles of gas transmission pipelines.

Country Review

MYANMAR

Myanmar will soon be a regional gas exporter as Total and Texaco develop and market their significant gas reserves from the Andaman Sea. Several major gas transmission lines from these discoveries to both onshore Myanmar and Thailand are currently planned.

Myanmar has reserves of some 145 MMbo and 10 Tcf, with corresponding production of 16 MMbopd and 160 MMcfd. All production at present is from onshore fields operated by the state oil company, Myanmar Oil and Gas Enterprises (MOGE).

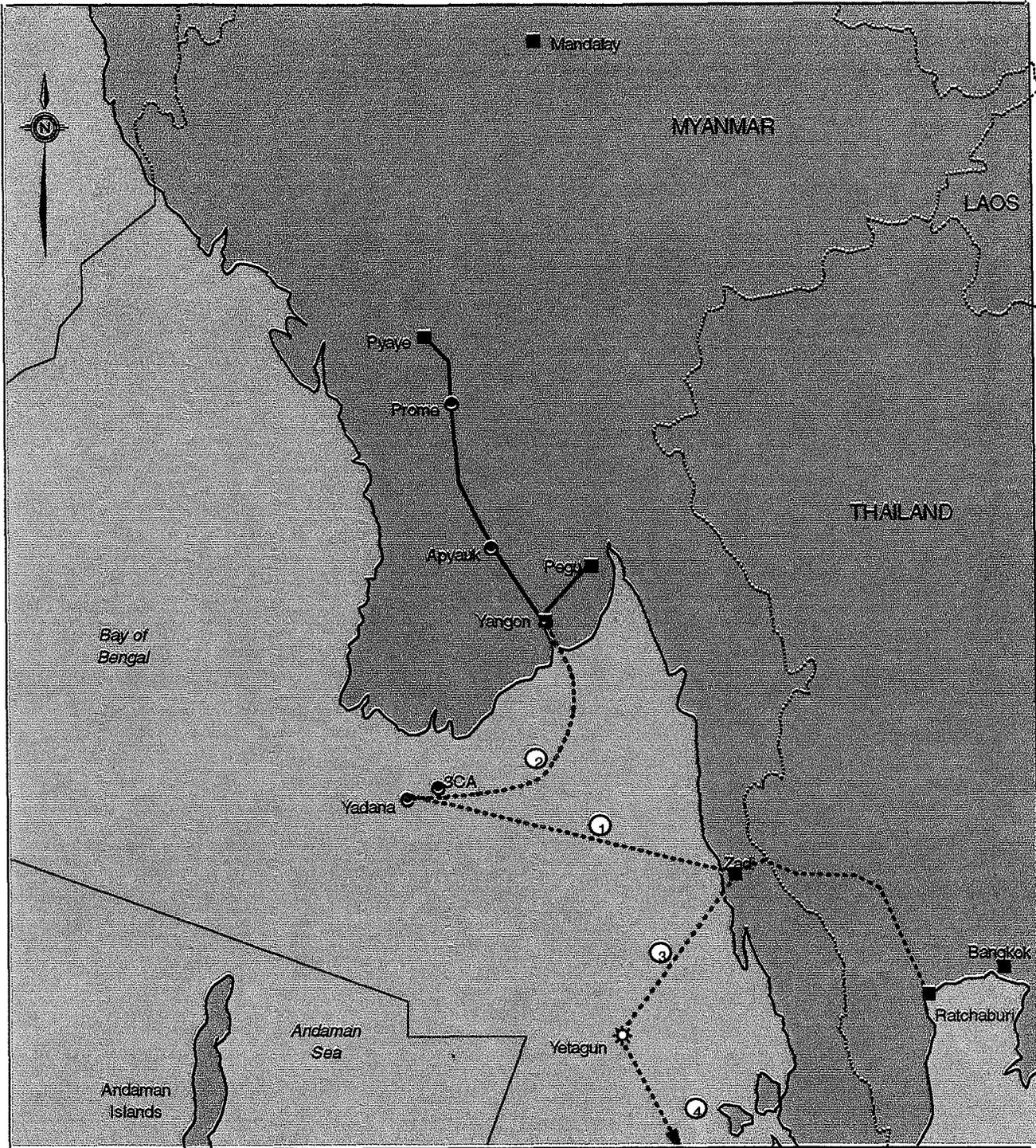
Offshore, in the Gulf of Martaban/Andaman Sea area, Total and Texaco have made significant gas discoveries, development plans for which are in progress as are gas export transmission lines to Rangoon (for domestic consumption) and to Thailand for export. These discoveries are:

Total: Yadana	reported 5.7 Tcf to be developed for domestic and export
3CA	reported 1.7 Tcf, may be developed with Yadana
Sein	tested 33 MMcfd, near Yadana
Bandamya	tested 32 MMcfd, near Yadana
Texaco: Yetagun	reported 1.5 Tcf, to be developed for export to Thailand

Natural Gas Pipeline Activities

Reported gas transmission projects for Myanmar are focused on the Gulf of Martaban/Andaman Sea discoveries to be developed in the near future. These pipeline projects are reported as:

- Yadana Field east to Heinze Island and onshore Zadi, then to Bong I Tong on the Thai border. This 215-mile, 36" pipeline will transport some 240 MMcfd and Total and MOGE have initiated this development. From Bong I Tong, PTT of Thailand has started to build a 162-mile connecting pipeline to transport the gas to the power plant at Pilok, near Ratburi; **Figure 10 - Pipeline 1**
- Also from Yadana Field is a 162-mile, 18" gas transmission line to Yangon, near Rangoon for domestic usage of the gas; **Figure 10 - Pipeline 2**
- There are two options considered for the export of the Texaco Yetagun gas;
 - A 224-mile pipeline northeast to connect with the Yadana-Ratburi line at Heinze Island/Zadi; **Figure 10 - Pipeline 3**
 - A 225-mile pipeline southeast to Ranong on the Thailand west coast, then connected to a 75-mile onshore line to end-users in this area. **Figure 10 - Pipeline 4**



LEGEND

- City / Town
- Gas Field
- ★ Gas Discovery
- Existing Pipeline
- Planned Pipeline
- - - Proposed Pipeline
- - - Maritime Boundary
- ① Pipeline Projects

To Ranong
on Thailand



**MYANMAR
Selected New Gas Pipelines**

Proj. A965 March 97 Checked: Fig. 10

Country Review

NEW ZEALAND

New Zealand recently modified its petroleum legislation and has issued new exploration permits. Current activity is centered on the Kupe and Maui Fields' production. Reserves of the country are 134 MMbo and 2.3 Tcf, with corresponding production of 33 Mbopd and 475 MMcfd.

Natural Gas Pipeline Activities

There are some reported plans for gas transmission pipelines, however, they are generally small local systems, or there is some uncertainty as to their project details.

Reported pipeline projects include:

- Ministry of Energy 145-mile, 12-20" gas transmission pipeline from Huntly to the Marsden power station near Whangare;
- Southgas Resources is planning a 62-mile system in the Invercargill area and a 112-mile system in the Dunedin area;
- Shell/BP/Todd have plans for a 276-mile gas line from the offshore Maui B platform to Taranaki.

Country Review

PAPUA NEW GUINEA

There is much discussion regarding the development of the natural gas potential of the country. Reserves are some 645 MMbo and 14.6 Tcf, with production being 100 MMbopd and only 9.4 MMcfd. The oil is produced from its inland fields and piped to the Kumul Terminal in the Gulf of Papua. However, there are several fields both onshore and offshore with significant gas reserves yet to be developed.

These undeveloped gas discoveries include:

Onshore	Hides, SE Hedinia, Lehi, Barikewan, Kuru, Bwata
Offshore	Uramu, Pasca, Pandora

In addition, new discoveries reported are:

Chevron	Moran (4.8 MMcfd - 1,900 BOPD); Paua
Oil Search	Makas

Natural Gas Pipeline Activities

There has been much discussion regarding the alternative development of options for the country's natural gas resources. LNG is the prime option, however, because of the inland location of a significant portion of the reserves, significant gas transmission pipeline will be required to transport gas to the coastal LNG site wherever it is eventually located.

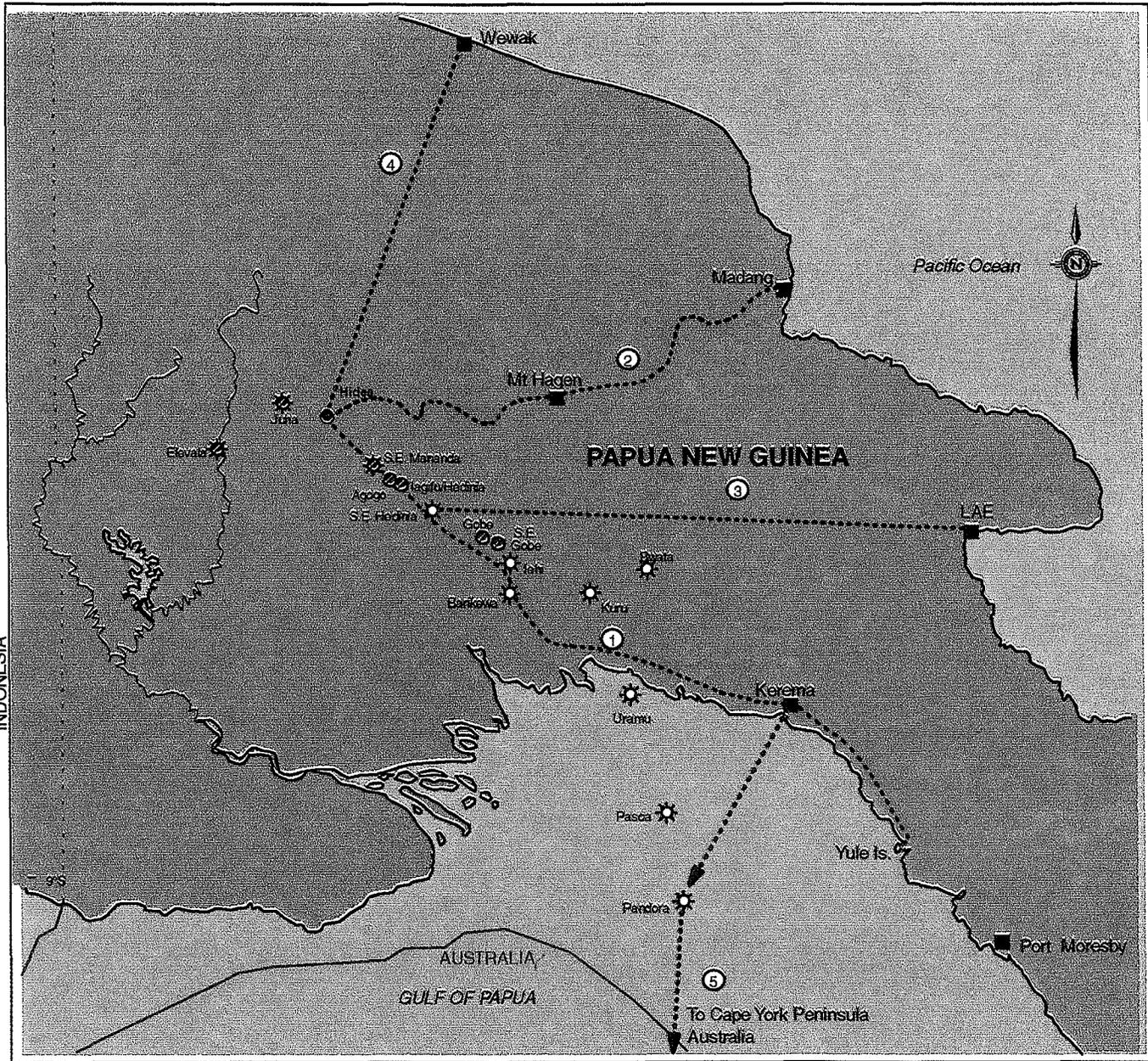
The various LNG options include:

- South, 300 miles along the existing crude line route to Kerema; **Figure 11 - Pipeline 1**
- Northeast, 200 miles to Madang; **Figure 11 - Pipeline 2**
- East, 375 miles to Lae; **Figure 11 - Pipeline 3**
- North, 150 miles to Wewak. **Figure 11 - Pipeline 4**

In all cases, severe terrain difficulties are expected due to the rugged topography and environment.

Perhaps the most logical site for the proposed LNG will be on the south at Kerema, following the existing crude line and which has best option of connecting with the offshore Gulf of Papua discoveries.

In addition to these LNG based pipelines, IPC proposed a direct pipeline gas export to Australia with a 200-mile pipeline from the Pandora Field to the Cape York Peninsula. It is also reported that Chevron may join IPC and export gas to Australia. Should this be the case, the gas pipeline from the interior highlands will follow the existing oil pipeline route to Kerema, and will require an additional 100 miles of offshore gas pipeline to connect with the Pandora facilities. **Figure 11 - Pipeline 5**



INDONESIA

AUSTRALIA
GULF OF PAPUA

Pacific Ocean

PAPUA NEW GUINEA



LEGEND	
■	Town / City
●	Gas Field
☼	Gas Discovery
☼*	Gas / Condensate Discovery
●*	Oil / Gas Field
—	Maritime Boundary
- - - - -	Proposed Pipeline
①	Pipeline Projects

PAPUA NEW GUINEA Possible New Gas Pipelines		
Proj. A965 March 97	Checked:	Fig. 11



Country Review

PHILIPPINES

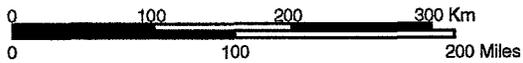
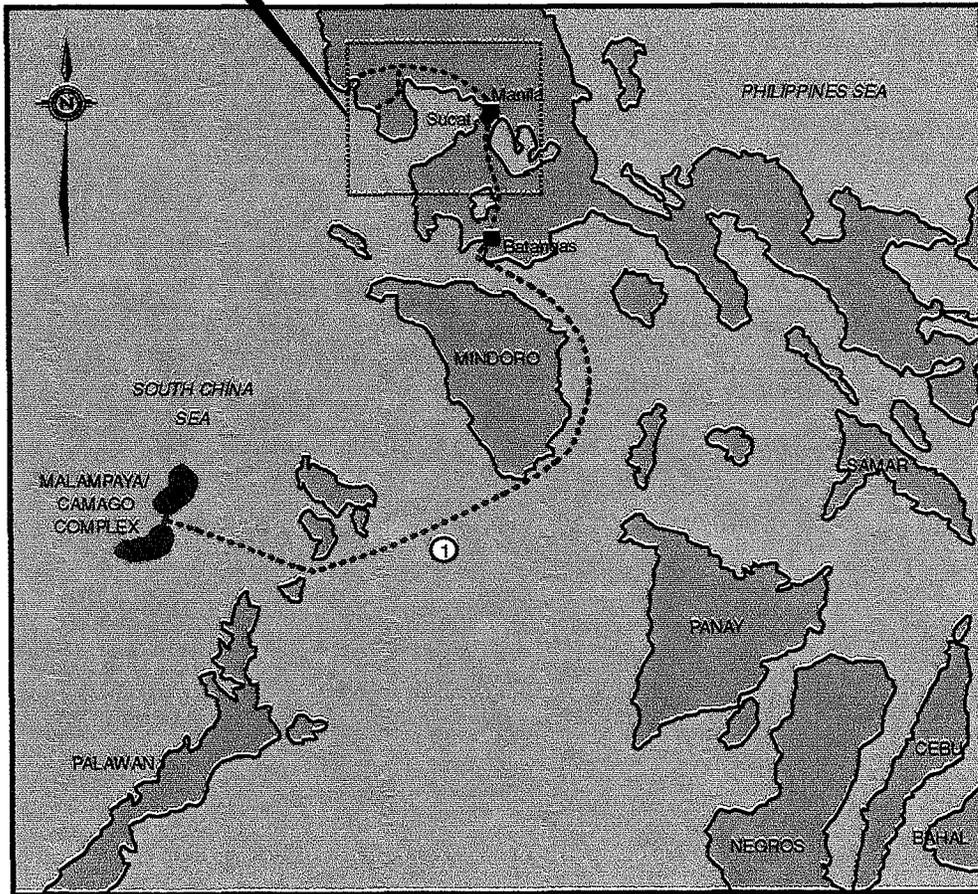
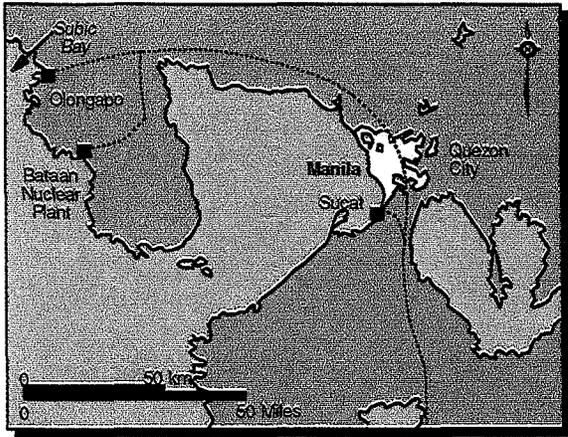
The Philippines has very little significant activity, with energy demand growing as population expands. Reserves are on the order of 300 MMbo and 5 Tcf, with production on the order of 3 Mbopd, with no gas.

The potential development by Shell of the Malampaya and Camago gas discovery is presently stalled due to price negotiations.

Natural Gas Pipeline Activities

The development of the Malampaya-Camago will require a 310-mile pipeline from the field to Batangas located on the southern portion of Luzon island. This pipeline will transport some 200 MMcfd, and plans are for it to be operational by 2000 or 2002. Figure 12 - Pipeline

1



----- Proposed Pipeline

PHILIPPINES
Possible New Gas Pipeline

Proj. A965 March 97 | Checked:  | Fig. 12

Country Review

THAILAND

Thailand has been undergoing a period of high activity, both from its own exploration activities that have resulted in several significant gas discoveries, but also as a potential importer of gas from the neighboring countries, Myanmar on the west and the JDA to the south. There has also been some discussion regarding possible import of gas from Vietnam.

Thailand reserves are about 275 MMbo and 5.9 Tcf, with production on the order of 51 Mbopd and 1 Bcfd. The most significant exploration activity is focused on the Gulf of Thailand (Pattani Trough).

The more notable new gas discoveries are:

Total	Ton Koon (near Bongkot)
Unocal	Ubon, Pailin, Trat (near Bongkot)
Maersk	Benchamas, Pakakong (25 MMcfd)
Pogo	Tantawan

In addition, from the JDA with Malaysia, there have been several gas discoveries:

CTOC Bulan (36 MMcfd), Cakerwala East (22 MMcfd), Suriya (56 MMcfd)

Natural Gas Pipeline Activities

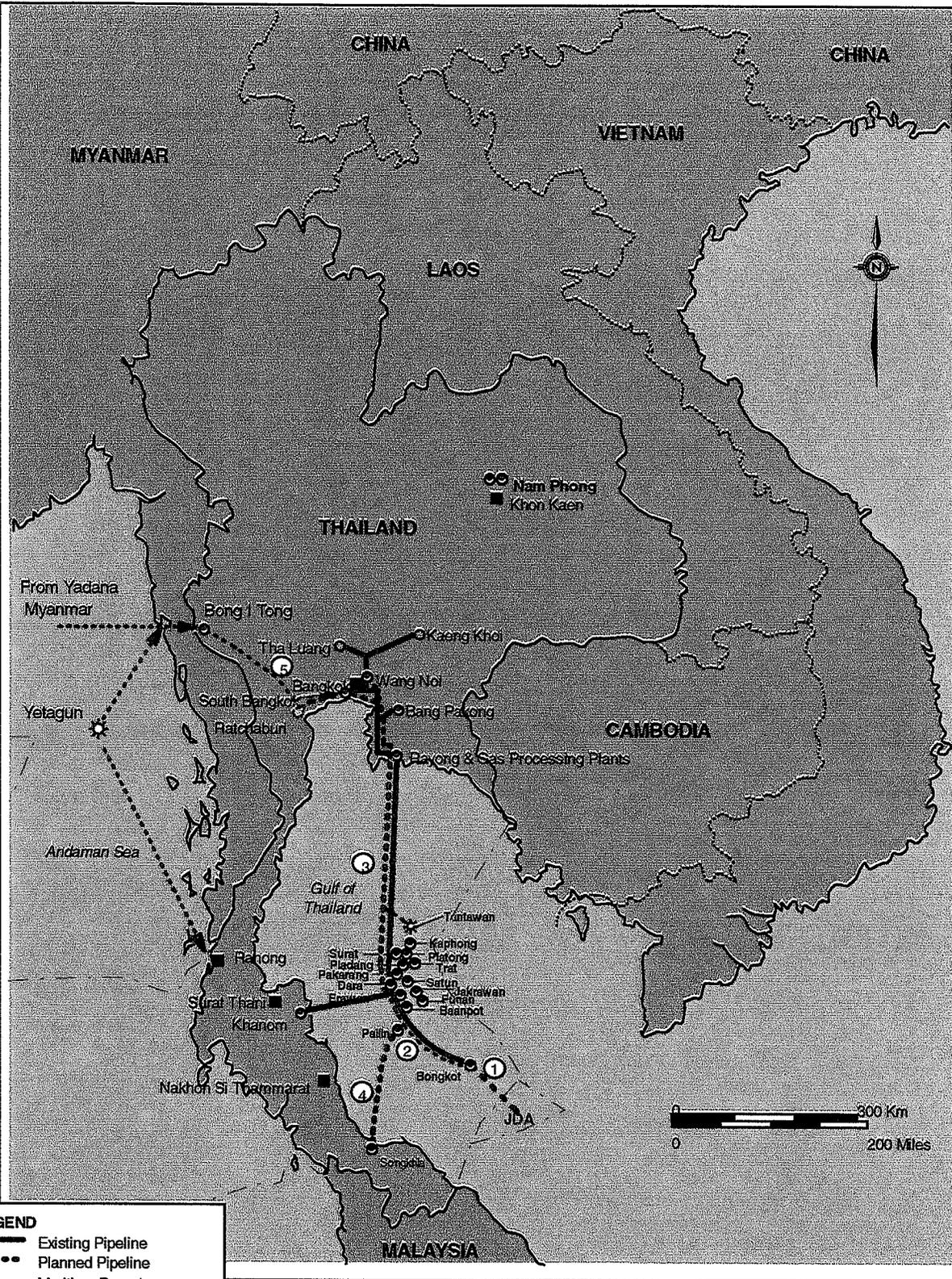
In view of the increasing gas demand and new discoveries, there are many plans for new gas pipelines in the country, both from local development, as well as from import sources.

The more significant of these PTT gas transmission pipelines are summarized as follows:

- JDA to Bongkot, 50 miles; **Figure 13 - Pipeline 1**
- Bongkot to Erawan, 110 miles, part of a 350 MMcfd upgrading of capacity; **Figure 13 - Pipeline 2**
- Erawan to Rayong, a proposed new parallel line to handle additional gas from the Pattani Trough area in the Gulf of Thailand. This pipeline will be on the order of 256-mile, 36" and will increase capacity from 850-1,450 MMcfd at a cost of US\$700 MM. **Figure 13 - Pipeline 3**

Other PTT Thailand gas pipeline proposal include:

- Palin to Songkhla, 106 miles; **Figure 13 - Pipeline 4**
- Bong I Tong to Ratburi, 161 miles onshore, connecting the import gas pipeline from Myanmar Yadana-Yetegan Gulf of Martaban Fields. **Figure 13 - Pipeline 5**



LEGEND

- Existing Pipeline
- Planned Pipeline
- - - Maritime Boundary or Thailand Boundary Claim
- ☉ Cement Plant
- ⊙ Gas-Based Power Plant
- ⊕ Proposed Power Plant
- ⊙ Gas Field
- ⊛ Gas Discovery
- City / Town
- ① Pipeline Projects

THAILAND
Selected New Gas Pipelines

Proj. A965 March 97	Checked:	Fig. 13
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4.2 FAR EAST (INCLUDING CHINA)

This region contains the high-energy users of the eastern hemisphere, and includes Japan, South Korea, and Taiwan, countries that collectively consume 76.5% of the world's LNG supply. Most LNG imports are from Indonesia, Malaysia, Brunei, and Australia, with little from Abu Dhabi and Algeria. Future potential for the importation of pipeline gas from East Russia, Central Asia, and Sakhalin could seriously compete with LNG imports in the future, however, such regional mega-gas projects are realistically only in the distant future.

China, with its vast population, is becoming an important gas user, and although it has significant natural gas resources both inland and offshore, it may become a gas importer if demand exceeds indigenous supply. In any event, because of the size of the country and the location of the gas sources relative to the populous areas along the China coastal areas, Guangzhou, Shanghai, and Beijing, significant gas pipeline projects could be developed in the future. Hong Kong will be returned to the Peoples Republic of China in July, and the economic impact of this move is uncertain, although the status-quo is expected to be retained. The successful delivery of Yacheng gas to Hong Kong was achieved. Much of China's current gas pipeline activity is focused on transporting Ordos Basin gas to the surrounding population centers, as well as the development of the offshore Ping Ho Field in the East China Basin. On a more long-term basis, there are numerous reports of potential pipeline projects for import gas from East Russia and/or Central Asia, and Turkmenistan. Such mega projects will have to overcome major economic and financial hurdles, and expectations are that realization of these projects would not be until sometime in the next millennium.

Japan, the largest importer of LNG, continues to increase its usage of natural gas. Discussions regarding the importation of Sakhalin gas continues, as well as the Trans-Japan system required to distribute this gas within the country. Current gas imports are based in several LNG receiving terminals associated with local distribution grids. Pipeline gas would require major trunklines to transport and distribute the pipeline gas if this project proceeds. It is anticipated that pipeline construction within Japan would be very expensive due to the dense population and high land cost. Alternative approaches may have to be determined to resolve these problems. Import gas from East Russia and/or Central Asia via China also are possible projects.

South Korea continues to expand its gas utilization with the completion of its local gas distribution system. LNG usage will continue to increase, and Korea would also be one of the countries that could receive export gas from East Russia or Central Asia via China, or from Sakhalin gas via Japan.

Taiwan, like the other countries of this region, is also continuing to increase its usage of LNG and has plans for a major gas transmission line connecting the south to the north of the island via an offshore subsea pipeline.

Vietnam has recently completed the initial development for its offshore oil fields, and the emphasis will now be focused on expanding this infrastructure to include other fields, including the natural gas discoveries. Current plans are aimed at the local market and/or possibly for export to Thailand.

Country Review**CHINA**

China, with its huge population and expansive territory, provides significant but, perhaps difficult, opportunities with respect to gas pipeline infrastructure development. China has some 26 prospective basins in which significant gas resources have been identified in ten basins, four of which are offshore. China reserves are reported as 24 billion barrels of oil and 59 Tcf, with corresponding production of 2.9 MMbopd and 1.6 Bcfd.

China's main onshore gas areas with significant discoveries and fields are:

Sichuan Basin	Wei yuan gas fields, a developed gas region with local infrastructure
Ordos Basin	Developing gas area
Qaidam Basin	Sebei gas fields, a developed gas area
Tarim Basin	Kosastok gas field, potential gas in area
Junggar Basin	Hu gas discovery (27 MMcfd), a new gas area
Songliao Basin	Daqing Field, a potential gas area

China's main offshore gas areas with significant discoveries and fields are:

Qiongdongnan Basin	Arco's Yacheng Field, gas sales to Hong Kong started
Yinggehai Basin	CNOOC's Dongfang, Ledong, Lingtou gas discoveries
East China Sea	CNOOC Ping Hu, Chunxaio gas discoveries
Bohai Gulf	Jinzhou gas field

Natural Gas Pipeline Activities

The 438-mile pipeline (300 MMcfd) from Yacheng to Hong Kong is now operational, as well as the 62-mile line from the field to Hainan Island. **Figure 14 - Pipeline 1**

Reportedly, there are numerous planned pipelines both on and offshore, as well as reported major import gas pipelines into China.

The following summarizes the main potential pipeline projects reported:

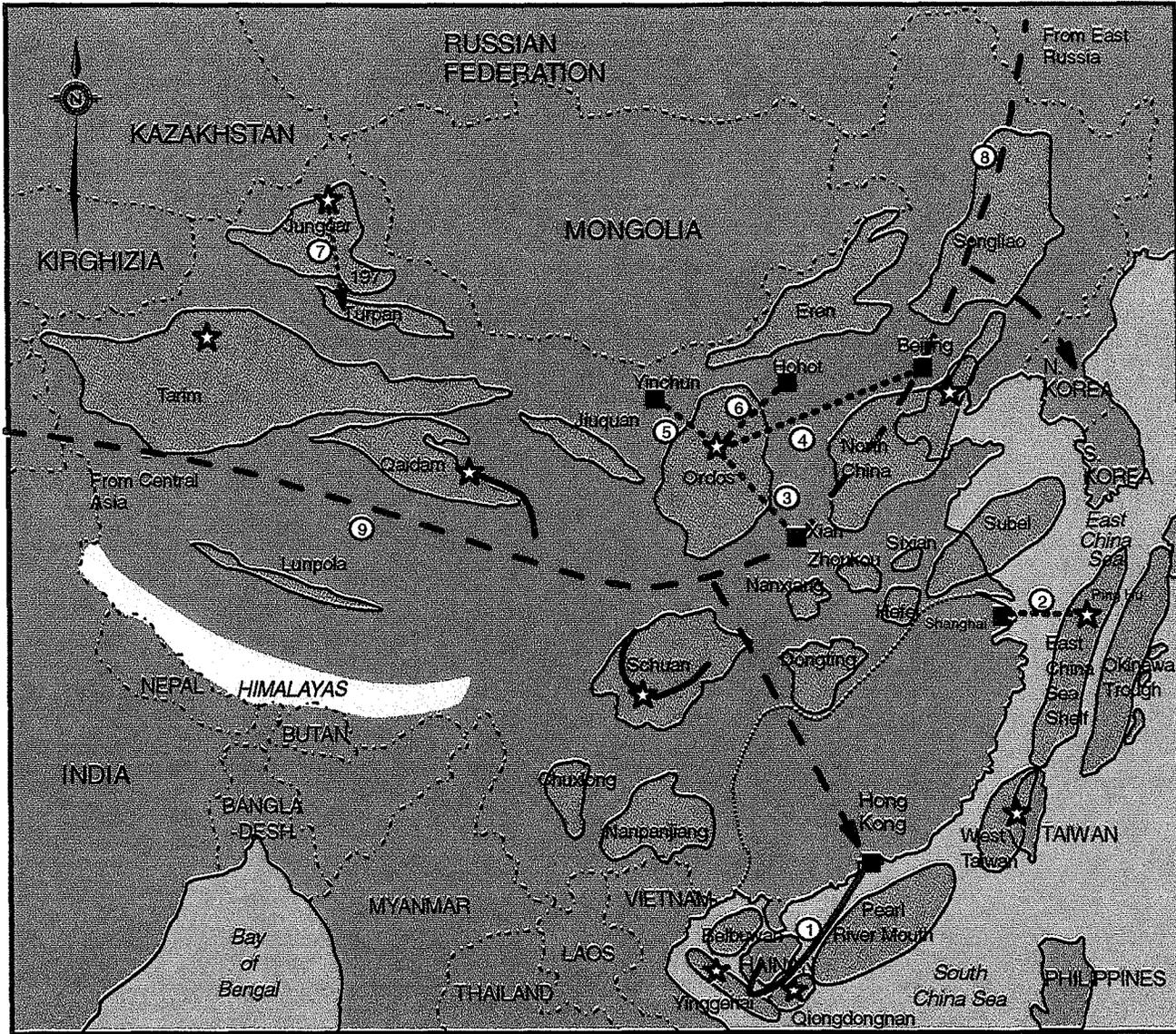
- Shanghai Petroleum Corp. 249-miles, 14" offshore gas transmission from the Ping Hu Field to Shanghai; **Figure 14 - Pipeline 2**

- CNPC

Ordos Basin to:

Xian	305-mile, 16" gas pipeline, 25 MMcfd, US\$300 MM	Figure 14 - Pipeline 3
Beijing	559-mile, 26" gas pipeline, 100 MMcfd, US\$350 MM	Figure 14 - Pipeline 4
Yinchun	204-mile, 16" gas pipeline, 100 MMcfd, US\$500 MM	Figure 14 - Pipeline 5
Hohot	372-mile, 16" gas pipeline	Figure 14 - Pipeline 6

- Connection between Junggar Basin and Turpan Basin, 194-mile, 18", 155 MMcfd. **Figure 14 - Pipeline 7**



LEGEND

- Town / City
- ★ Gas Area
- Existing Pipeline
- - - Regional Planned Pipeline
- Planned Pipeline

CHINA
Possible New Gas Pipelines

Proj. A965 March 97	Checked:	Fig. 14
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In addition to the above, hypothetical projects for importing gas from Russia in the north (Yakutsk) **Figure 14 - Pipeline 8** and/or from Kazakhstan/Turkmenistan from the east have also been reported **Figure 14 - Pipeline 9**. Such a project will require an estimated 3,750 miles of pipeline. However, such a project will be subject to tremendous political as well as economic risks between the countries involved.

An alternative consideration to supply China with gas is possibly from LNG imports. The nearby Southeast Asia region is well established as an LNG exporter, and there appears to be gas source to supply possible gas demands from China.

Country Review

JAPAN

Japan has very little petroleum resources, with reserves on the order of 55 MMbo and 800 Bcf, corresponding production is 15 Mbopd and 156 MMcfd. Japan imports over 2 Tcfy (44 MM tons of LNG) per year, mainly from Indonesia, Malaysia and Australia.

Natural Gas Pipeline Activities

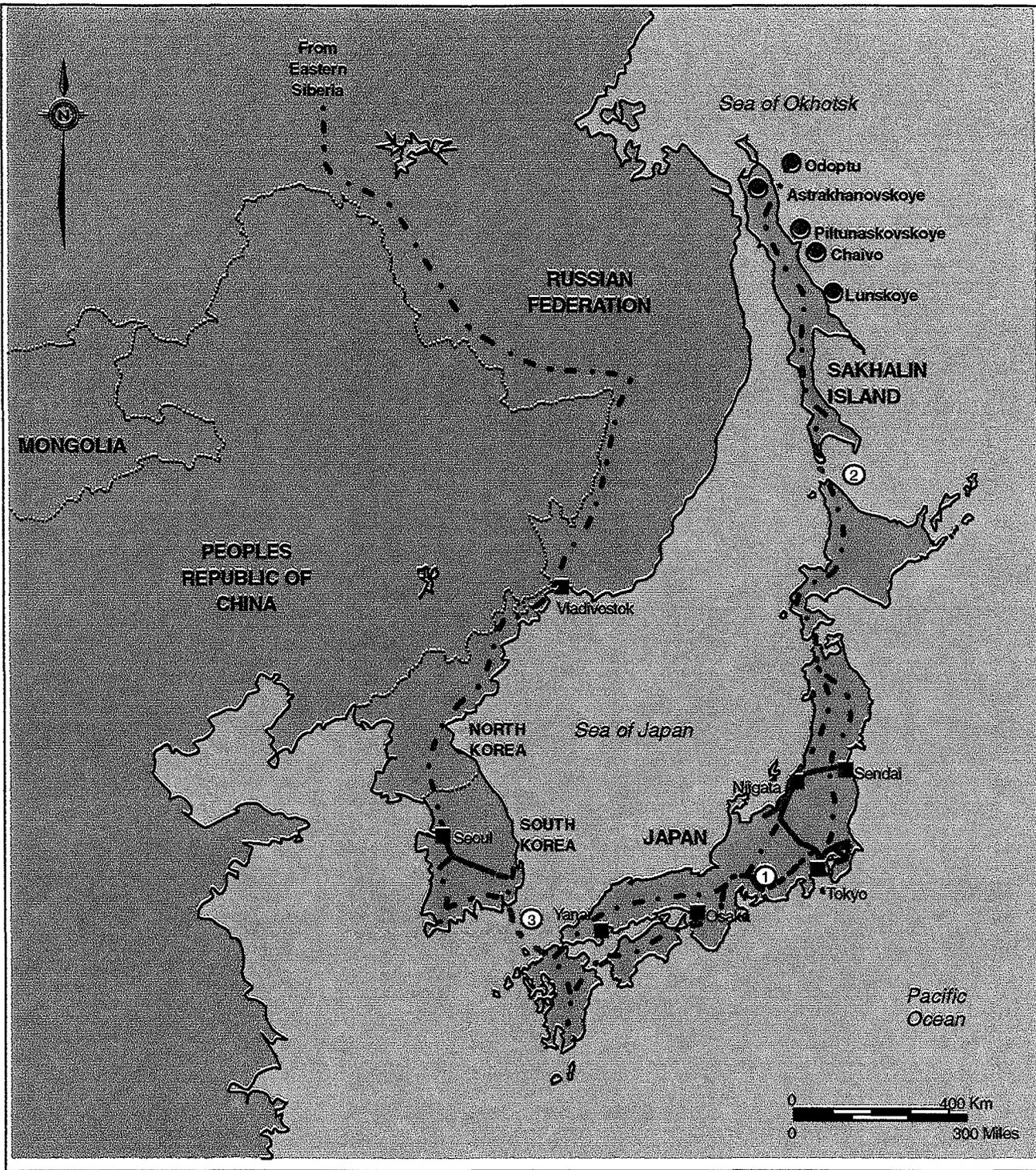
Pipeline activities considered in Japan are for local domestic distribution and for longer term import of pipeline gas, the reality of which is very uncertain at this time due to political risk and cost considerations. Within the Japanese territory, pipeline costs are estimated to be extremely expensive (US\$15 million per mile) due to high land costs, dense population and highly built-up areas, resulting in very slow progress for construction.

Domestic pipeline project considered:

- Connecting Tokyo and Osaka, 300-mile , 36" gas pipeline. **Figure 15 - Pipeline 1**

Import pipeline options considered, which would involve 1,000 plus miles and be super costly:

- Pipeline gas from Sakhalin gas areas, this will include some 1,700 miles of pipeline, including gas transmission across Japan; **Figure 15 - Pipeline 2**
- Pipeline gas imports from East Russia through China and Korea. **Figure 15 - Pipeline 3**



LEGEND	
	Existing Pipeline
	Possible Pipeline
	Proposed Pipeline
	Gas Field
	City
	Pipeline Projects

JAPAN		
Possible New Gas Pipelines		
Proj. A965 March 97	Checked:	Fig. 15

Country Review

KOREA (South)

South Korea has no petroleum resources, and exploration efforts so far have not found commercial hydrocarbons. Korea currently imports some 300 Bcfy of LNG and prospects for increasing LNG imports are high.

Natural Gas Pipeline Activities

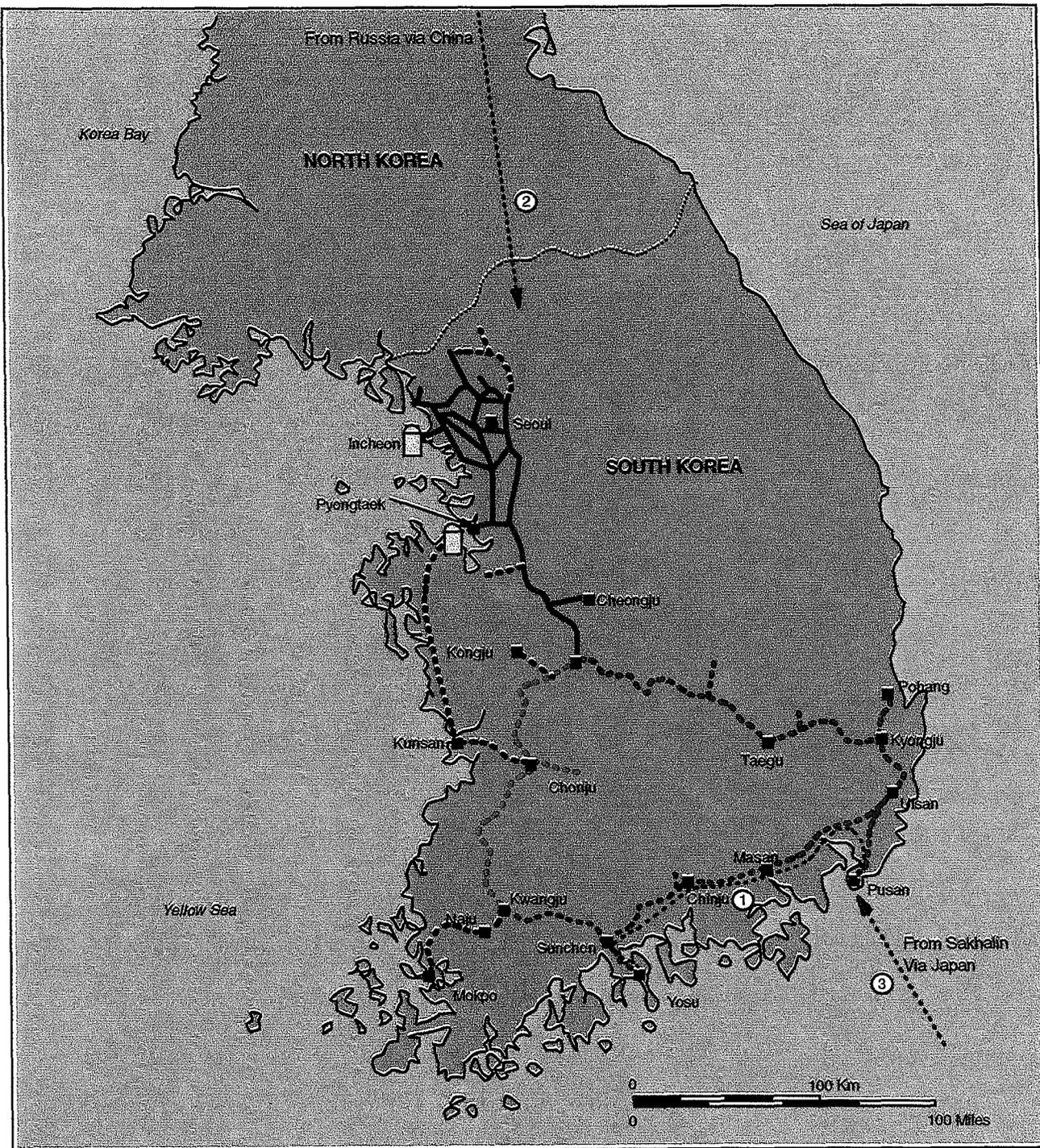
In view of Korea's increasing usage of natural gas, domestic distribution systems are being built to transport gas to end users across the country. Several hundred miles of gas transmission pipelines have been built over the recent past and only a small segment remains to be completed. In addition, there are pipeline import gas possibilities (together with Japan) of gas from East Russia and/or the Sakhalin area.

Domestic Pipeline project being considered:

- Connecting Pusan to Yosu, 150 miles. **Figure 16 - Pipeline 1**

Import pipeline options considered, which would involve 1,000 plus miles and be very costly:

- Pipeline gas imports from East Russia through China; **Figure 16 - Pipeline 2**
- Pipeline gas from Sakhalin gas area, from Japan. **Figure 16 - Pipeline 3**



LEGEND

- Existing Pipeline
- Planned Pipelines:
 - Youngnam Trunkline
 - Honam Trunkline
 - Nambu Trunkline
 - Other Pipelines
 - Planned Pipeline
- LNG Receiving Terminal
- City
- Pipeline Projects

**SOUTH KOREA
New Gas Pipelines**

Proj. A965 March 97	Checked:	Fig. 16
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Country Review

TAIWAN

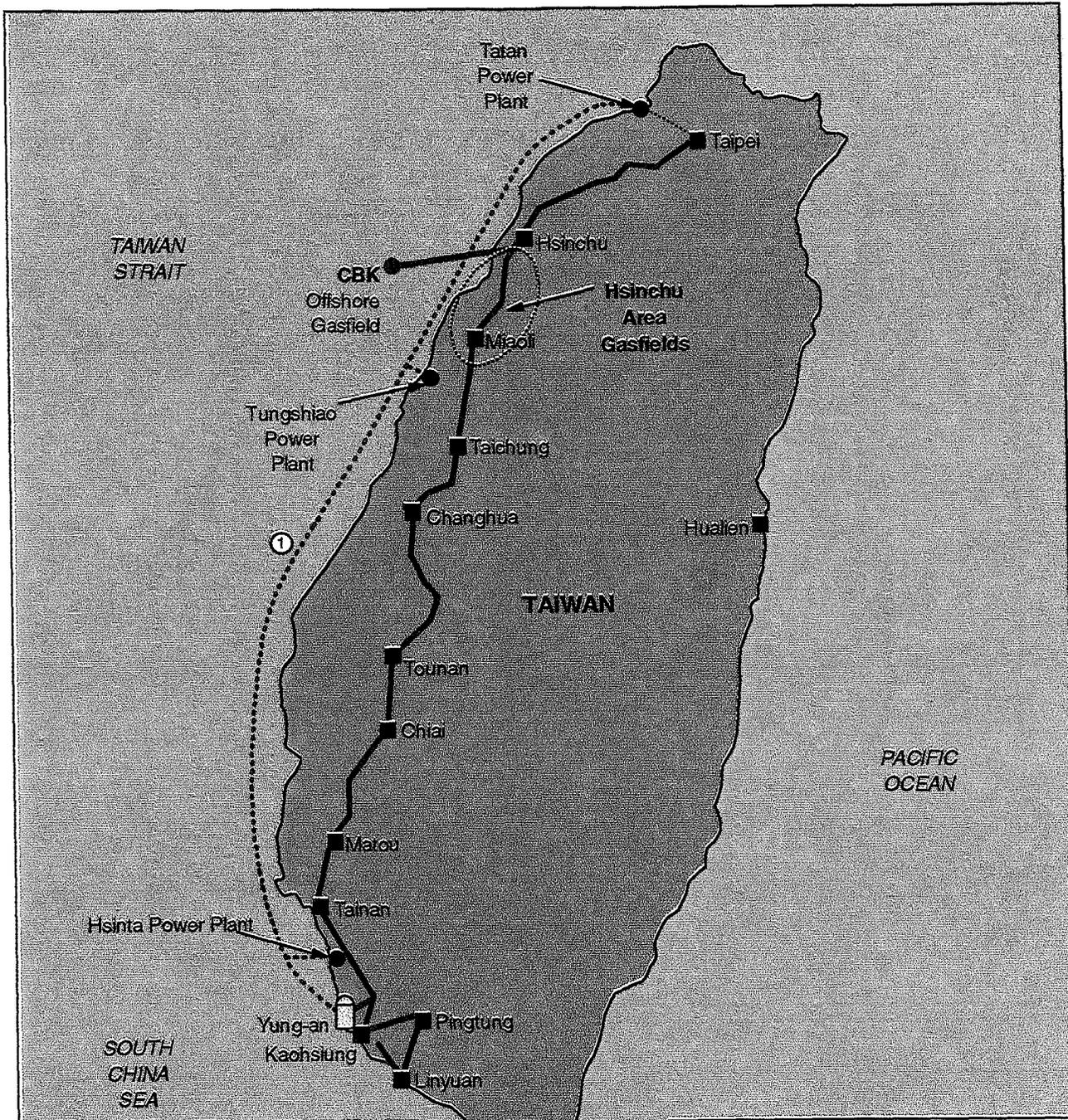
Taiwan has very little petroleum resources, and exploration efforts so far have found some gas resources and little oil. Current production is approximately 1,200 BOPD and 82 MMcfd. Gas reserves reported on the order of 2.4 Tcf. Taiwan currently imports some 120 Bcfy of LNG and prospects for increasing LNG imports are high.

Natural Gas Pipeline Activities

With increasing LNG imports, Taiwan recently upgraded its receiving terminal at Yung-an, on the southwest side of the island, and have in operation an onshore gas transmission pipeline north to Taipei. Current planning contemplates either the building of a LNG receiving facility on the north side of the island, and/or the construction of a new second gas pipeline to transport the increased gas from Yung-an to users in the northern portion of the island. This proposed pipeline will be constructed offshore and will parallel the coastline.

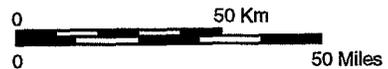
Domestic pipeline project being considered:

- CPC/Tenneco Yung-an to North Taiwan 190-mile, 24" offshore gas pipeline.
Figure 17 - Pipeline 1



LEGEND

- City
- Power Plant
- 🏗️ LNG Receiving Terminal
- Existing Pipelines
- ⋯ Proposed Pipelines
- ① Pipeline Projects



**TAIWAN
Main Gas Pipelines**

Proj. A965 March 97 Checked: Fig. 17

Country Review

VIETNAM

Activity is mainly offshore, with several significant gas discoveries being considered for development. Reserves are on the order of 663 MMbo and 4 Tcf, with production being some 173 Mbopd and 136 MMcfd.

Among the several gas discoveries that are undeveloped are:

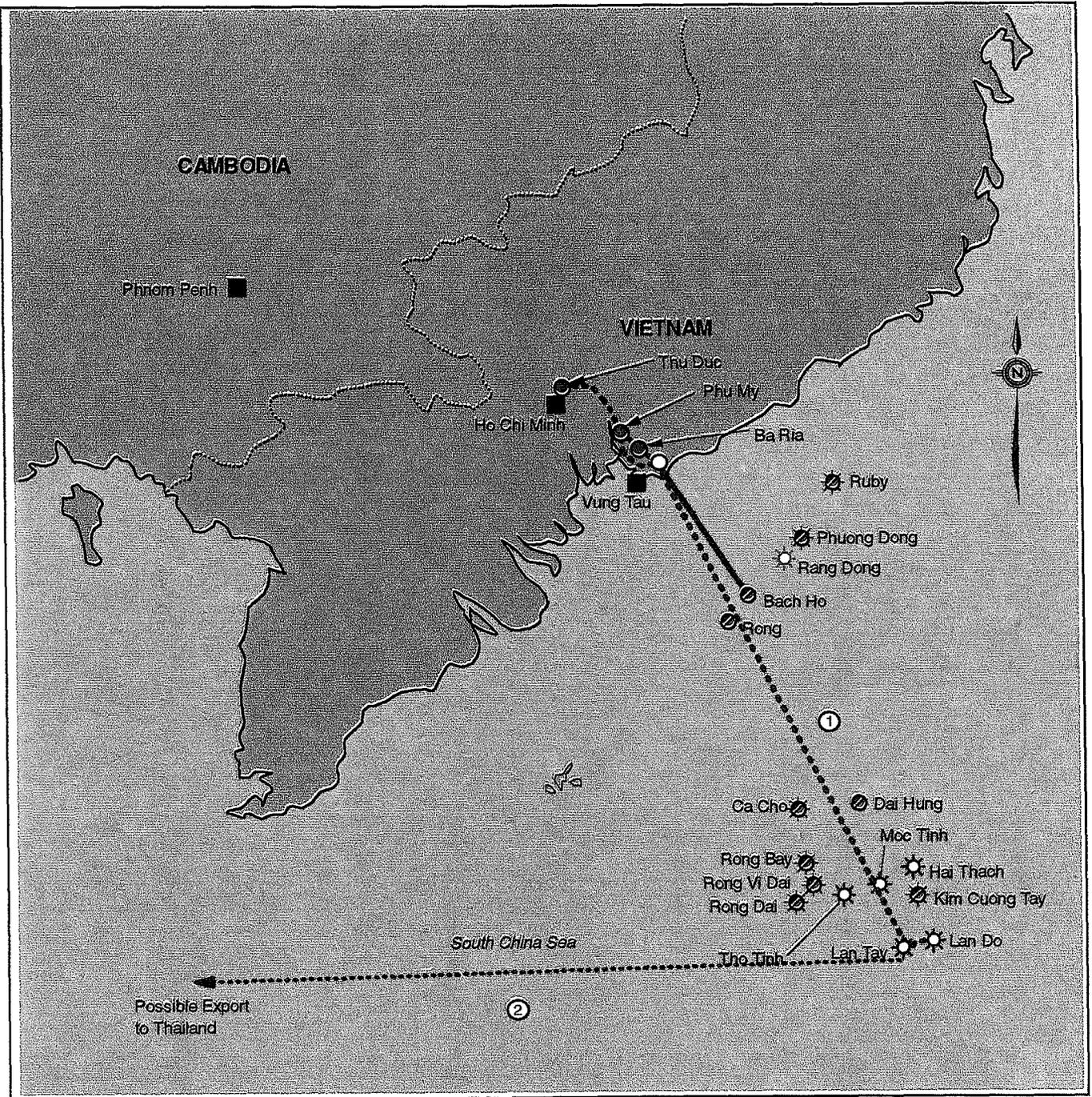
- Can. Oxy Hai Au (24 MMcfd)
- MJC Thanh Long (Blue Dragon) (22 MMcfd)
- PEDCO Rong Doi Tay (33 MMcfd)
- BP Lay Do and Lay Tay

Natural Gas Pipeline Activities

Recent commission of the oil pipeline from the Bach Ho Field to Vung Tau is now operational. Only one major gas pipeline is presently contemplated, which will transport gas from BP's Lay Tay and Lay Do and other nearby gas discoveries. This gas transmission pipeline will be some 230 miles to onshore, ultimately to Ho Chi Minh City and is expected to be completed by 1998. **Figure 18 - Pipeline 1**

An old proposal to export gas to Thailand that is under study would require a 435-mile pipeline to connect the Vietnam gas fields with the Erawan facilities in Thailand. **Figure 18 - Pipeline 2**





LEGEND

- Existing Pipeline
- Planned Pipeline
- Power Station
- Gas Processing Plant
- Gas Field
- ⊗ Oil / Gas Field
- ⊗ Oil / Gas Discovery
- ⊗ Gas Discovery
- ⊗ Oil Discovery
- City
- ① Pipeline Projects



**VIETNAM
New Gas Pipelines**

Proj. A965 March 97	Checked:	Fig. 18
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4.3 INDIAN SUBCONTINENT REVIEW

The Indian subcontinent is being awakened to the usage of natural gas, and there is much discussion regarding potential gas importation projects from regional gas-rich areas such as the Middle East, Central Asia and, to a lesser extent, Southeast Asia. This highly populated region has the potential to become a major gas consumer that could rival the volumes achieved in the Far East.

Prominent among the major regional pipeline gas projects are gas imports to Pakistan/India from Oman, Qatar, Yemen, Iran, and Turkmenistan. Recent reports suggest that the Oman and Yemen pipeline projects have had major setbacks and are for all intents indefinitely postponed. Gas pipeline projects from Iran, Turkmenistan, and Qatar remain on the drawing board. Alternative consideration for importing LNG are also being considered, and India has made some progress in this direction. LNG supply will most likely be from the Middle East, Qatar and Abu Dhabi.

Bangladesh continues to improve and expand its local gas distribution system, and there is a possibility that an export pipeline to East India may be achieved in the near future.

India, the largest country in this region with almost a billion people, is moving towards increased usage of natural gas. Current developments are focused on the Bombay High area, and future consideration is being made for regional transmission and distribution gas pipelines. India could become the first country in this region to build an LNG receiving terminal.

Pakistan continues to increase its use of the gas supply from the Lower Indus Basin. However, discussions are also continuing with regard to the importation of gas from the Middle East and Central Asia. These regional pipeline projects are considered in association with extending the pipeline to also deliver gas to India.

Country Review

BANGLADESH

Bangladesh development of its gas resources continues to be slow. Production is around 1 Bcfd with 1 Mbd of condensate. Reserves are reported to be on the order of 10 Tcf and 58 MMB condensate.

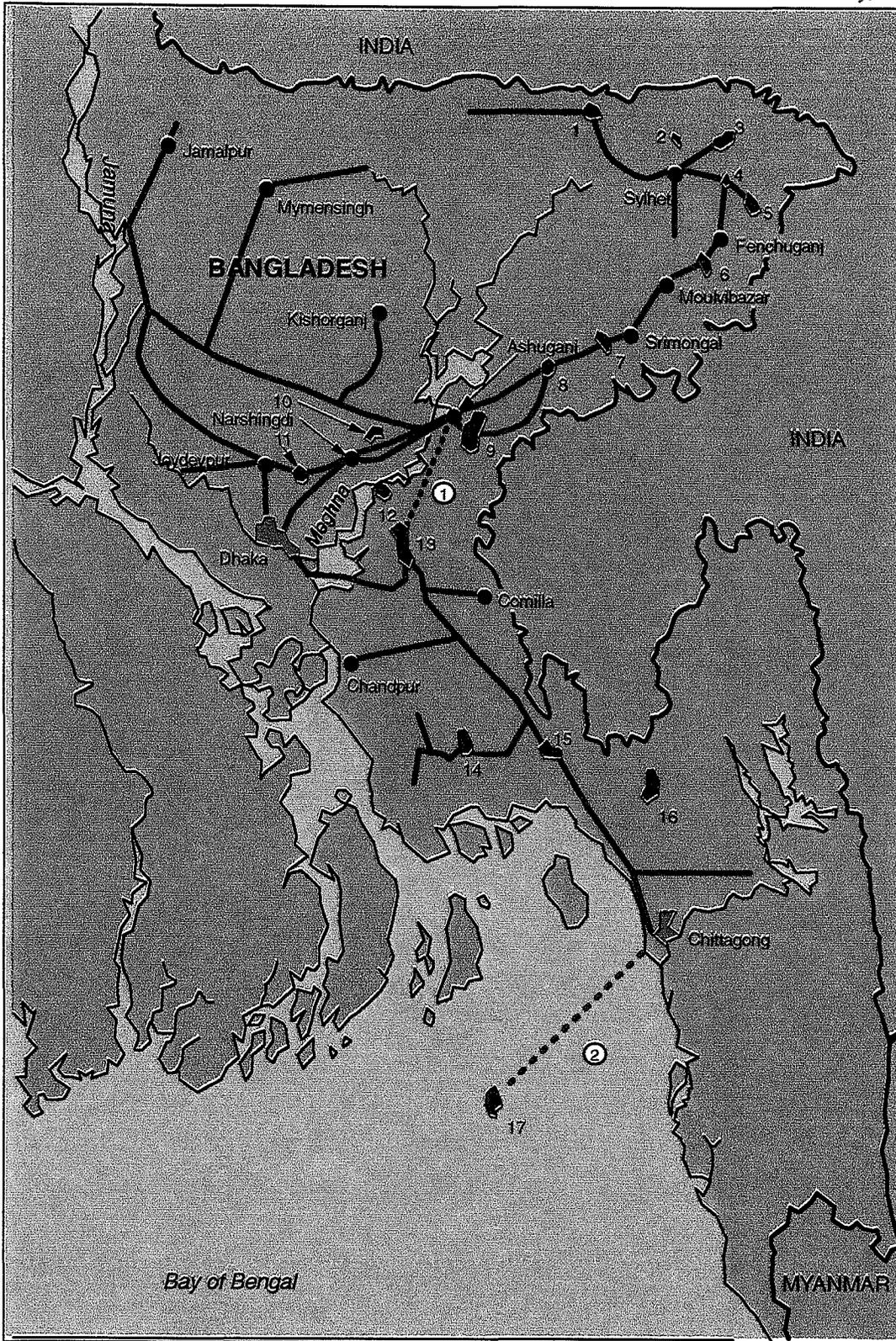
Some onshore gas discoveries, both inland on the Surma sub-basin and on the coastal Chittagong sub basin, remain to be developed. Carin's Kutubdia offshore gas discovery is also undeveloped.

Natural Gas Pipeline Activities

There is a well established gas grid onshore Bangladesh that connects most of the gas fields along the route. Few additional connections, plus addition of undeveloped fields, will require some new gas pipeline construction, the overall length of these lines is not expected to be significant. Longer-term consideration is for expansion of the gas grid to the west and northwest, which will require an additional 400 miles of pipeline.

Domestic pipeline project being considered:

- Ashuganj to Bakhradbad, 40-mile, 36" gas connection pipeline; **Figure 19 - Pipeline 1**
- Offshore Kutubdia to Chittagong, estimated 50 miles; **Figure 19 - Pipeline 2**
- Northwest expansion of gas grid, estimate 400 miles.

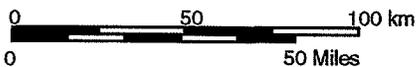


KEY TO FIELDS

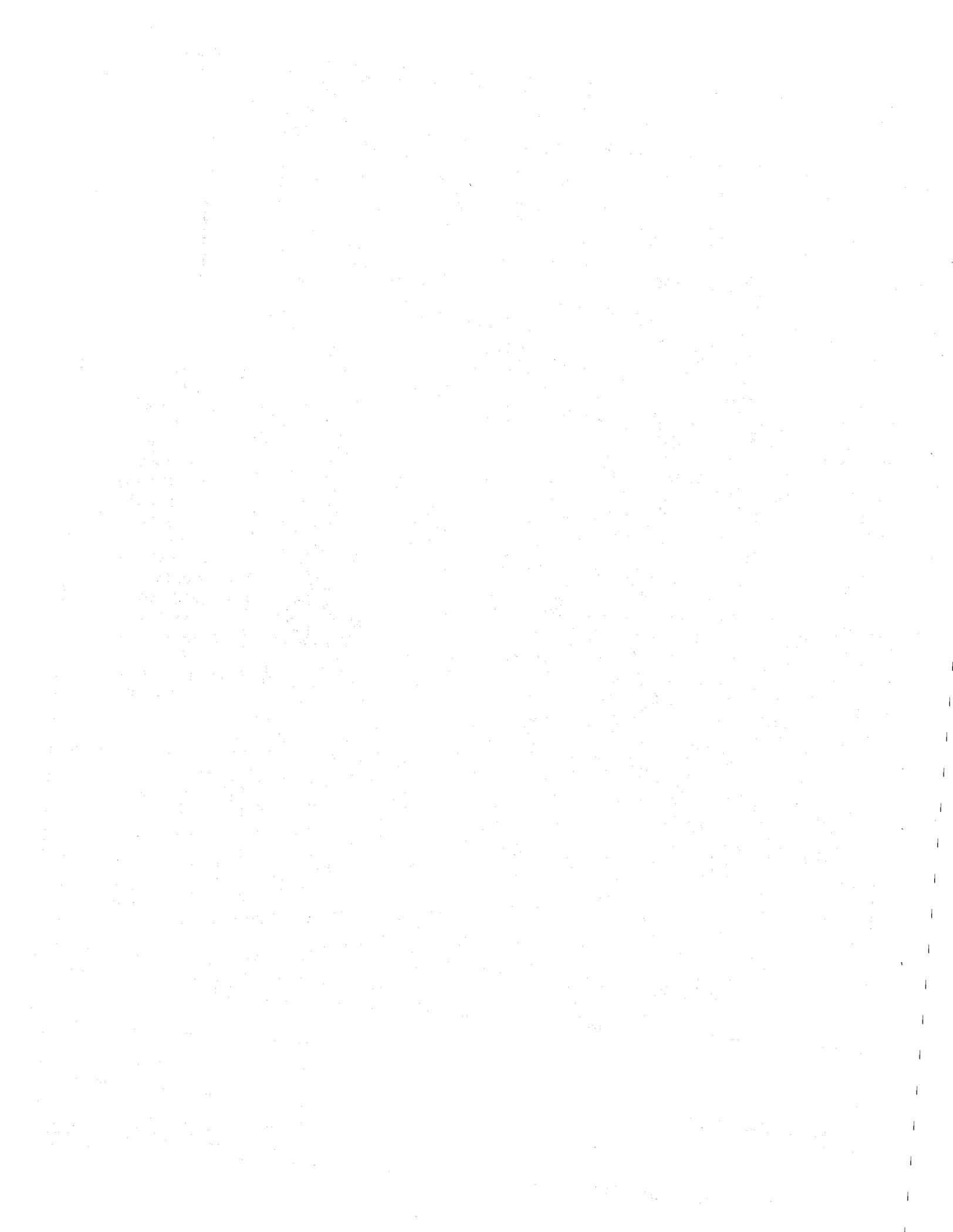
- 1. CHHATAK
- 2. JALALABAD
- 3. SYLHET
- 4. KAILASTILA
- 5. BEANIBAZAR
- 6. FENCHUGANJ
- 7. RASHIDPUR
- 8. HABIGANJ
- 9. TITAS
- 10. BELABO
- 11. KAMTA
- 12. MEGHNA
- 13. BAKHRABAD
- 14. BEGUMANJ
- 15. FENI
- 16. SEMUTANG
- 17. KUTUBDIA

LEGEND

- Town
- Field
- Existing Pipeline
- Planned Pipeline
- National Border
- Pipeline Projects



BANGLADESH
Existing and New Gas Pipeline



Country Review**INDIA**

India continues striving to attract foreign companies to assist in the development of the country's petroleum resources, however, development of its gas resources continues to be slow. Production is around 700 Mbopd and 1.7 Bcfd. Reserves are reported to be on the order of 15.8 billion barrels of oil and 25 Tcf.

There are 26 basinal areas in India, with petroleum resources established in only five areas: Bombay, Cambay, Krishna-Godavari, Cauvery Basins and the Assam/Arakan/Tripura Basins. The most significant is the Bombay High area.

Recent gas discoveries include the WO16, B27, C37, and B15 gas fields found in the Bombay High area and the Borhajan gas discovery on the Krishna-Godavari Basin area.

Natural Gas Pipeline Activities

There has been much discussion trying to establish a national grid within India, however, the realization of this concept is not likely to occur in the near future. Instead, several independent local gas grids, centered around the local gas supply areas, constitute the gas pipeline infrastructure of the country, and which will expand as supply and more end-users increase. Current pipeline activities are focused on the continued development of the Bombay High Fields, with several other minor local grid expansion gas pipelines also planned.

Bombay High pipeline project being considered:

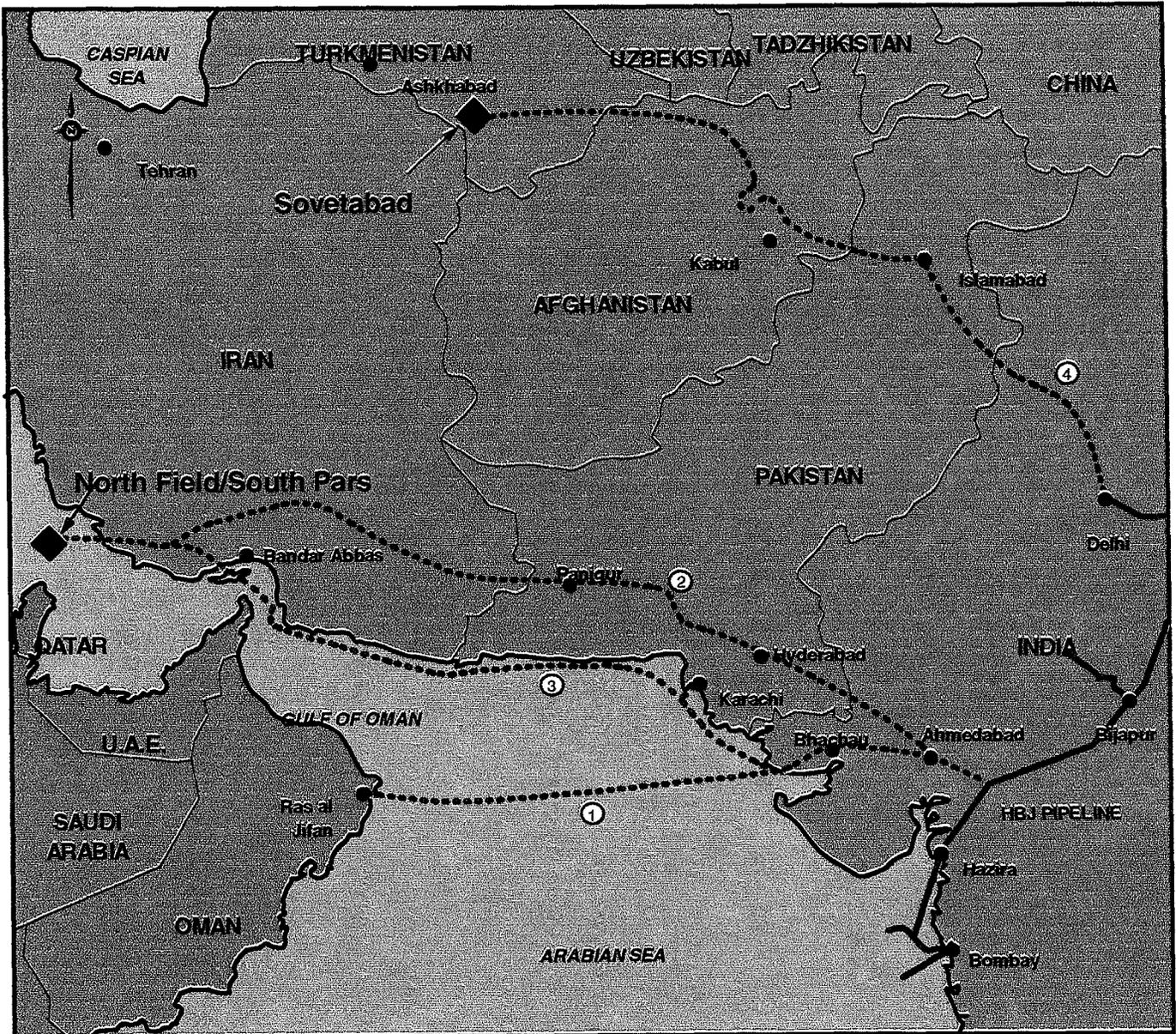
- ONGC Bombay High to Herera Field 124-mile, 20/30" gas pipeline
- ONGC Bassein Field to Hazira terminal 150-mile, 42" gas pipeline

There has also been various discussions regarding the importation of pipeline gas from available regional gas suppliers. The realization of these projects are not expected for the short or intermediate term as much discussion regarding financing and political risk assessments are made. Among these plans for gas imports are from:

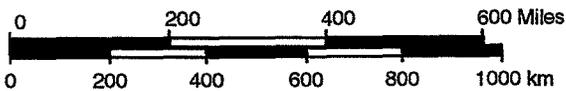
- Oman via Arabian sea subsea pipeline approx. 1,050 miles, 24"; **Figure 20 - Pipeline 1**
- Qatar (North Field) via Iran approx. 2,000 miles; **Figure 20 - Pipeline 2**
- Iran (South Pars) via subsea pipeline approx. 1,500 miles; **Figure 20 - Pipeline 3**
- Turkmenistan over land pipeline approx. 1,200 miles - Unocal; **Figure 20 - Pipeline 4**
- Bangladesh, via overland pipeline few-to-many miles depending on location
- Myanmar, via subsea pipeline Approximately 1,000 miles

As an alternative to these large-scale regional trunklines, there have also been discussions regarding LNG imports from similar regional LNG sources - Abu Dhabi, Oman, Iran and Yemen.

In the event of LNG imports, the requirement for India will be the establishment of LNG receiving facilities and a local gas distribution network. Like the regional pipeline projects, the LNG import issue is a long-term project. *An overall analysis suggests that, barring adverse economics, the LNG option may be more practical and realistic.*



APPROXIMATE SCALE



Routes

- 1 Oman - India Deep Water
- 2 Qatar/Iran - India Overland
- 3 Qatar/Iran - India Shallow Water
- 4 Turkmenistan - India Overland

LEGEND

- Existing Pipelines
- Possible Pipelines
- ◆ Major Gas Field
- ① Pipeline Projects

INDIA
Possible Gas Import Pipeline



Country Review

PAKISTAN

Pakistan petroleum activity continues mainly onshore, and several new gas discoveries are reported. Gas demand is increasing and current projections are that Pakistan could become a gas importer in the future. Production is about 57 Mbopd and 1.8 Bcfd. Reserves are reported to be on the order of 174 MMB of oil and 27 Tcf.

There are two main basins in Pakistan, the Indus and the Baluchistan Basins, with petroleum resources established mainly in the Indus Basin. The Indus Basin itself is subdivided into four sub-basins as follows:

Kohat	Northeast portion of Upper Indus Basin, a mainly oil producing area;
Potwar	Main portion of the Upper Indus Basin, a mainly oil producing area;
Sulaiman	Upper portion of the Lower Indus Basin is the main gas producing area;
Kirthar	Lower portion of Lower Indus Basin is an oil and gas producing area.

Union Texas is the major foreign operator in Pakistan and together with OGDC (state oil company) operates most of the oil and gas fields in Pakistan.

Recent gas discoveries, all onshore, will most likely be tied to the existing infrastructure include:

OGDC	Chak 5, Dim South (9.4 MMcfd), Buzdar, Panairi
UTP	Zaur, Makhdumpur, Khorewah
Tullow	Charo, Chachar
OMV	Miano, Kunddahu

Natural Gas Pipeline Activities

Pakistan already has a developed onshore gas transmission system which links the main producing areas to the major end-users and cities. Several expansion works are expected to continue, as well as incorporation of new gas fields into the system.

Significant reported pipeline systems, including potential regional import gas pipelines, are summarized as follows:

- Sui Northern Gas Pipelines Sui to Multan, 203-mile, 30" gas transmission loop; **Figure 21 - Pipeline 6**
- Various Onshore connections (grid expansion and new fields tie-in).

Regional pipeline gas import routes, the Pakistan and India include:

- Qatar to Pakistan 1,000-mile, 1.6 Bcfd, onshore across Iran. There are various options for such a line, parts of which may be on and offshore; **Figure 21 - Pipeline 1, 2 and 3**
- Oman to Pakistan 1,000-mile, 48", 1.6 Bcfd; **Figure 21 - Pipeline 4**
- Turkmenistan to Pakistan 1,000 miles across land; **Figure 21 - Pipeline 5**
- Iran to Pakistan 1,000 miles estimated

Country Review**IRAN**

Iran has an abundance of petroleum resources, with reserves of 88 billion barrels and 742 Tcf, second only to Russia in gas reserves. Iran's production is some 3.6 MMbopd and 6.4 Bcfd.

Iran's gas resources are located mainly along its southwest coastal and Arabian Gulf offshore region. Iran does not export any gas, however, within recent years, there have been discussions regarding the exportation of gas from Iran, as well as providing right-of-way for export gas from neighboring FSU states (Turkmenistan). It is anticipated that in the future natural gas will play a more significant role in Iran's petroleum export portfolio.

It should be noted that Iran is still the subject of U.S. sanctions and, as such, financing or participation in Iranian projects has been difficult to achieve.

Natural Gas Pipeline Activities

- **NIGC** Dalan to Marun Fields' 212-mile, 30", a planned gas pipeline for a major gas injection project in the Marun oil field. First phase is expected to cost some US\$400 MM and is targeted for a 1997 completion;
- **Governments** A 40" gas line from the Turkmenistan Korpedzhe Field is being constructed to tie into the Iran gas pipeline systems in northern Iran. The mileage of this pipeline is unknown; **Figure 22 - Pipeline 1**
- **Governments** Turkey's gas company, Botas, has initialed an agreement for the import of gas from Iran. Plans call for the delivery of some 200 MMcfpd by 1999 or 2000, increasing to nearly 1 Bcfd by the year 2020. The full scope of this project is to extend the export pipeline to Greece, incorporating a total distance of some 4,000 miles, with a reported estimated cost of US\$10 billion. The Iranian portion of the pipeline is estimated to cost some US\$800 million, which will be difficult to finance due in part to U.S. sanctions; **Figure 22 - Pipeline 12**
- **Governments** A US\$3-10 billion project for an export gas pipeline between Iran and Pakistan, involving some 1,060 miles of pipeline from Iran's offshore South Pars gas field to Pakistan. There is also discussion regarding the extension this pipeline to India, increasing the overall length of the pipeline to 1,242 miles. An agreement between India and Pakistan has not been achieved at this time. This project is being considered by several international oil companies, and the leading contender is BHP. Other interested companies reported are British Gas, Shell, and Gaz de France. **Figure 22 - Pipeline 2**

The Iranian and Turkmenistan governments made an agreement last year that will permit the export of gas from Turkmenistan to Europe via Iran. This plan calls for some 2,485 miles of gas pipeline, of which 900 miles are within Iran.

5. MIDDLE EAST AND AFRICA

5.1 MIDDLE EAST

The Middle East contains some 30% of the world's natural gas resources, the exploitation of which have been mostly dedicated to supporting oil production activities or used as feedstock for its petrochemical industry. Recent projects, however, have focused more on the export gas potential, both in terms of LNG or as pipeline gas to the Indian subcontinent and to southeast Europe.

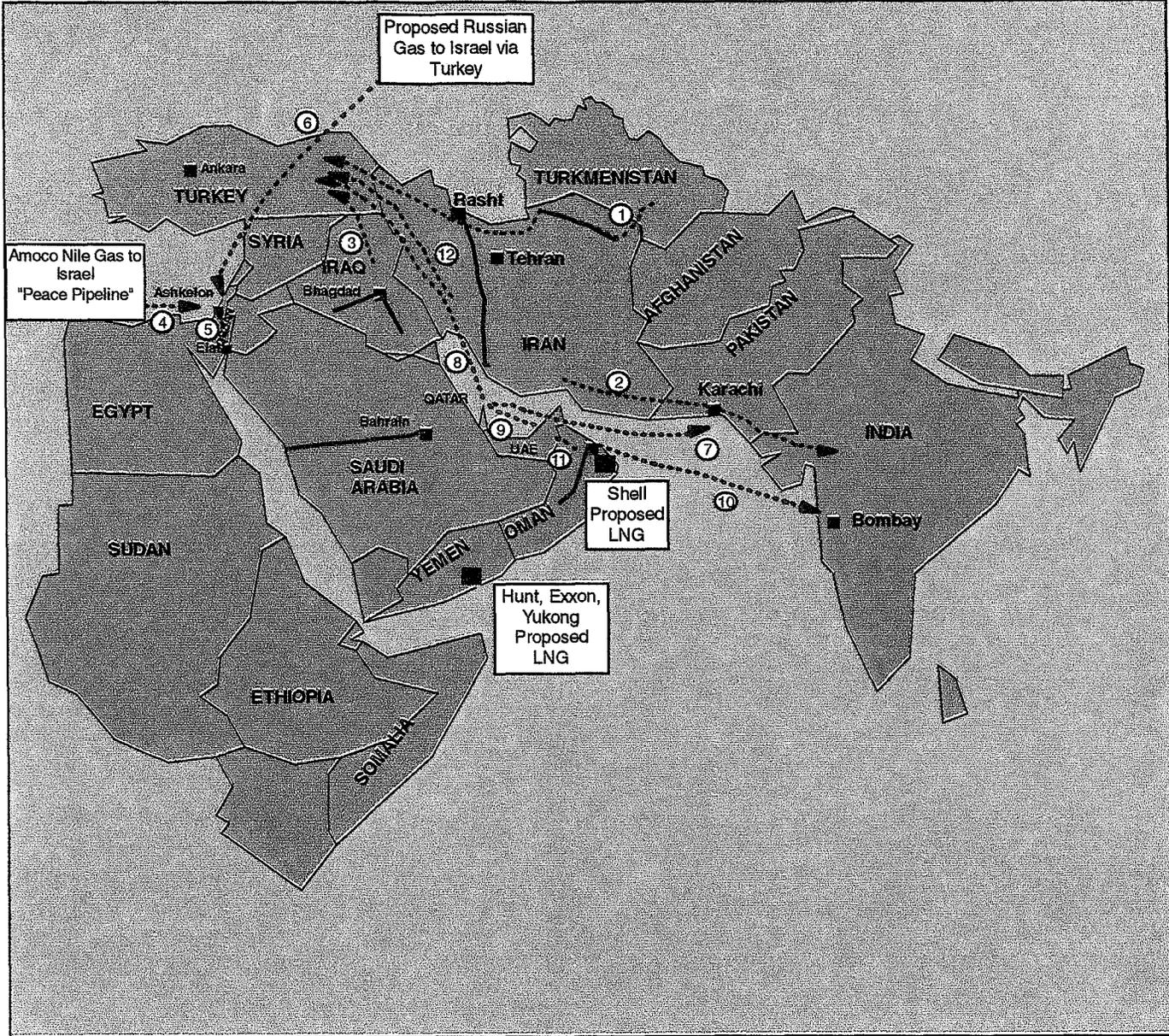
Iran has the largest natural gas resource base in this region. However, present political sanctions have limited major development of its gas resources. Present considerations include major regional export gas projects to Greece on the west and to Pakistan/India on the east. These projects will involve several thousand miles of pipeline. However, financing of these ventures is uncertain. In addition, there are plans to connect the gas pipeline system with those of the neighboring gas-rich Turkmenistan who plans to export its gas to Europe via this Iranian connection.

Iraq continues to face UN sanctions, with little gas pipeline activity at present. There is some discussion regarding an export gas project with Turkey.

Israel continues to move forward with its peace process, and is contemplating development of a national gas distribution system. Discussions are being made regarding the importation of gas from Egypt on the west, and possibly from Russia via Turkey on the north.

Oman is trying to develop its natural gas resources and it now looks like the long discussed Oman-to-India gas pipeline project will be postponed indefinitely. However, progress has been made regarding export gas to neighboring Sharjah. Shell is reportedly making progress regards its proposed LNG project.

Qatar continues to seek ways to develop its huge North gas field, particularly with numerous LNG projects being discussed. However, export pipeline gas projects also continue to be reported, among them are pipeline projects to Pakistan on the east, to Europe on the west, and also to neighboring Dubai.



LEGEND
 ——— EXISTING GAS PIPELINE
 PLANNED or UNDER CONSTRUCTION PIPELINE

**MIDDLE EAST
 Selected New Gas Pipelines**

Proj. A965 March 97 | Checked: | Fig. 22

Country Review

ISRAEL

Israel does not have significant oil and gas resources, and with peace treaties between Egypt and Palestine, there has been serious discussion regarding the importation of pipeline gas from Egypt and other neighboring countries.

Natural Gas Pipeline Activities

Amoco, Agip and EGPC plan to sell gas from the Nile Delta area to Israel via the "Peace Line" and current plans call for the construction of an export gas pipeline from Port Said to Israel, a distance of some 150-200 miles. Initial deliveries contemplated are some 250 MMcfd, and could increase to 600 MMcfd as the gas market expands. **Figure 22 - Pipeline 4**

On the Israeli side, plans to construct an internal pipeline distribution system, including a feeder system to the Dead Sea are contemplated. These will be some of the projects that are linked with the Middle East peace process. It is reported that several U.S. and western European engineering and design companies have submitted bids for this project. The design phase is expected to be completed by early 1997. It has also been reported that there is a plan to build a 323-mile gas pipeline from Eilat in the Gulf of Aquaba to Ashkelon on the Mediterranean coast. However, with the most-likely source of gas from the Nile Delta, this latter pipeline would be part of the internal gas distribution system referred to above. **Figure 22 - Pipeline 5**

In a separate development, there has been reported a plan to sell gas to Israel proposed by a consortium comprised of Russia's Gazprom, Turkey's Botas, TransCanada Pipelines and Israeli partner, Del-Men. This proposal is to sell some 575 MMcfd of gas to Israel and will require a 300-mile gas pipeline from southern Turkey to Israel via the Mediterranean Sea. This project will be an extension of the proposed pipeline from Russia to Turkey. The consortium claims that gas can be delivered by 1999. Negotiations are continuing between the consortium and the Israeli government. **Figure 22 - Pipeline 6**

Country Review

IRAQ

Iraq has abundant petroleum resources, located mainly in the northeastern provinces. Iraq's reserves are some 100 MMbo and 110 Tcf, with its sanctioned imposed production of only 560 Mbopd and 330 MMcfpd. Iraq does not export any natural gas.

Iraq is presently under U.S./UN sanctions and, as a result, pipeline activity is limited.

Natural Gas Pipeline Activities

In view of the current sanctions against Iraq, only one significant gas pipeline project has been reported. Iraq has agreed to discuss the potential of exporting gas to Turkey. This US\$2 billion project calls the delivery of 1 Bcfd of gas through 850 miles of gas transmission pipelines. Figure 22 - Pipeline 3

Country Review

OMAN

Oman has been active in trying to market its petroleum resources, including gas. Oman's reserves are some 5.1 billion barrels and 25 Tcf, with current production of 850 Mbopd and 650 MMcfd. Oman exports very little of its gas production, however, there are numerous plans for major gas export projects in the future.

Natural Gas Pipeline Activities

The much-discussed Oman-to-India pipeline proposed by Oman Petroleum Development is now postponed, and expectations for this US\$4 billion project that will lay some 700-900 miles of 24" gas pipeline from Oman across the Arabian Sea to India may not be realized. Problems associated with the projects included concerns for adequate supply of gas and major technological problems to lay the pipe over the difficult sea floor. **Figure 22 - Pipeline 10**

There is an agreement between Oman and Amoco for the delivery of some 1.2 MMcfd of gas from Oman's central gas fields to Amoco's gas plant in Sharjah. This project will involve some 300 miles of 36" pipeline at a cost of some US\$2 billion. Amoco will use this gas to continue supplying its customers in the UAE where they are the largest supplier. **Figure 22 - Pipeline 11**

In other Oman news, there is progress regarding the Shell proposed Oman LNG plant. Plans for this 533 MMcfd complex (4 MMty) will require some 230 miles of gas gathering pipelines between the Saih Rawl Fields and the LNG site at al Ghalilah. Engineering contracts were awarded last November.

Country Review

QATAR

Qatar has the third highest gas resources in the Middle East, most of which are located in the gigantic North Field. Qatar's reserves are some 3.7 billion barrels and 250 Tcf, with current production of 500 Mbopd and 1.8 Bcfd. Qatar does not export any natural gas at this time, however, several gas export projects, both pipeline gas and LNG, are in progress.

Natural Gas Pipeline Activities

The main development activity in Qatar at this time is the work associated with the proposed LNG developments on the North Field. With respect to pipeline activity, the significant projects are major inter-regional export pipelines from Qatar. The main export gas destinations presently reported are:

- **Qatar to Pakistan** Gulf South Asia Gas Co., a consortium of Crescent Oil, TransCanada, Itochu, and Brown & Root is proposing a 1,000-mile, 48" export gas pipeline from Qatar to Pakistan; **Figure 22 - Pipeline 7**
- **Qatar to Europe** A plan to export Qatar gas to Europe via Turkey has been rumored, but details are not available. It is believed that Turkey's Botas and Shell are the sponsors of this project, which will include some 1,200 miles of gas pipeline; **Figure 22 - Pipeline 8**
- **Qatar to Dubai** Arco is reportedly proposing a Qatar-to-Dubai, 225-mile pipeline to deliver 300 MMcfd. **Figure 22 - Pipeline 9**

5.2 AFRICA

Africa's natural gas pipeline activities are focused mainly on its gas-rich countries in the north, with isolated projects planned for the rest of central and south Africa. Export gas to Europe was increased with the completion of the Magreb Europe pipeline from Algeria to Spain and there are discussions regarding the proposed "Peace" pipeline for the export of gas from Egypt to Israel.

Algeria is very active regarding gas pipeline projects, but is under attack by Algerian Islamic fundamentalists. The highlighted activity is the completion of the Magreb Europe gas pipeline which will export gas to Spain via Morocco. Several significant domestic trunk transmission pipelines are presently contemplated.

Egypt continues to have exploration success and has significantly increased its natural gas resources. Major developments regarding its gas resources on the Western desert and offshore Nile Delta are contemplated, the latter could be aimed at exporting to Israel.

Libya, under U.S. sanctions, has little gas pipeline activity, most significant related to extension of its internal trunk transmission system.

Morocco, with little gas resources, has limited gas pipeline activity, most significant is the recent completion of the Magreb-Europe pipeline from Algeria to Spain which passes through this country.

Tunisia has some plans for the expansion of its domestic gas distribution system.

In the rest of Africa, mainly central and south African countries, there are significant but isolated gas pipeline projects aimed at exploiting some of the gas reserves of the area.

In west central Africa, the proposed Bonny LNG in Nigeria continues to stall due to lack of firm markets. A West Africa project to deliver gas from Nigeria to Togo and Ghana is currently planned.

In southeast Africa, Madagascar has plans to develop its Manambolo gas field, and Mozambique is planning to develop its Pande gas field which is planned to supply gas locally to Maputo and for export to Johannesburg in South Africa. Further north on Africa's east coast, Tanzania plans to develop the Songo Songo gas field, which calls for a gas pipeline to Dar es Salaam.

In southwest Africa, Namibia plans for its Kudu gas field may involve local usage, as well as possible export to Cape Town in South Africa.

Country Review

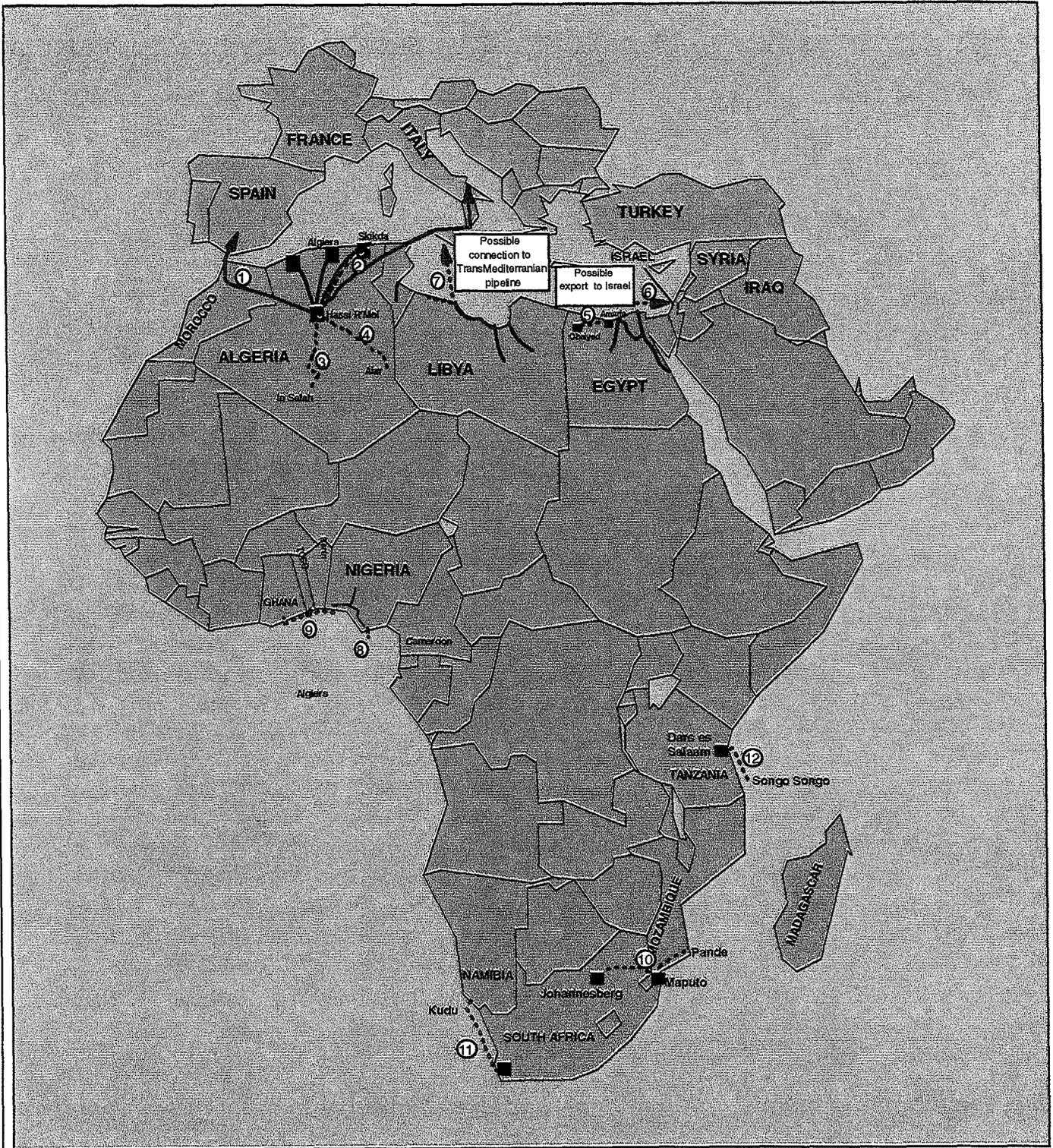
OTHER MIDDLE EAST

The remainder of the Middle East countries, although with significant petroleum resources, has relatively less gas pipeline activity mainly because they already have significant gas pipeline infrastructure developed. However, for some of these countries, continuing development will require gas pipelines and transmission systems.

Natural Gas Pipeline Activities

For the other Middle East countries, the following are summaries of the main highlighted gas pipeline projects:

- | | |
|--------------|--|
| Abu Dhabi | ADNOC has several local intra-field gas pipeline connections; |
| Saudi Arabia | Aramco is carrying out improvements to the Master Gas System and has plans for a forth gas plant. Some US\$600 MM is budgeted for additional gas pipeline linking the major components of this facility; |
| Yemen | Proposed Hunt Oil, Exxon, Yukong US\$3 billion LNG project discussed. Planned capacity is 5 million tons/year. |



LEGEND
 ——— EXISTING GAS PIPELINE
 - - - - - PLANNED or UNDER CONSTRUCTION PIPELINE

AFRICA		
New Gas Pipelines		
Proj. A965 March 97	Checked:	Fig. 23



Country Review

ALGERIA

Algeria, located on the southern Mediterranean Sea, is a major pipeline and LNG gas exporter to western and southern Europe. Algeria has tremendous hydrocarbon resources, with some 10 billion barrels of oil and 128 Tcf. Production is reported at 1.2 MMbopd and 12.9 Bcfd, of which some 3.1 Bcfd is exported. Algeria has its LNG facility in the coastal city of Skikda and has a gas export pipeline to Italy (TransMediterranean pipeline) and recently extended to Spain/Portugal (Magreb-Europe pipeline).

Algeria gas resources are located on the central (Hassi R'Mel), south central (In-Salah) and southeast sections of the country.

Algerian Islamic militants have threatened and carried out attacks on petroleum operations in the country.

Natural Gas Pipeline Activities

There are several significant gas pipeline construction presently active in Algeria, among them are:

- **Magreb Europe Pipeline**

This recently completed (fall 1996) 860-mile, US\$2.2 billion pipeline will transport gas from the Hassi R'Mel gas field and gas pipeline hub to Spain and Portugal via Morocco and the Gibraltar Straits. The Algerian portion of this pipeline, comprising some 330-mile, 48" pipeline connects Hassi R'Mel to Berguent on the Moroccan border. This pipeline is expected to have a capacity of 1 Bcfd, but will initially carry only about 300 MMcfd. Future expansion of this system to export gas to France and Germany is under consideration; **Figure 23 - Pipeline 1**

- **Hassi R'Mel to Skikda**

Sonatrach is presently constructing this 356-mile, 42" gas pipeline which is expected to be completed by year-end 1997. This pipeline is expected to cost some US\$200 MM; **Figure 23 - Pipeline 2**

- **In-Salah to Hassi R'Mel**

BP has an agreement to develop the In Salah Field in southern Algeria and plans are for the construction of a 356-mile, 42" gas pipeline to deliver gas to the Hassi R'Mel gas pipeline hub, where the gas may be sold into the Magreb-Europe system. The inclusion of the In Salah Field may help alleviate gas supply concerns to meet Algeria export commitments. This project is expected to start in December 1997; **Figure 23 - Pipeline**

3

- **Tiguentour to Hassi R'Mel**

Sonatrach is considering the construction of a 324-mile, 42" pipeline that will connect these fields. However, this project would be an alternative if the In-Salah to Hassi R'Mel project fails to materialize. The Tiguentour Field is enroute of the In-Salah to Hassi R'Mel pipeline;

- **Alar to Hassi R'Mel**

Sonatrach and BP are considering this 345-mile, 48" pipeline to collect gas from Alar and other fields in this eastern area near the Libyan border. This line will parallel existing pipeline. Figure 23 - Pipeline 4

Country Review

EGYPT

There is an increasing importance of gas in Egypt, and plans call for a significant jump in domestic gas consumption to 1.9 Bcfd by the year 2000, and 2.8 Bcfd within the next decade. Egypt has substantial petroleum resources, with reserves of 3.9 billion barrels of oil and some 22 Tcf of gas. Corresponding production is 920 Mbopd and 1.5 Bcfd.

Egypt's gas resources are found in all its important petroleum areas, the Western Desert, the Nile Delta, and the Red Sea. Recent gas discoveries in the Nile Delta by Amoco, and in the Khalda area (Shell and Apache) have spurred the interest in gas development in the country.

Natural Gas Pipeline Activities

The most significant domestic gas development is the gas resources in and around the Khalda concession, including Shell's Obaiyed gas discovery, as well as Apache's fields in the area. This development will connect these fields with the existing gas grid and supply gas to the 640-mw power plant at Amaria. This proposed system will be a 200-mile gas pipeline, with an estimated combined 465 MMcfd from both suppliers. **Figure 23 - Pipeline 5**

Because of the gas discoveries in the Nile Delta and other areas, there has been consideration of expanding the domestic gas grid. Details of this proposal have not been released.

In a related development aimed at developing the country's gas resources, is a plan to export gas to neighboring Israel. Amoco, Agip and EGPC plan to sell gas from the Nile Delta area to Israel via the "Peace Line" and current plans call for the construction of an export gas pipeline from Port Said to Israel, a distance of some 150-200 miles. Initial deliveries contemplated are some 250 MMcfd, and could increase to 600 MMcfd as the gas market expands. Portions of the Egyptian gas would also be export to the newly established Palestinian areas. **Figure 23 - Pipeline 6**

In other activity, the Petroleum Pipeline Company (Egypt) has several localized minor gas pipeline projects under construction or planned.

Country Review

LIBYA

Libya, located on the southern Mediterranean Sea, is a modest LNG gas exporter to Spain. Libya has tremendous hydrocarbon resources, with some 30 billion barrels of oil and 45 Tcf. Production is reported at 1.3 MMbopd and 1.2 Bcfd, of which some 142 MMcfd is exported as LNG to Spain.

Libya continues to be under U.S. sanctions, but European companies Agip, Repsol and OMV are active in the country. There are several potentially significant gas development projects possible.

Natural Gas Pipeline Activities

There is little activity regarding gas pipeline projects in Libya, however, some discussions are reported that may result in firm gas pipeline plans in the future, among them are:

- Possible linkage with the TransMediterranean gas pipeline to Italy, details unknown; **Figure 23 - Pipeline 7**
- A 417-mile gas pipeline linking Misratah and Knoms;
- Pipelines associated with the development of the Attahadi gas discovery (reported 10 Tcf).

Country Review

MOROCCO

Morocco, located on the southern Mediterranean Sea, has negligible oil and gas resources. Of main significance at present is the construction of the Magreb Europe gas pipeline which passes through the country.

Natural Gas Pipeline Activities

- **Magreb Europe pipeline** This recently completed (fall 1996) 860-mile, US\$2.2 billion pipeline will transport gas from the Hassi R'Mel gas field and gas pipeline hub to Spain and Portugal via Morocco and the Gibraltar Straits. The Moroccan portion of this pipeline, comprising some 340-mile, 48" pipeline connects with the pipeline from Hassi R'Mel at Qujada near the Moroccan boarder to the Straits of Gibraltar, where it crosses into Spain. This pipeline is expected to have a capacity of 1 Bcfd, but will initially carry only about 300 MMcfd. There is consideration for future expansion of this system to export gas to France and Germany.
- **ODEP** 120-mile, 14" and 24" gas transmission pipeline is under study.

Country Review

NIGERIA

Nigeria, located on the west coast of Africa, has significant oil and gas resources, with reserves on the order of 20 billion barrels and 110 Tcf. Six major operators in the country, both onshore and offshore, are Shell, Mobil, Chevron, Agip, Elf and Texaco, with Shell being the largest. Current production is on the order of 2.0 MMBopd and 3.3 Bcfd. Of main significance is the proposed US\$4.5 billion Bonny LNG plant scheduled to be constructed. However, another setback was experienced late last year when ENDL canceled its contract to purchase Nigerian LNG. This negative action could further stall the realization of this LNG project.

Nigeria's gas resources are found mainly on the Niger Delta, onshore along the coast and offshore.

Natural Gas Pipeline Activities

There are two main proposed gas pipeline activities reported:

- Gas pipeline associated with the proposed Nigerian LNG project, reported to be 126-mile, 20" and 36"; Figure 23 - Pipeline 8
- Regional gas distribution pipeline between Nigeria, Ghana, and Togo. These three countries recently signed a pact to form the West Africa Pipeline company that will supply gas to local power plants. Reported cost for this pipeline project is some US\$230 MM. It is noted that Chevron (Nigeria) also reported planning a 524-mile gas pipeline from its offshore Eservos Field to Ghana. Figure 23 - Pipeline 9

Country Review**OTHER AFRICA**

The remainder of the African countries have relatively less petroleum resources, and their gas pipeline activity is correspondingly reduced. However, for some of these countries, emerging exploration activity may lead to the development of some gas pipeline transmission systems.

Natural Gas Pipeline Activities

The following are summaries of the main highlighted gas pipeline projects:

Angola	Several local minor intra-field gas pipelines;
Ghana	Part of the West Africa Pipeline system planned to transport gas from Nigeria to Togo and Ghana;
Madagascar	A 220-mile gas pipeline is planned to transport gas from the offshore west Manambolo Field to the mainland;
Mozambique	Enron is considering a 565-mile, 16" and 24" gas transmission pipeline from the coastal Pande Field to Maputo and to Johannesburg in South Africa. In addition, two laterals of 380 miles and 340 miles may be needed to reach industrial areas; Figure 23 - Pipeline 10
Namibia	Shell is planning to develop its Kudu gas discovery and pipe the gas to shore with a 75-mile, 25" system. Shell is also planning to build a 342-mile gas transmission pipeline from its Kudu Field to Cape Town in South Africa; Figure 23 - Pipeline 11
Tanzania	Ocelot Energy is planning a 136-mile, 18" gas pipeline from its Songo Songo offshore discovery to Dar es Salaam; Figure 23 - Pipeline 12
Tunisia	Societe Tunisienne de l'Electricite et du Gaz is building a 148-mile gas pipeline from Gabes to Msaken for power generation.

APPENDIX

Europe Region

Company	Country	Miles*	Diam. Inches	Location (from)	Destination (to)	Status	Completion	Contractor	Notes
Gazprom	Albania			Russian port of Tuapse under the Black Sea	to Trabzon in Turkey	Planned			From Turkey gas will be delivered to Greece, Macedonia, and Albania
OMV	Austria	93		Puchkirchen, Austria	Burghausen, Germany	Completed			This link brings gas from Russia via Slovakia and Austria to Germany. The pipeline has 2 strands capable of moving 8 bil cu meters/y.
Wingas	Belgium	140		Zeebrugge, Belgium	Aachen, Germany	Planned			Will transmit 1 bil cu meters of gas
Amerada Hess	Denmark			South Arne field	Kaegard, Danish Coast	Planned			Will transport 4 billion cu meters per/year with estimated costs of \$260-430 mm
	Finland			Helsinki to Copenhagen, Denmark	Berlin, Germany	Planned			
	Finland			Haltenbanken, offshore Norway through	Sweden north of Stockholm to Helsinki	Planned			
Gasum	Finland			Russia	Finland	Planned			Gasum plans to double the capacity of the pipeline with costs estimated at \$160 million
Neste Gas	Finland	160	20	Finland	Gaule, Sweden	Planned			
Gaz Du Sud-Ouest	France	110	32	Toulouse-Lias	Narbonne-Argeliers	Planned	1997		
Gaz de France	France	115		Dunkirk	Goumay sur Aronde	Planned			Estimated costs will be \$211 million
RuhrGas AG	Germany	87	36	Breitbrunn/Schnaitsee	Anwalting	Under constr.	1997		JV with Bayerngas GmbH.
OMV	Germany			Punchkirchen, Austria	Burghausen, Germany	Completed	1996		Austrian Bavarian Gasline (ABG) has 2 strands with a capacity of 8 bcm/y
	Germany	398		Emden, North Sea	Karlsruhe	Completed			Midal Pipeline System should be completed in 2 years
RuhrGas	Germany	125	48	Wardenberg	Werne	Completed	1995		
	Germany			Denmark	Germany	Completed	Oct 1996		Expansion was completed for the Deudan Gas Pipeline
	Germany			Soest	Lippstadt	Completed	1997		The additional 220 km stretch to Aachen is to be completed by autumn 1998
iazprom and Wintershall	Germany	186		Bielefeld, Germany	Aachen, near Germany Belgium border	Planned			Wingas Pipeline System. The Wedal pipeline will connect with the 1200 km Medial/Steagal pipeline system
Wingas	Germany			Marseille, France French Border	Karlsruhe, Germany	Planned			
Wingas	Germany	186	30	North Rhine, Germany	Westphalia, Germany	Planned	1997		
Wingas	Germany			Basle, Switzerland	Karlsruhe	Planned			
Public Gas Corporation of Greece	Greece	342	30	Kula, Greek-Bulgarian Border	Athens to Lavrion	Planned			Natural gas transmission and and distribution system including an LNG reception terminal with high pressure that will import gas from Russia
	Ireland			North Ireland	South Ireland	Planned			A Feasibility Study has been designed to link the two together. The project has been put on hold until March 1997
SNAM SpA	Italy	84	42	Montesano	Palagiano	Under constr.	1997	Snamprogetti SpA-Engr.	This is a new pipeline
SNAM SpA	Italy	924	26/48	Mazara del Vallo	Minerbio (Bologna)	Under constr.	June 1997	Snamprogetti SpA-Engr.	Algeria/Italy Transmediterranean Gas Pipeline expansion. This is the Italian section
Gazprom	Macedonia			Russian port of Tuapse under Black Sea	to Trabzon in Turkey	Planned			From Turkey the gas will be delivered to Greece, Macedonia, and Albania
	Macedonia	124	30	Skopje, Macedonia	Deve Baira, Albania	Planned	2000		
	Macedonia	103		Kriva Palanka, Bulgaria	Skopje, Macedonia	Under Const			Estimated costs of \$66 million with a capacity of 0.8 Bcm/y
	Netherlands			Nogat Line	L Block	Planned			This pipeline will extend the Nogat Line northward to increase capacity
Statoil, Asgard	Netherlands	295		Aasgard Fields	Statpipe gas Trunkline, then to a gas treatment plant in Norway	Planned			Haltenlink, Aasgard Fields (Smoerbukk, Smoerbukk South, and Midgard)
Gasunie	Netherlands			UK	Europe	Planned			They are studying the possibility of a second UK to Europe Pipeline that would supply Russian gas to the UK. This could be viable in the next ten years
Statoil	Netherlands	395	40	Karstoe, Norway	Emden, Germany	Planned	1997		Europe II will run parallel to the Europe I with estimated costs of \$1.1 billion
Statoil	Netherlands	186	40	Sleipner Field	Kollsnes, Norway	Planned			Zeepipe IIB will carry 16.5-18 Bcm/y with costs estimated at \$340 million
Statoil	Norway	522	42	Draupner	Dunkirk (Dunkerque), France	Planned		McDermot	NorFra. Pipeline

Statoil	Norway	507	40	Kollsnes	Draupner	Under constr.	1997		Phase IIB
Statoil	Norway	155	16	Heidrun	Tjeldbergodden	Under constr.	1997	European Marine Contractors	Haltenpipe
	Poland	418		Bovankovo and Kharasavei gas fields, Yamal Peninsula	Western Europe	Under constr.			JV with Gazprom of Russia
	Poland			Szamatuly, Poland to	Frankfurt an der Oder, Germany	complete	1996		The 75 mile section of the Yamal to Europe Pipeline will cost \$184 mm and deliver 600 million cm/y with an additional 340 mile segment under construction
	Portugal	330	28	Setubal, Portugal	Braga, Portugal	Under Const			In this pipeline includes 100 miles of branchline distribution system with gas coming from Algeria via the Europe-Maghreb system
Gazprom	Slovenia	186		Hungary across Slovenia	into Italy	Planned			The annual land rent will be \$50 million
Empressa Nacional De Gas SA	Spain	112	20	Oviedo	Tuy	Under constr.		INITEC	
The Natural Gas Group	Spain	108	8-12	Cordoba	Jean/Granada	Planned			
The Natural Gas Group	Spain	259	2-20	Valencia	Alicante	Planned			
	Spain	785		Hassi R'Mel gas field through Morocco and Gibraltar	to the Iberian Peninsula	Completed	1996		Will carry a capacity of 8 bcm/y for the Spanish, Moroccan, Portugese, German and French Markets with Spain being the Terminus of the Maghreb-Europe Pipeline
The Natural Gas Group	Spain	180	48	Tarifa	Corboda	Planned			
	Sweden					Planned			The European Union Council approved a proposal to include the Nordic Gas Grid in the Trans-European Energy Networks. The Nordic Gas Grid will integrate the natural gas networks of Finland, Sweden, and Denmark
	Sweden			Haltenbaken, Norway	through Sweden, north of Stockholm, to Helsinki, Finland	Planned			
Sydgas	Sweden	100	16	Hyltebak	Tonkoping	Planned			Estimated costs are \$90 million
Gazprom	Turkey			Russian port of Tuapse under the Black Sea	to Trabzon in Turkey	Planned			From Turkey the gas will be delivered to Greece, Macedonia, and Albania
Gazprom	Turkey			Mozok, Russia	Mameulli, Georgia to the Turkish Border	Planned			
	Turkey			Iraq	Turkey	Planned			Estimated costs of \$2 billion and will deliver 1 Bcfd of gas
Shell	Turkey			Europe	Turkey	Planned			Designed to carry Turkmeni and Iranian gas and connect with a pipeline in Qatar
BOTAS	Turkey			Iran	Greece	Planned	1999-2000		Will carry 200 MMcfd increasing to 1Bcf/d by the year 2020 with costs of \$10 billion
Gazprom, Botas, Trans Canada Pipelines and Del-Men	Turkey	300		Southern Turkey	Israel	Planned	1999		Proposal to sell gas to Israel that will carry 575 MMcf with an extension of the proposed pipeline from Russia to Turkey
BP Exploration	United Kingdom		36	Serves Forties field in North Sea		Under constr.		ETPM Services (UK) Ltd.	
British Gas	United Kingdom	100		Castle Douglas, Scotland	Ballylumford, Ireland then to Belfast	Planned			Will transport 100 mmcf/d
	United Kingdom	112	26	Murdock Field, North Sea	Theddlethorpe, English Coast	Planned			
	United Kingdom	121	26	Britannia Feild	Sage Terminal at St. Fergus	Planned	1997		
	United Kingdom	150	40	Bacton, England	Zeebrugge, Belgium	Under Const	1998		Will transport 2 bcfd and designed to carry gas to the UK if necessary. The interconnector is the largest natural gas pipeline project in UK
Total Pipeline Miles		8498							
Completed Miles		1401							
Under Construction Miles		2870							
Planned Miles		4227							(*) Note - For regional multi-country pipeline, milage included in origin country only

FSU Region

Company	Country	Miles*	Diam. Inches	Location (from)	Destination (to)	Status	Completion	Contractor	Notes
	Armenia			Turkmenistan through Iran to Armenia	to Ukraine	Planned			Armenia and Ukraine will find it difficult to fund the \$1 billion cost and there will probably be some type of barter or exchange agreement.
	Armenia			Azerbaijan through Armenia	to Turkey	Planned			In the past Azerbaijan has vehemently opposed this route.
AIOC (Azerbaijan International Oil Company)	Azerbaijan	143		Azeri, Chirag and Guneshli fields	Sangachali via the Neftyanie Kamni field	Under Constr	mid 1997	Saipem	The cost of this system is \$24.5 million
	Belarus			Nesvizh	Kondratki to Poland	Under Const	1997		The Belarus section of the Yamal - Europe pipeline will consist of a 130-mile double pipeline from Nesvizh to Kondratki where the pipeline will connect with the Northern Lights system into Poland. This part of the project is projected to cost \$500 mm.
	Estonia			Norway to Sweden	to Finland to Estonia to Latvia	Planned			There are no firm plans for the pipeline at this time
Gazprom	Georgia			Mameulli, Georgia	Turkish Border	Planned			Grutransgas is trying to form a joint venture with a Swiss Company to build the new section of the pipeline. This pipeline would give Gazprom another route for gas from the Astrakhan Field
Kazakfragaz	Kazakhstan			Southern Kazakhstan		Planned			Kazakfragaz is considering expanding gas storage in Southern Kazakhstan
	Latvia			Norway to Sweden	to Finland to Estonia and Latvia	Planned			Presently no plans to build this pipeline
Gazprom	Russia	2485	56	Yamal Peninsula, Russia through Belarus and Poland	to Germany and the German gas distribution system	Planned			Yamal to Europe Pipeline with three 56" pipes that would run the 1531 miles from the Yamal Peninsula to Torzhok with a throughput of 83 Bcm/y. From Torzhok to Frankfurt an der Oder, Germany two 56" pipes will be able to carry 67 Bcm/y. This pipeline will connect with the Northern Lights system for part of the distance in Belarus.
Gazprom	Russia	1959	56	Russian port Tuapse	under Black Sea to Trabzon, Turkey	Planned			From Turkey the gas will be delivered to Greece, Macedonia and Albania
Gazprom	Russia			Gorky through Tallin	to Kiev, Ukraine	Planned			
sum, joint venture between Gazprom and Neste	Russia			Russia	Finland	Planned			There is a proposal to double the capacity of the pipeline with costs of \$160 million
	Russia			Irkutsk, Siberia	through Mongolia to the Chinese Coast	Planned			Chinese and Russian leaders run this pipeline. This line could extend to South Korea with an oil Pipeline running from eastern Siberia to China is already under construction
Gazprom	Russia	2812	56	Yanburg	Zahavkazye to Gorky	Planned			
	Russia	142		Sakhalin Island	Sekasti	Under Const			
Unocal, Delta Oil Co. of Saudi Arabia	Turkmenistan	900		Dauletabad field, Turkmenistan	through Afghanistan to the Sui gas field in Pakistan	Planned			Gazprom and Trao Turkmenrosgaz, a joint venture between Gazprom and the Turkmeni government, Unocal and Delta Petroleum have proposed this pipeline which will cost \$3 B and carry 1.5- 2 bcf/d. Unocal and Delta Petroleum have proposed extending the pipeline into India.
Esso China, CNPC and Mitsubishi	Turkmenistan	3700		Turkmenistan across Kazakhstan	to China's Pacific Coast	Planned			Could be extended 1,200 miles to Japan with extension to South Korea.
Shell	Turkmenistan			Turkmeni and Iranian gas to Europe	via Turkey and connecting w/ a pipeline from Qatar	Planned			Eventually the pipeline will carry Syrian and Iraqi gas, with lines that would run to loading terminals at Ceyhan, Turkey
	Turkmenistan	87		Turkmenistan's Korpedeh field	Kurtkue, Iran	under Const			Estimated costs are \$192 million and will carry 8 bcm/y
Uzbektransgaz	Uzbekistan	57	30	Bukhara field	Khorezm	Planned			Uzbektransgaz is studying
Total Pipeline Miles		12285							
Completed Miles									
Under Construction Miles		372							
Planned Miles		11913		(*) Note - For regional multi-country pipeline, mileage included in origin country only					

South America

Company	Country	Miles*	Diam. Inches	Location (from)	Destination (to)	Status	Completion	Contractor	Notes
Gas del Estado	Argentina	110	6 to 12	Repgamino	Bragado	Planned			
Enron	Argentina	560		Southern Argentina pipelines		Planned	2002		
YPF SA	Argentina	30	10	San Sebastian	Bandurias	Under constr.	1997		This is a new pipeline
Nova Corp	Argentina	288		La Mora, Argentina	Santiago, Chile	Completed			Gas Andes export gas pipeline with costs of \$350 MM that will carry 123 MMcfd. There are plans to increase deliveries to 212 MMcfd by 2000 and 600 MMcfd by 2007
YPF & Uruguay	Argentina	2020		Campo Duran area, NW Basin	Paraguay & Uruguay	Planned			
Gas del Estado	Argentina	69	8	Santa Rosa	Gra. Pico	Planned			
YPF & Uruguay	Argentina	150	12	Buenos Aires	Montevideo	Planned			Will carry 35 MMcfd with costs of \$100 MM
YPF SA	Argentina	300		Loma la Lata, Argentina	Concepcion, Chile	Planned			Pipeline located at southern portion of Neuquen Basin and will carry 4 to 6 MMcfd
CMS	Argentina	509	24	Northwest, Argentina	Chile's northern cities, Mejillones, Antofagasta & Tocopilla	Planned			This is a 1 Gas Atacama pipeline that will carry 80 MMcfd. Nova recently withdrew from project
YPF & Uruguay	Argentina	336		Argentina (San Jeronimo)	Brazil (Parana, Rio Grande del Sol, & Santa Catarina)	Planned			
Nova Corp	Argentina	470		Northern Loop		Planned			
Gas del Estado	Argentina	231	4 to 8	Briboche	Esquel	Planned			
YPF SA	Argentina	1522		Northwest Argentina Grid		Planned			
Shell	Bolivia			Bolivia	Peru	Planned			This line is trying to avoid the Andes Mountain Range
YPFB, BHP and ENAP	Bolivia	700		Santa Cruz	Antofagasta	Planned			This pipeline is in competition with a Northern Argentine pipeline
Transportadora de Hidrocarburos (YPF, Enron, and Shell)	Bolivia	350	28 to 32	Santa Cruz area	Campinas, Brazil	Planned			Will carry 3.7 Tcf/y for 20 years with costs of \$1 billion extending over 2000 miles
Bolivia & Paraguay Governments	Bolivia	621	18	Bolivia	Paraguay	Planned			Will carry 88 MMcfd with costs of \$300 MM
Petroleos Brasileiro SA	Brazil	290	10	Duque de Caxias	Campos/Vitoria	Planned			This is a new pipeline
Petroleos Brasileiro SA	Brazil	2122	16/32	Santa Cruz, Bolivia	Sao Paulo and Branches	Planned	1998		This is a new pipeline
Petrobras	Brazil	290		Duque de Caxias	Campos/Vitoria	Planned			
Petrobras	Brazil	250	16	Rio de Jenero	Belo Horizonte	Planned			
Petroleos Brasileiro SA	Brazil	202	8/10	Guamara	Fortaleza	Under constr.	June 1997		This is a new pipeline
Petrobras et al	Brazil	225	22	Campinas	Curitiba	Planned			Phase II of Bolivia to Brazil Pipeline
Petrobras	Brazil	2000		Amazon	Brazilian Coast	Planned			This pipeline will run through a tropical forest
Petrobras	Brazil	221		Duque de Caxias	Betin	Planned			
Petrobras et al	Brazil	100	16	Curitiba	Itaiai	Planned			Phase II of Bolivia to Brazil Pipeline
Petrobras et al	Brazil	150	14	Criciuma	Porto Alegre	Planned			Phase II of Bolivia to Brazil Pipeline
Petrobras	Brazil	290		Guamara	Fortaleza	Planned			
Petrobras et al	Brazil	250	20	Campinas	Guararema	Planned			Phase II of Bolivia to Brazil Pipeline
Petrobras / YPF	Brazil	1000		Argentina's Northwest Basin	Southeastern Brazil	Planned			
British Gas, Tenneco, BHP, Petrobras	Brazil	700	28	Corumba, Brazil	Campinas, Near San Paulo	Planned			This Bolivia to Brazil Pipeline will carry 300 MMcfd with costs of \$1.8 billion. Bolivian gas pipeline owned by YPFB, Enron, & Shell
Petrobras et al	Brazil	200	14	Itaiai	Criciuma	Planned			Phase II of Bolivia to Brazil Pipeline
Nova Corp	Chile			La Mora, Argentina	Santiago, Chile	Completed			Gasducto Gas Andes SA export gas pipeline expected to begin 2nd qtr of 1997 with costs of \$350 MM and will carry 123 MMcfd. There are plans to increase deliveries to 212 MMcfd by 2000 and 600 MMcfd by 2007
Chilectra Metropolitan	Chile	5000				Planned			Various gas distribution lines are expected to be constructed
YPF	Chile			Loma la Lata, Argentina	Concepcion, Chile	Planned			Will carry 4 to 6 MMcfd
CMS & Partners	Chile		24	Gas Atacama pipeline from Argentina's Northwest Basin	Chile's northern cities; Mejillones, Antofagasta and Tocopilla	Planned			This pipeline will carry 180 MMcfd. Nova recently withdrew from project
Transmetano SA	Colombia	97	12	Sebastopol	Medellin	Planned	1997		This is a new pipeline
Empresa Colombiana de Petroleos	Colombia	193	2/4/10	Main gas pipelines	Influence area	Planned	1997	Spie Capag	This is a new pipeline
Empresa Colombiana de Petroleos	Colombia	214	20	Mariquita	Cali	Under constr.	1997	Transgas de Occidente SA	This is a new pipeline

Empresa Colombiana de Petroleos	Colombia	128	22/14/12	Vasconia	Bogota	Under constr.	1997	Condux, Dragados, Conequipos, Montecz	This is a new pipeline
Enron	Colombia	357	18	Ballena	Barrancabermeja	Completed			Centragas Pipeline with capacity of 150 mmcfpd and Ecopetrol as operator
Amoco	Colombia	55	20	Opon	Barrancabermeja	Planned			
Ecopetrol	Colombia	76	20	Vasconia	Mariquita	Under constr.			Centragas Pipeline
Ecopetrol	Colombia	94	12	Cusiana-Apiay		Under constr.			
Ecopetrol	Colombia	93	16-20	Barrancabermeja	Puerto Serviez	Under constr.			Centragas Pipeline
Minminas	Colombia	68	6-10	Barrancabermeja	Bucaramanga	Under constr.			Ancillary spur lines will connect major cities along main pipeline route
Ecopetrol	Colombia	173	12	Mariquita	Dina	Under constr.			Centragas Pipeline
	Paraguay		18	Bolivia	Paraguay	Planned	1997		Estimated costs of \$300mm that will export 88 mmcfpd. The Paraguay Gov. has applied to the IDB and Fonplata for joint funding and tender for construction
Petroperu	Peru	170	12	Camisea	Cusco	Planned	1998		
Shell / Mobil / Petroperu	Peru	373	18	Camisea	Lima	Planned	1998		Estimated costs of \$2.8 billion that will carry 200 mmcfpd and take 7 years to complete
	Peru	52	6	Aguaytia	Pucallpa	Planned			Maple gas acting as field operator with the Aguaytia pipeline running to the town of Pucallpa
	Peru	500		Camisea	La Paz, Bolivia	Planned			Will connect with the proposed Bolivia to Brazil gas pipeline system
3C) National Gas Company of Trinidad	Trinidad	112	36 & 40	offshore SSEG field to land near Galeota point,	then onshore to the LNG plant at Point Fortin	Planned	1999		will carry 475 mmcfpd
YPF & Uruguay	Uruguay	150	12	Buenos Aires	Montevideo	Planned			Will carry 35 mmcfpd with estimated costs of \$100 to \$130mm. The bids have been called for this project
	Uruguay			Bolivia	Paraguay	Planned			This pipeline may be extended from Paraguay to Uruguay
	Venezuela	200				Planned			Development of a future LNG project
	Venezuela	500				Planned			This pipeline is a steam generation to enhance heavy oil production from the vast Orinoco Heavy Oil Belt
	Venezuela	900		Venezuela	Colombia	Planned			There will be an additional delivery spur of an extra 320 miles of gas pipeline although the project looks doubtful
	Venezuela	100		gas fields	Jose	Planned			The Jose Petrochemical Complex is a feedstock for petrochemical production
	Venezuela	200		Eastern Venezuelan Pipeline	Western Venezuelan Pipeline	Planned			Built for additional oilfield and refinery use
Total Pipeline Miles		26361							
Completed Miles		645							
Under Construction Miles		1078							
Planned Miles		24638							(* Note - For regional multi-country pipeline, milage included in origin country only

Asia Pacific Region

Company	Country	Miles*	Diam. inches	Location (from)	Destination (to)	Status	Completion	Contractor	Notes
Tenneco Gas	Australia	470	16	Ballera	Wallumbilla	Completed	1996	Fletcher/Spie Pit Engr.	This is a new pipeline
Gas and Fuel	Australia	65	8	Chiltem Valley	Koonoomoo	Planned			
Chevron / IPC	Australia	820		Cape York	Weiba	Planned			Pipeline will import gas from P N G
Gas Transmission Corp.	Australia	80	16	Wodonga	Wagga Wagga	Planned	May 1998		JV with East Australian Pipeline Ltd.
Gas Transmission Corp.	Australia	84	20	iona	Corio	Planned	Apr. 1999		This is a new pipeline
Gas and Fuel	Australia	105	8	Cansbrook	Horsham	Planned			
BHP Petroleum	Australia	435	18	Longford	Wilton	Under Constr	1997		JV with Westcoast Energy
	Australia	870	14 to 16	Offshore Northwest Shelf area (Karratha)	Kalgoortie, Western Australia	Completed			Goldfields Gas PL: cost \$400 mm
Magellan Petroleum	Australia	375		Darwin	Gove, Gulf of Carpentaria	Planned			This line competes with other Gove pipeline
	Australia	83	12	Wagga Wagga (N S W)	Albury (Victoria)	Planned			East Australian Pipeline and Gas Transmission Corp. Pipeline
Northern Territory Power and Water Authority	Australia		12	Mataranka	Gove	Planned			This line taps into the Palm Springs to Darwin Pipeline
Tenneco	Australia	800	14	Amadeus Basin (Palm Valley)	Port Pirie, South Australia	Planned			Estimated costs of \$200 million
	Australia	746	16	Amadeus Gas at Palm Valley (N T)	Moomba (Southern Australia)	Planned			Estimated costs of \$200 million
PASA	Australia	375		Minerva	Onshore to NSW (Melbourne) and/or SA (Adelaide)	Planned			Offshore Bass Straits
Woodside	Australia	100		NW Shelf	Burrup Peninsula	Planned			
Australian Gas Light	Australia	522		Cooper/Eromanga Basin	Mount Isa	Under Constr			
Gas Transmission Co., Ltd.	Bangladesh	40	36	Asuuganj	Bakhrabad	Planned		John Brown E&C	
	Bangladesh	50		Offshore Kutubdia	Chittagong	Planned			
	Bangladesh	400		Northwest gas grid expansion		Planned			
Arco et al	China	438		Yacheng	Hong Kong	Completed			Will carry 300 mmcfpd
Arco et al	China	62		Yacheng	Hainan Island	Completed			
	China			East Russia	thru China	Planned			Estimated to be 3750 miles
CNPC	China	372	16	Ordus basin	Hohot	Planned			
CNPC	China	204	16	Ordus basin	Yinchun	Planned			Will carry 100 mmcfpd with costs of \$500 mm
CNPC	China	194	18	Junggar basin	Turpan Basin	Planned			Will carry 155 mmcfpd
CNPC	China	559	26	Ordus basin	Beijing	Planned			Will carry 100 mmcfpd with costs of \$350 mm
Shanghai Petroleum Corp	China	249	14	Ping Hu field	Shanghai	Planned			
	China			Turkmenistan	thru China	Planned			Estimated to be 3750 miles
CNPC	China	305	16	Ordus basin	Xian	Planned			Will carry 25 mmcfpd with costs of \$300 mm
	India			Bangladesh	India	Planned			
ONGC	India	150	42	Bassein field	Hazira terminal	Planned			Bombay High Pipeline
UNOCAL	India			Turmenistan	land pipeline	Planned			Estimate 2000 miles
	India			Iran (South Spars)	Sub Sea Pipeline	Planned			Estimate 1500 miles
	India			Myanmar	subsea pipeline	Planned			1000 mile subsea pipeline
ONGC	India	124	20/30	Bombay High	Herera Field	Planned			Bombay High Pipeline
	India		24	Oman	Arabian Sea	Planned			Project postponed, est. 1050 miles
	India			Qatar (North field)	Iran	Planned			Estimate 2000 miles
Pertamina	Indonesia	500		Banjarmasin (So. Kalimantan)	Gresik	Planned		Perum Gas Negara (PGN)	
Pertamina	Indonesia	300		Banjarmasin (So. Kalimantan)	Balikpapan	Planned		Perum Gas Negara	
Shell	Indonesia	280		Central Java	Cilacap (S. Java)	Planned		Perum Gas Negara	
British Petroleum	Indonesia	100		Kampong Baru area	Ujung Pandang	Planned		Perum Gas Negara (PGN)	
Shell	Indonesia	128		Kepodang Field	Central Java (Semarang)	Planned		Perum Gas Negara (PGN)	
ARCO	Indonesia	100		E. Java additional field development and connections		Planned		Perum Gas Negara (PGN)	
Perum Gas Negara (PGN)	Indonesia	300		South Sumatra (Prabumulih)	West Java (Cilegon)	Planned			
Pertamina et al	Indonesia	900		Malaysia-Malacca Straits	Arun (N.Sumatra)	Planned		Perum Gas Negara (PGN)	Extension of the Natuna/Duyong line across the Peninsula
Perum Gas Negara (PGN)	Indonesia	175		Central Sumatra	Batam Island/ Singapore spur	Planned			
Pertamina/PTT	Indonesia	932		Natuna Field	Thailand	Planned		Perum Gas Negara	
Pertamina	Indonesia	295		Natuna Area	Singapore	Planned		Perum Gas Negara	
Perum Gas Negara (PGN)	Indonesia	335		South Sumatra	Central Sumatra	Planned			Trans Sumatra Corridor Gas Project-Duri Field

RCO, British Gas, Statoil	Indonesia	200		Wiriagar/ Mogoi Deep development, Irian Jaya		Planned		Perum Gas Negara (PGN)	
Perum Gas Negara (PGN)	Indonesia	335		Gresik (east Java)/Yogyakarta	Jakarta	Planned			Trans Java Project
Esso Indonesia	Indonesia	140		Natuna Field	Natuna Island	Planned		Perum Gas Negara (PGN)	
Pertamina	Indonesia	200		Natuna area	Malaysia (Duyong Area)	Planned		Perum Gas Negara (PGN)	
	Japan	1700		Sakhalin	Japan	Planned			This line includes across Japan Transmission Pipelines
	Japan	300	36	Tokyo	Osaka	Planned			
	Japan			East Russia	Through China and Korea	Planned			Estimated at 1000 plus miles
Korea Gas Corp.	Korea	35	30	Kwahgju	Mokpo	Under constr.	Sep. 1998	Hyundai	This is a new pipeline
	Korea			Sakhalin	Through Japan	Planned			Estimated at 1000 plus miles
	Korea	150		Pusan	Yosu	Planned			
	Korea			East Russia	China	Planned			Estimated at 1000 plus miles
Petronas	Malaysia	430		West coast of Peninsular Malaysia	Thailand border	Completed			This PGU III completes the connection from the gas supply on the east coast at Kerih with capacity of 2bcfd
Shell	Malaysia	150		East Malaysia fields	onshore processing facility	Planned			Bintulu MLNG II
Petronas	Malaysia			Malaysia	Bongkot Facility, Thailand	Planned			Joint Development Area (JDA)
Occidental	Malaysia	200		Offshore Malaysia	Bintulu Processing Facilities	Planned			MLNG III
Petronas	Malaysia	530	36	Kerih to Segamat	to Meru, Klang	Planned			Secondary Parallel loop of Peninsula Gas Utilization (PGU I and II)
N. Bridge Corp., Chiyoda	Malaysia	120		Penang area, West Malaysia	Songkhla, Thailand	Planned			
Esso	Malaysia	200	30	offshore Lawit	Malaysia	Planned			
Shell	Malaysia	150				Planned			Sabah gas discoveries with an intra field connection
Texaco	Myanmar	225		Yetegun	Ranong, Thailand west coast	Planned			This 225 mile pipeline connected to a 75 mile onshore line competes with the line to Ratburi
PTT	Myanmar			Bong I Tong, PTT of Thailand	Pilok, near Ratburi	Planned			To be built by PTT in Thailand
	Myanmar	1000		Myanmar	subsea pipeline	Planned			Potential Export to India
Texaco	Myanmar	224		Yetegan	Heinze Island/Zadi	Planned			This line connects with Yadana pipeline
Total, MOGE	Myanmar	215	36	Yadana Field east to Heinze Island & onshore Zadi	Bong I Tong, Thailand Border	Planned			Will carry 240 mmcfpd
Total	Myanmar	162	18	Yadana field	Yangoon, near Rangoon	Planned			
Southgas Resources	New Zealand	112		Dunedin area		Planned			
Shell/BP/Todd	New Zealand	276		Offshore Maui B Platform	Taranaki	Planned			
Ministry of Energy	New Zealand	145	12-20	Huntly	Marsden, near Whangare	Planned			
Southgas Resources	New Zealand	62		Invercargill area		Planned			
	Pakistan			Iran	Pakistan	Planned			Estimate 1000 miles
i Southern Gas Co. Ltd.	Pakistan	166	16-42	Gadani	Karachi	Planned	2000		Infrastructure expansion for imported gas: 1,600 MMcfd new capacity
rescent Petroleum Co.	Pakistan			Doha, Qatar	Karachi, Pakistan	Planned			Estimated to be 994 miles
i Southern Gas Co. Ltd.	Pakistan	75	20	Dadu	Karchat	Under constr.	June 1997	Sui Southern Gas Co. Ltd.	Rehabilitation and expansion project: 20 MMcfd of added capacity
i Southern Gas Co. Ltd.	Pakistan	140	18/20	Jacobabad	Shaikh Mandah	Under constr.	Oct. 1998	Sui Southern Gas Co. Ltd.	Phase II of Quetta pipeline capacity expansion project that will carry 40 MMcfd of added capacity
	Pakistan			Onshore Connections		Planned			Grid expansion and new fields will tie-in to this line
	Pakistan		48	Oman	Pakistan	Planned			Will carry 1.6 bcfd with estimated 1000 miles
Northern Gas Pipelines Ltd.	Pakistan	203	30	Sui	Multan	Planned			This line is a gas transmission loop
	Pakistan			Qatar	Pakistan	Planned			Will carry 1.6 bcfd onshore across Iran with estimated 1000 miles
	Pakistan			Turkmenistan	Pakistan	Planned			onshore line: est 1000 miles
ron / Government et al	Papua New Guinea	300		South along the existing line	Kerema	Planned			
ron / Government et al	Papua New Guinea			North	Wewak	Planned			This pipeline competes with the Southern line, 150 miles
ron / Government et al	Papua New Guinea			East	Lea	Planned			This pipeline competes with the Southern line, 375 miles
ron / Government et al	Papua New Guinea			Northeast	Madang	Planned			This pipeline competes with the Southern line, 200 miles
IPC	Papua New Guinea	200		Pandora field	Cape York Peninsula, Australia	Planned			

Chevron	Papua New Guinea	100		Kerema	Pandora	Planned			This line will run onshore to offshore connections
Shell	Philippines	310		Malampaya / Camago	Batangas, Luzon Island	Planned	2000/2002		Will carry 200 mmcfpd
CPC/Tenneco	Taiwan	190	24	Yung-an	North Taiwan	Planned			
Petroleum Authority of Thailand	Thailand	30	24	Tantawan offshore pipeline		Under constr.	1997		Bechtel
Petroleum Authority of Thailand	Thailand	30	36	Parallel onshore pipeline		Under constr.	1997		Bechtel
PTT	Thailand	50		JDA	Bongkot	Planned			
PTT	Thailand	106		Palin	Songkhla	Planned			
PTT	Thailand	256	36	Erawan	Rayong	Planned			Will carry 1450 mmcfpd with costs of \$700mm
PTT	Thailand	110		Bongkot	Erawan	Planned			Will carry 350 mmcfpd
PTT	Thailand	161		Ban I Tong	Ratburi	Under Constr			Will connect Myanmar Yandana/Yetagun Gulf of Martaban fields
	Vietnam	435		Vietnam gas fields	Erawan, Thailand	Planned			
British Petroleum	Vietnam	230		Lay Tay and Lay Do	Ho Chi Min City	Planned	1998		
Total Pipeline Miles		23775							
Completed Miles		2270							
Under Construction Miles		1428							
Planned Miles		20077		(*) Note - For regional multi-country pipeline, mileage included in origin country only					

Africa Region

Company	Country	Miles*	Diam. Inches	Location (from)	Destination (to)	Status	Completion	Contractor	Notes
Sonatrach	Algeria	332	48	Hassi R'Mel	Berguent	Under constr.	1997	Bechtel-Engr./PE/CS	Phase II-IV, part of Maghreb-Europe project, will cross Morocco and Strait of Gibraltar to Cordoba, Spain
British Petroleum	Algeria	356	42	In-Salah	Hassi R'Mel	Planned			This line will deliver gas to Hassi R'Mel pipeline hub, where the gas may be sold into the Maghreb-Europe System
Sonatrach	Algeria		42	Tiguentour	Hassi R'Mel	Planned			A 324 mile project would be an alternative if the In-Salah to Hassi R'Mel project fails to materialize
Sonatrach and British Petroleum	Algeria	345	48	Alar	Hassi R'Mel	Planned			
Sonatrach	Algeria	356	42	Hassi R'Mel	Skikda	Under Const	1997		Estimated costs of \$200 mm for project
Sonangol	Angola	18	16	Takula	Malongo north	Planned			
Sonangol	Angola	18	18	Kambala	Limba	Planned			
Shell, Apache	Egypt	200		Obaiyed field	Apache's field	Planned			Both lines are around the Khalda concession and supply gas to the 640 mw power plant at Amanis and will carry 465 mmcfpd from both
Amoco, Agip, EGPC	Egypt	200		Port Said	Israel	Planned			Will carry 250 mmcfpd and could increase to 600 mmcfpd
West African Pipeline Company	Ghana			Nigeria	to Togo to Ghana	Planned			
	Libya	417		Misratah	Knoms	Planned			
	Madagascar	220		Offshore west Manambolo field	Mainland	Planned			
	Morocco	340	48	Hassi R'Mel	Gibraltar Straits	Completed			Maghreb Europe Pipeline will cost \$2.2 billion. The Hassi R'Mel hub to Spain via Morocco to Straits of Gibraltar to Spain will carry a capacity of 1 bcf/d and 300 mmcfpd
ODEP	Morocco	120	14 & 24			Planned			
Empresa Nacional de Hidrocarburos de Mozambique	Mozambique	565		Pande field	near Johannesburg	Planned			
Shell	Namibia	342		Kudu Field	Cape Town, South Africa	Planned			
Shell	Namibia	75	25	Kudu Field	to shore	Planned			
Nigeria LNG Ltd.	Nigeria	126	20/36	Bonny Island, Rivers State		Under constr.	1999	Snamprogetti SpA-Engr.	This is a new pipeline
British National Petroleum Corp.	Nigeria	64		Aluminum Smelting Co., Ikot Etetuk		Under constr.	1997	Snamprogetti SpA-Engr.	
British National Petroleum Corp.	Nigeria	16	12/4	LBV Station	Tolarams	Under constr.	1997	Snamprogetti SpA-Engr.	This is a new pipeline
Chevron / Governments	Nigeria	524		Offshore Eservos field	Ghana	Planned			Three countries signed a pact to form the West African Pipeline Company with estimated costs of \$230 mm
Ocelot Tanzania Ltd.	Tanzania	136	18	Songo Songo Island	Dar-es-Salaam	Planned			JV with TransCanada Pipelines Ltd./Tanzania govt.
Societe Tunisienne de Electricite Gaz	Tunisia	3	20	Nabeul	Tunis	Planned	1997		
Societe Tunisienne de Electricite Gaz	Tunisia	27	24	Nabeul	Tunis	Planned	1997		
Societe Tunisienne de Electricite & du Gaz	Tunisia	148		Gabes	Msaken	Planned			Power generation project
Total Pipeline Miles		4948							
Completed Miles		340							
Under Construction Miles		894							
Planned Miles		3714							(*) Note - For regional multi-country pipeline, mileage included in origin country only

Middle East Region

Company	Country	Miles*	Diam. Inches	Location (from)	Destination (to)	Status	Completion	Contractor	Notes
Zakum Development Co.	Abu Dhabi	10	4	Zakum field		Planned	1997	John Brown E&C	
Igat 2	Iran	880	48/56	Kangan gas field, Persian Gulf	C.I.S.	Completed		Saipem	Contr. will lay 20% of remaining pipeline.
Governments	Iran		40	Turkmenistan Korpedzhe field	Northern Iran	Planned			The mileage is unknown for this pipeline
Governments	Iran	4000		Iran	Greece	Planned	1999/2000	Botas	Will carry 200 mmcfpd and increase to nearly 1bcf/d by 2020 with costs of \$10 B. The Iranian portion will cost \$ 800 MM.
Governments	Iran	1060		Iran, South Pars Field	Pakistan	Planned			The leading contender is BHP and others interested are Br. Gas, Shell and Gaz de France with costs of \$3-10 billion
NIGC	Iran	212	30	Dalan field	Marun field	Planned	1997		First phase expected cost: \$400 mm
	Iraq	850		Iraq	Turkey	Planned			Estimated costs are \$2 billion and will carry 1 bcfpd of gas
Amoco, Agip, EGPC	Israel	200		Port Said	Israel	Planned			
	Israel	323		Eilat, Gulf of Aquaba	Ashkelon, Mediterranean coast	Planned	1997		Internal gas pipeline distribution system with a feeder system to the Dead Sea, both will be linked with the Middle East Process
Gazprom, Botas, TransCanada Pipelines, Del-Men	Israel	300		Southern Turkey	Israel	Planned	1999		Will carry 575 mmcf of gas with an extension of the proposed pipeline from Russia to Turkey
Petroleum Development Oman	Oman	110				Under constr.		Saipem/Consolidated	
Oman Petroleum Development	Oman	900	24	Oman	India	Planned			Project reported to be postponed
Amoco	Oman	300	36	Oman	Sharjah	Planned			Will carry 1.2 mmcfpd with estimated costs of \$2 billion
Shell	Oman	230		Saih Rawl	Ghailah	Planned			Will carry 533 mmcfpd complex (4mmty)
Gulf South Asia Gas Co.	Qatar	1000	48	Qatar	Pakistan	Planned			Consortium of Crescent Oil, Trans Canada, Itochu and Brown & Root
Shell & BOTAS	Qatar	1200		Qatar	Europe	Planned			
ARCO	Qatar	225		Qatar	Dubai	Planned			Will carry 300 mmcfpd
Total Pipeline Miles		11800							
Completed Miles		880							
Under Construction Miles		110							
Planned Miles		10810							(* Note - For regional multi-country pipeline, mileage included in origin country only