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Long-term competition between gas infrastructures developments in Asia.

The constraints on the Siberia and Caspian export development by cross-border pipelines

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Despite the effects of the recent financial crisis, the problem of satisfying the energy requirements of the emerging economies in Asia remains the principal challenge facing us in the first half of the 21st century. Their requirements are expected to increase by a factor of 2½ between now and 2030, representing an increase of 2-2,5 Billion additional Toe. Supply by gas, which currently holds a much lower share in Asia than the world average (6% instead of 12%), will need to increase considerably. In the next twenty years, in fact, gas consumption could increase from 210 Mtoe in 1997 through 600 Mtoe in 2020 to 8-900 Mtoe in 2030¹.

It is not sufficient, however, merely to take account of significant gas requirements in order for supply to increase. Of course the growth of gas supplies in Asia has been impressive, in the nineties by diversifying out national production intended for internal consumption or exports of LNG intended for the Japanese markets alone. Before the crisis, the leading emergent economies (South Korea and Taiwan) were making spectacular progress by entering into the Importer's Club. Imports by Korea have increased from 2 Bcm in 1990 to 16.3 Bcm in 1997. There seemed to be no end to the development projects being announced for deposits and LNG chains, and a number of international pipeline projects were beginning to be studied. All the crisis did was to put back the development of numerous LNG projects, and that only in the short term. In the medium and long term, however, will the recovery be sufficient to respond to the fuel requirements of the major markets of Southern and Eastern Asia?

The development of the market, which is still organised around supplies of liquefied natural gas (LNG) by a few South-East Asian exporters, will be influenced by the emergence not only of new importer countries such as Thailand, the Philippines, China, India and Pakistan, but by that of new suppliers - oil-producing countries of the Middle East such as Qatar, Oman and Yemen. They will be looking to maximise the value of their gas resources in countries in the Pacific Rim area (Alaska, Canada, Papua New Guinea, Vietnam). But they will be joined in the future by the Central Asian Republics, and Russia, who between them hold over 60% of world resources, will join them in future.

In fact, given the scale of future requirements and the super-abundant resources in these countries, they should be called upon more and more to satisfy the needs of Southern and Eastern Asia. However, the competition between sources of supply is influenced by the nature of the transport infrastructures used in their exportation, and by the associated economic and geopolitical conditions: capital intensiveness, rigidity, country-risk, etc...The development of supplies from these potentially very large new suppliers is conditioned to a considerable extent by competition between GNL projects, the limited profitability of continental pipeline projects, the need to reach high output levels very quickly, the territorial risk associated with

¹ For 2020, the provisional 2020 estimation by International Energy Outlook 1998 (US DOE-EIA) is 635 Mtoe, and the estimation by DRI (quoted in FT International Gas Report, 6 February 1998), is 530 Mtoe. Simulation of IEPE's POLES model (world scene reference DGXVII-CE) produces a total of 570 Mtoe in 2020 and 840 Mtoe in 2030.

these investments and, in view of the scale of financial investment required, the need to involve international operators and investors on a significant scale.

The aim of this study is to the position that could be occupied by major continental infrastructures in trade within the Asian continent, in view of the economic institutional and geopolitical restraints that would appear more favourable to projects based on LNG. Developments in Siberia and Central Asia will be heavily influenced by the geographical remoteness and organisational weakness of the countries in that area.

1. The widening of the Asian market

Despite the recent crisis, the Asian markets still have potential for very significant growth, apart from the Japanese market, now reckoned to have reached maturity. The development of these markets must not however be allowed to rest on national resources or resources from South-East Asia alone, even though Indonesian, Malaysian, Vietnam and Australian resources are still promising. The relative nearness of the Middle East, Central Asia and Siberia, three areas very rich in gas resources, is opening up significant opportunities; but many different requirements need to be met before the capital needed to complete the projects can be mobilised. In addition, the restrictions on exchanges via gas pipelines are much more far-reaching than the restrictions on the LNG projects.

Table 1 : Main LNG importing countries in South East Asia (Mt/y)

	South Korea	Japan	Taiwan
1987	1.4	28.6	-
1990	2.3	35.0	0.7
1995	7.0	43.0	2.4
1997	11.4	45.0	2.9
1999	16.3	64.6	5.0

Sources : Petroleum Economist & Shell international gas. Ltd, *The global LNG Map*. CD Rom, Mars 1998, BP Amoco *Statistical Review of World Energy*, 2000.

Table 2 : LNG trade in South-East and East Asia in 1997 (Mt/y)

	Abu Dhabi	Australia	Brunei	Indonesia	Malaysia	Qatar
South Korea	0.9	-	0.9	10.6	4.1	0.7
Japan	6.0	9.0	6.9	23.1	12.5	5.5
Taiwan	-	-	-	2.5	2.5	-

Source : BP Amoco *Statistical Review of World Energy*, 2000

1.1. The necessity to fill the region's energy gap and to mitigate its growing environmental problems by gas supply development

Among all the regions of the world, emerging Asian countries (EACs) are expected to show the most rapid increase in economic growth, energy consumption and CO₂ emissions over the next three decades. Under the POLES economic assumptions these countries are expected to expand at about 4.5 percent per year through 2030. Rising standard of living, which increase the use of appliances, air conditioning, and personal transportation generate important growth in energy demand and the corresponding CO₂ emissions, which are projected to be slightly

lower than the rate of economic expansion (respectively at 2.9 and 3.7 %/y by the same period).

Whereas emerging Asian countries accounted for 24 percent of total world energy consumption in 1997, they are expected to account for 32 percent of world demand in 2030. They will account for 41 % of the world's total increase in energy demand and for 34 % of the incremental demand for oil, this making emerging Asian countries a dominant force on the demand side of the world's oil market. In order to slow their increasing dependence on crude imports, emerging Asian countries need to diversify away from oil use. Always according POLES forecast Emergent Asian countries will account for 73 % of incremental demand for coal, and 40 % of incremental demand for electricity. So these countries will be responsible for nearly 47 % of the total increase in CO₂ emission suggesting a major need for cleaner energies and more energy performing technologies in order to cap already widespread environmental degradation.

Table 3 : Growing importance of emerging Asian countries in the energy world in the POLES scenario to 2030

	Share of emerging Asian countries in the world		Share of emerging Asian countries in the world's increase
	in 1997	in 2030	2030/1997
GDP	24%	39%	48%
Energy demand	24%	32%	41%
Coal demand	40%	58%	73%
Oil demand	18%	26%	34%
Gas demand	7%	19%	26%
Electricity demand	17%	32%	40%
CO₂ emissions	25%	37%	47%

Source : IEPE-POLES baseline scenario S2 to 2030

- **Rising environment issues in emerging Asian countries**

If emerging Asian countries energy demand reach the levels projected in the POLES reference case, carbon emissions will rise from 1.5 billion metric tons in 1997 to 5.1 billion metric tons in 2030. Their growth rates are expected to exceed nearly 1.5 times the average of the world (representing 37 percent of the world's emissions at the end of the forecast period).

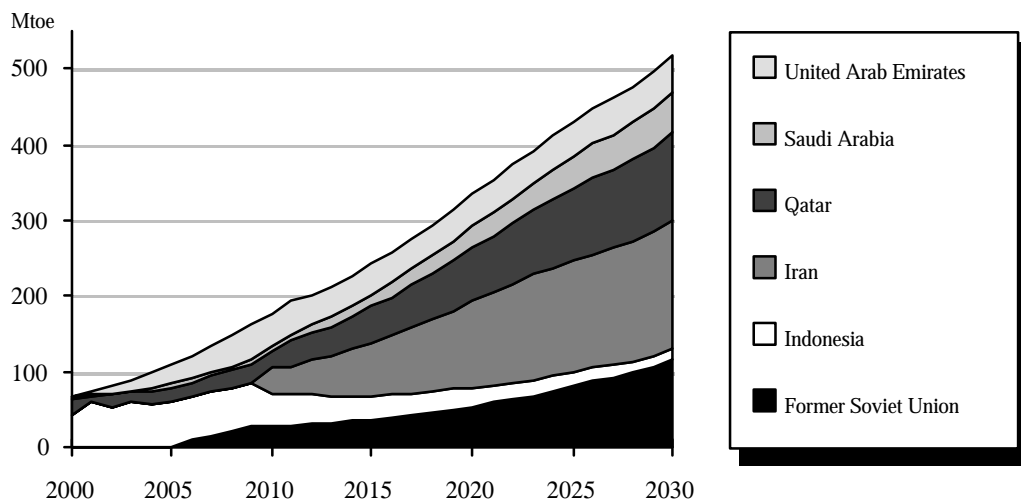
The sizeable rise in emissions from emerging Asian countries is partially a result of their heavy dependence on coal, the most carbon-intensive of the fossil fuels and their highest expected rate of economic growth. While coal use grows at the slowest rate among the three fossil fuels world-wide, the relatively high level of carbon emissions per toe of energy from coal leads to higher growth in emissions from coal than from oil or natural gas. In overall carbon emissions per capita from Emerging Asian countries are expected to nearly equal (75 %) world's average by 2030, representing in the same time only 20 % of USA's emissions per capita. By that date carbon emissions per capita of India represent only 12 % of USA level; China's level attains 32 % of USA's level; South Korea's level 73 %.

Policies to require Emerging Asian countries stabilisation would dramatically change the projections. There are many possible ways to reduce carbon emissions : non fossil energy may be substituted for fossil fuels. Alternatively, high-carbon fuels, notably coal, may be replaced by low carbon fuels - particularly natural gas. Given that natural gas would allow conservation of coal and oil for power generation and industrial uses, additional power generation with lower CO₂ emissions, and long term reduction of urban coal use, its role in the EAC's energy demand is expected to grow rapidly. POLES sees EACs natural gas demand rising by 6.5 % /yr through 2030, which means that overall gas demand is expected to grow from about 134 Mtoe in 1997 to 1071 Mtoe in 2030. But lack of infrastructure is the major barrier to this growth. Further improved end-use efficiency or reduced reliance on energy intensive activities may serve to reduce the link between rising economic activity and increased energy consumption. Emissions can also be reduced through introduction of a carbon value. For example an introduction of a carbon value of \$100/tC curtails 27% in EAC's emissions in 2030 in comparison with the reference case.

1.2. A reserve base that needs to be widened

Supplying natural gas to EACs on the long run is not a simple task because the discrepancy between the locations of the resources and the actual or potential major consuming regions. By referring to gas exchanges development trends resulting from the POLES simulation based on simple costs and prices projections ignoring financial and political constraints, the POLES reference case shows that , in a logic way, gas imports should develop from the resource richer regions, Middle East and also the Asian part of the-FSU. Even if the natural gas production doubles in the region from 1997 to 2030, EACs became a growing importing region. Furthermore major infrastructures investment in LNG chains or in pipe-lines will be needed to transport gas to the demanding markets

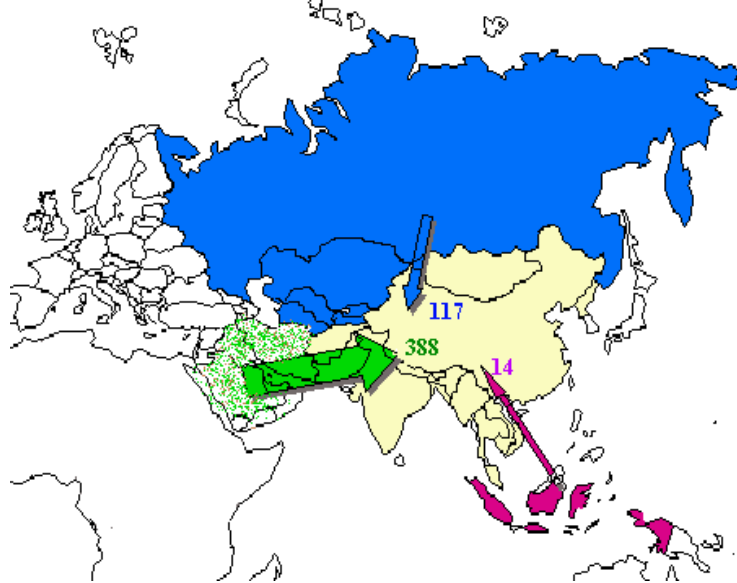
Figure 1 :POLES prospects of development of the regional gas exchanges from new major suppliers to the importing Asian countries



Without any constraints, Middle-East will dominate the exports to EACs in 2030 with 290 Mtoe , followed by the FSU countries, with 120 Mtoe. South-East Asian exports which dominate presently the regional market with 80 % of the 85 MT market will decline to the

level of 15 Mtoe. At the beginning of the period Indonesia is the first supplier of EACs. While its role declines gradually up to 3% of the EACs gas market at the end of the period, the role of Iran increase considerably beginning from 2010. Iran gain the first place with 33 % of the market in 2030 followed by former Soviet Union and Qatar (each supplying 22 %), Saudi Arabia and United Arab Emirates (holding together 20 % of the market). The POLES simulation has the merit to lighten a logic way of solving the Asian gas supply equation: to appeal the major resources. But the constraints will orient the choice of the major players in the development of infrastructures in a quite different way with the risk that Asian gas imports cannot reach the desirable level.

Figure 2 : EACs imports in 2030



The Asian gas market, which until 1990 was organised around LNG imports from Japan, will have to change dramatically in the next thirty years. The emergence of South Korea and Taiwan has already broken Japan's position as sole buyer and opened up the possibility of setting up projects with other exporter states than South-East exporters such as Qatar, Oman and (soon) Yemen. The huge increase in the number of LNG projects between 1995 and 1998, against a background of potential for rapid growth, gives a clear indication of the kind of trends that will follow the gradual economic recovery of the Asian countries concerned.

The Asian market's reserves base has doubled in South-East Asia and Australia in the past fifteen years, while production has tripled in response to demand. The reserves/production ratio currently stands at 53 years in this sub-region², but this will not be sufficient to meet the increased consumption demands in Asia in the medium term.

In Eastern Asia, and especially China, major reserves need to be discovered in order for autarkical development to be ensured in the gas industry. In Southern Asia, the reserve base for the countries of the Indian subcontinent is much lower, but its Western edge is close to the Persian Gulf, which means that the available reserves base for India and Pakistan will be increased significantly. In addition, its Eastern edge is close to the reserves held by the South-East Asian exporters (Indonesia and Malaysia).

² APERC, *Natural gas infrastructure development in East Asia*, Tokyo, February 1999.

Table 4 : Proven gas reserves in Asian countries (in units of Bcm)

S-E Asia	South Asia	China	Middle East (ex. Iran)	Iran	Central Asia	Russia
8.0	1.6	1.1	26.5	23	6.6	48.1

Source: BP Amoco Statistical Review of World Energy, 2000.

Against this background of extension, the medium-term incorporation of new LNG importers such as China, India, the Philippines and (later) Pakistan and Thailand, must surely influence changes in gas exchanges between Asian countries. These new importers will call upon new gas suppliers. Vietnam and Papua New Guinea will soon become exporters. The Middle Eastern countries with the largest gas reserves (Abu Dhabi, Qatar, Oman and especially Iran, which is the second richest country of all in terms of resources) are, or will be, anxious to sell them as profitably as possible in view of the recent levelling-off of their oil incomes. In addition, a number of former CIS members (Kazakhstan, Uzbekistan and most notably Turkmenistan) have the potential to export gas, especially to Southern and Eastern Asia, and the fall of Communism has allowed Russia to establish relations with Eastern Asian countries such as Japan, Korea and China. In this context, these Asian countries should consider imports from the deposits in Western Siberia (Yamal), Eastern Siberia (Irkutsk and Sakha), and Sakhalin Island as being of major potential.

1.3. The restrictions on completing new gas projects in Asia

The predominance of LNG exchanges has shaped the gas market in South-East Asia. The increased cost of investing in LNG export projects (\$4-5,000 million for 6-8 million Bcm per year) is the reason for the relative concentration of suppliers and the frequent organisation of exchanges on the basis of long-term "Take or Pay" contracts with a 20-year span. Contract prices, which are fixed in parity with oil prices, are high (\$3.5/Mbtu) in comparison with the border prices apparent on other regional markets (\$2.5/Mbtu in Europe and \$2.0/Mbtu in the USA). The aim of the buyers, who are few in number, has been to prefer stability to the search of moderate price levels; and until the end of the 1980s, they were exclusively Japanese and electricity utilities or intermediaries (commercial groups) able to invest in the whole of the GNL chain. The sellers, who are also few in number and whose projects are linked exclusively to Japanese buyers, experience little competition amongst themselves³.

Asian gas projects will only develop if prices are kept sufficiently high, and this in itself poses two problems: the question of maintaining sufficient distance from oil prices if these fall too low in the future as in the period 1998-1999, and the need to maintain a significant price differential against the North American and European markets. Once the maturity stage is reached, these markets will encounter the gas to gas competition conducive to lower prices. Asian prices should remain at a distance of \$1/Mbtu from the prices on these other markets, for a variety of reasons:

- The profitability levels of the LNG chains, and *a fortiori* those of the long-distance pipeline projects, will tend to set minimum prices in the area of \$3/Mbtu (even if profitability levels of extensions to projects can be set in the region of \$2.5/Mbtu), as these projects need to be completed.

³ "LNG in Asia - a fuel for niche or mass markets?", *Energy Economist Briefings, Financial Times*, July 2000, p. 1-7.

- For competing energy sources, the increasing needs in Asia will doubtless have a pressure effect on the increase of world oil prices in the medium term (2005-2010), as it has been the case with the conjunctural increase in 2000 under the effects of Asian economic recovery.

The difference between the contract price and prices on other regional markets can be maintained thanks to the absence of infrastructures and integrating mechanisms; the spot market for LNG cargoes will have only a marginal role to play in future. It will only prevent fluctuations in crude oil prices from remaining a risk factor, as gas price/crude oil prices cannot exceed certain limits.

- **The uncertainty of demand**

Long-term contracts will only be signed if there is a secure potential for an outlet. The fact that the national markets are immatured with weak internal infrastructures, means that most potential outlets in the new markets (about 85%) are in the fields of electricity production, chemical usage and some other big consuming sectors. This fact alone restricts the potential for development, and as a result the import projects are mostly linked to electricity production projects; this is a well-known pattern already encountered in previous market developments in Japan and South Korea. It will be favoured in future because of the liberalisation of the electricity industry and the advent of independent power producers using combined cycle gas turbine equipment. In future, however, it will also be severely restricted by the level of development in internal regional transportation networks and urban distribution networks, as will be the case in China and India.

- **The reduced cost and risk of the LNG projects**

The restriction and uncertainty affecting the realisation of the projects is however different. In addition to political uncertainty, economic restrictions will lead to a scale of projects-types, with preference going to the extension of existing factories (\$2,000 million), then to the realisation of new projects (the so-called “grass-roots” projects costing \$5-6,000 million), and finally to the cross-border gas pipeline projects. Because of the distances to be covered, and the greater influence of distance on costs, the gas pipeline projects will require larger, single investments. A continental project, such as the planned route from Irkutsk to China (and eventually to Korea and Japan), which involves 12-20 Mtoe per year of gas and transportation over 4-5,000 km, will require an investment of \$8-12,000 million. The cost of the Iran-Pakistan pipeline project, measuring 1,600 km in length, assessed for a volume of 8 Mtoe, totals \$5,000 million. In comparison, a typical LNG project can be based on several successive modular contracts for 2.5 Mtoe per year, with an initial investment of \$3,000 million for the first two trains.

1.4. Changes in restrictions to, and risks inherent in, new gas import projects

Developmental restrictions (finance, outlets, currency risk, territorial risk) are significant in both options (that is, LNG and regional gas pipelines). These restrictions have been overcome in the past by the reliability of the Japanese, Korean and Taiwanese purchasers. The acceptance of contractual prices higher than oil prices and expressed in dollars by purchasers giving priority to price stability has made the business of realising the projects easier. However, with the increase in the number of actors involved in the market, new problems connected with pressure of competition have arisen, namely the reduction in future contract

prices and the requirement to prove not only the solvency of the purchasers but also the presence of sufficient outlets.

- **The pressure to reduce contract prices**

The increase in the number of potential exporters, competition between potential projects, and the advent of new purchasers, especially independent electricity producers, should bring about the need to reduce prices in future projects. This probable development, however, should not discourage the realisation of new projects, for two reasons: first, the known scope for reducing the cost of LNG projects, and second, the more rapid development of commercial gas outlets in an environment of competition with other fuels⁴. A price level of \$3/Mbtu would certainly allow all the extension projects and most of the new “grass roots” projects to be made profitable. The long-distance gas pipeline projects could also prove profitable at this price level for quantities of 30 Bcm/y over 6,000-7,000 km and 10 Bcm/y over 3,000 km in submarine pipelines or 4,000 in pipelines on land.

The purchase of imported gas might render gas or electricity sale prices too high if the purchaser is an electric company. This would be a problem if the country in question has not reformed its energy price structure or electricity industry, as is the case in China and, to some extent, in India. In China, national natural gas prices are being held artificially low in order to ensure that certain economic objectives, especially the maintenance of fertiliser production levels, are reached. Any increase in the price of this significant input would be passed on to the cost of agricultural products, thus leading to inflation. The same problem occurs if natural gas is made a source of competition against other fuels in industrial or commercial use (in the form of “city gas”)⁵.

In the same way, sales of gas imported for electricity production require the purchaser to be able to pay for the gas and make his investments in electricity production profitable. For gas exporters therefore, a public electricity enterprise will appear less reliable than an independent producer committed to a “Build, Own and Operate” (BOO) contract, which makes provision for suitable payment to be made to the fuel seller; this is the case for the Indian or Filipino LNG imports, which are linked to electrical BOOs. Reforms in the Asian electricity industry will therefore doubtless have the effect of stimulating changes in these imports.

- **The need for new guarantees**

The gas projects likely to develop in the next two decades will therefore require a new kind of guarantee, because of the economic and political profiles of the countries concerned. The new projects will be aimed at less economically developed markets than Japan and Korea (such as India, China, Pakistan, the Philippines and, to a lesser extent, Thailand). These economies all have limited financial markets and are not yet used to complex financial arrangements. In addition, the financial crisis has revealed the magnitude of the currency risk for contracts written in dollars; and the banks are no longer willing to bear this type of risk. The support of multilateral agencies such as the World Bank and the Asian Bank of Development is therefore

⁴ M. Lynch, op. cit.

⁵ Q. Lan and K.W. Paik, *China Natural Gas Report*, Royal Institute of International Affairs, London, 1998.

frequently sought in the form of guarantees, to limit the business risk inherent in stage of development at which these new, emergent markets currently find themselves⁶.

One method that will make investments in LNG chains and production secure is to make the importing country participate in the development of the projects. This is happening with the Korean purchasers, such as KEPCO, the power utility, in a project in Oman. Another method is to involve Western companies in the projects that bring together LNG chains and independent electricity production units, as is the case with Enron in India.

It is therefore State policies, company strategies, restrictions on mobilisation of capital and the risks inherent in each individual project that will make the projects effective. With the advent of new sellers and new purchasers on the Asian market, the opportunities and risks are different from those encountered in the period when Japan was the sole buyer. On top of that, the financial crisis has changed the way in which some risks are perceived.

2. The place for exports from the Caspian Basin and Siberia, via major continental pipelines, in supplies of the major Asian markets

The countries of the Caspian Basin, Central Asia and Siberia are becoming steadily more reliable in terms of supplies to Asia. In the light of increasing competition in the field of making supplies to Europe, it will very much behove Russia and the countries of Central Asia to turn to the Asian markets instead. The reserves identified in these countries, although not yet fully quantified, would appear to be sufficient to warrant the construction of a system of transcontinental gas pipelines. However, these new suppliers would be restricted by the profitability of the projects, and the risks inherent in that particular kind of investment; and in view of the scale of financial commitment required, international investors would have to become involved.

On top of that, Russia and the countries of Central Asia and the Caspian Basin need to make major economic reforms. The collapse of the planned economy system has created a deep-rooted uncertainty, both economic and political, which is not at all conducive to major international investment. They have also competitive interests. So what could be the degree of involvement by international investors in these countries in view of their reforms? What degree of competition will exist between Russia, Central Asia and Transcaucasia when it comes to supplying Asia? Not only the pace of development of hydrocarbon reserves, and therefore the cost of the hydrocarbons, but also the security of the export routes to the Asian markets, depends on the answers to these questions. In this area, the political instability of the countries, which is likely to have an effect on the export routes, may significantly alter the profitability of the projects planned by greatly increasing the financial risk inherent in specific investments.

2.1. Developments in import needs in the major South and East Asian markets

In East Asia Japan, South Korea and Taiwan, which are lacking in resources, rely on LNG import contracts for their economic development; they diversify their energy supplies and therefore limit the environmental effect of electricity production and domestic consumption.

⁶ T. Dols and G. Page, "New markets pose different challenges", *Petroleum Economist*, April 1998, p. 47.

China and India have reserves identified respectively at about 2,040 Bcm and 700 Bcm, for production of 20 Bcm in 1996⁷. The official forecasts needs for these two major markets are very large: 96 Bcm in 2010 and 204 Bcm in 2020 for China, and 70-120 Bcm in 2010 for India. Naturally, these countries give priority to exploring their territory and the development of their deposits, with recently the possible involvement of foreign companies. In India, however, domestic efforts have fallen short of requirements and there is likely to be a decline in production after 2005 if no new discoveries are made. National forecasts, however, predict a production level of 30 Bcm in 2010⁸. In China, an increase in national production is also forecast, with ambitious targets (62 Bcm in 2010, and 94 Bcm in 2020)⁹. The maximum use of national resources, some of which are located in remote Eastern areas such as Qinghai for the Qaidam basin and Xinjiang for the Tarim basin, will require expensive regional pipelines to be developed in order for the less remote industrial centres to enjoy access. Two projects with 2-3 Bcm per year (Sichuan-Jinzhou, 500 km and Qaidam-Gansu, 950 km) are currently being set up. An East-West link to Shanghai, costing \$6-7,000 million, should be set up between now and 2015 or 2020, creating a central line along which new consumer industries will be developed in the ten provinces crossed. In both cases, however, the magnitude of energy requirements is such that the countries are planning to make significant imports.

Table 5 : Forecast gas imports and consumption for China in 2010 (in Bcm)

	CNPC (1998)	Japan Institute of Energy Economics (1998)	RIIA (1998)	APERC 1999
Importations	68	43.0	23.2	12.5-19.5

Sources : APERC, op. cit., *Energy in Japan*, March 1998 ; et Lan et Paik, op. cit.

In India, it was officially forecast in 1997 that 38 Bcm would need to be imported by 2010 if the first eight LNG projects were completed quickly. In 1998, China's government increased its import forecasts from 20 to 30 Bcm in 2010 and from 40 to 60 Bcm in 2020¹⁰. In both cases, imports in 2010 would very probably be lower (15 Bcm for India and 8 Bcm for China in 2010), but even so, they would be improved.

2.2. The merits and demerits of transnational pipelines coming from Central Asia

The Caucasian States, and those of Central Asia, which have been submitted to Russia domination since the 19th century, are now becoming subject to geopolitical forces that are still nascent but can already be identified in some ways. Their geographical situation makes them strategically important countries, even though they were forgotten during the years of Russian domination. They are now the subject of conflicts of interest between powers close by (Europe, Russia and China) or far away (the USA), and these outer conflicts around the control of the Caspian's immense resources and the hydrocarbon export routes.

7 Source: IEA - *Asia Gas Study* - Paris, OCDE, 1996, p. 32. Chinese resources could reach 38Tcm. Cf. Ft Energy Economist, May 1998.

8 Morita, K. "Outlook for natural gas trade in Asia-Pacific region", *Energy in Japan*, March 1998, No 150, pp. 21-40.

In 1998, the Chinese CNPC mentioned a forecast production figure of 80 Bcm in 2010. A more sensible estimate of 54 Bcm is given in a recent APERC study (*Natural gas infrastructure development in East Asia*, Tokyo, February 1999).

9 O. Lan and K.W. Paik, *China Natural Gas Report*, Royal Institute of International Affairs, London, 1998.

10 O. Lan and K.W. Paik, op. cit.

- **The merits of Central Asia**

From the point of view of producing gas and exporting it to Asia, these countries are undoubtedly in a favoured position. The first “plus” is that their resources are very significant, even though the exact totals are uncertain because of lack of exploration in Soviet times. Estimates vary according to source, but the lowest Russian estimates put the totals at between 6 and 7.7 Bcm¹¹, while Western estimates produce figures of between 7.4 and 10 Bcm (see Table 6). These figures, however, might even be revised upwards, as initial exploration works in the Azerbaijani area of the Caspian basin has revealed the presence of enormous gas deposits¹². The three major gas producers in the area are Azerbaijan, Kazakhstan and Turkmenistan. Their gas production is already in the region of 6 Bcm per year for Azerbaijan and Kazakhstan and 23 Bcm for Turkmenistan, and the most optimistic forecasts talk about production of 130 Bcm in 2010¹³.

Table 6 : Estimation of gas reserves in the “Caspian” countries and Central Asia (Bcm)

	Azerbaijan	Kazakhstan	Kirghizstan	Tadjikistan	Turkmenistan	Uzbekistan
IEA	nd	1 800	n.d	n.d	2 900	1 800
BP	850	1840	n.d	n.d	2860	1870
Pétero-consultants	599	2 226	26	16	4 353	2 624

Sources : IEA.- *Caspian Oil and Gas : the supply potential of Central Asia and Transcaucasia*. - Paris : 1998 ; BP Statistical Review, 1999 ; Skagen (O).- *Caspian Gas*.- Royal Institute of International Affairs, 1997, p.4.

*: Except Russia and Iran

The second advantage is that the development works are being carried out under the aegis of international oil companies, who have found the legislation in these countries to be more favourable than in Russia. In consequence, the financial cost of making the most of the gas resources is less.

Finally, even though these countries have in the past concentrated in the European market and the export routes there, various factors may lead to a rethink of that strategy. The countries of Central Asia are precisely that - central, being located at a midway point between Europe and the Far East, and therefore between several great regions (Slav, Chinese, Islamic, Indian and Turkic). They are a privileged link between Asia and Europe in the whole field of exchange¹⁴. The difficulties encountered, especially by Turkmenistan, in opening up gas export routes to Europe, the current competition on the European gas market, and the sheer size of the need in Asia, are all gradually leading these countries to rethink their strategy with regard to Europe and to look into methods of developing export routes to Asia.

¹¹ These estimates were produced by VNIIGAZ-Gazprom.

¹² Exploratory works carried out by the Shah Deniz Consortium on the deposit of the same name revealed huge quantities of gas where oil had been expected.

¹³ At the 2020 horizon, the gas production forecasts total 17 Bcm for Azerbaijan, 17-32 Bcm for Kazakhstan, 92-130 Bcm for Turkmenistan and 52-55Bcm for Uzbekistan.

¹⁴ Djalili, M. “The rediscovery of Central Asia by the international community: a discussion of the realities”. *The Countries of the CIS*, La Documentation Française, 1997 edition.

- **The planned “gas routes” to Asia**

Three routes are currently being examined with particular interest. First, the Central Asia Pipeline project aims to carry Turkmen gas via Afghanistan to Pakistan, with a possible extension to India. (It should be noted that this gas project is developing hand-in-hand with a project aimed at exporting crude oil from Kazakhstan and Turkmenistan to Afghanistan, Pakistan and India). Second, there are plans for a gas pipeline between Turkmenistan and China, with the possibility of extending to Korea and Japan. A third project would allow Kazakhstan to export significant quantities of gas to China from its giant Karachaganak deposit, which is being exploited in conjunction with the Italian company ENI through its subsidiary Agip Karachaganak (see inset 1).

Inset 1

Main gas pipeline projects running from the Caspian and Central Asia to Asia

1. Central Asia pipeline: Turkmenistan-Afghanistan-Pakistan, with possibility of extending to India.

Coming from the Daulatabad or Yashlar deposits, this pipeline would be about 1,271 km long. The anticipated exports would be about 20 Bcm per year, for an estimated cost of \$2 Billion, to which a further \$600 million should be added for an extension to India. Uzbekistan is a party to this project. A major stumbling block to this project is the political instability in Afghanistan.

2. Turkmenistan-China, with possible extension to Korea and Japan.

A gas pipeline would run from the Daulatabad deposit in Turkmenistan to Shanshan, in China's Xinjiang Province, over a distance of about 2,150 km. Volumes exported would be in the region of 25 Billion m³ per year, for an estimated construction cost of about \$4,700 million. This project is currently at the feasibility study stage. The network could also involve Kazakhstan and Uzbekistan, for exports to China.

3. Kazakhstan-China

This project involves exports to Shanshan, in Xinjiang Province, from the Karachaganak gas deposit in Kazakhstan. 3,370 km long, the pipeline would allow 25 Billion m³ of gas to be routed to China each year.

- **The constraints and risks**

Despite the obvious benefits of these countries, “gas routes” to Asia, and particularly China, are not without their problems. The most pertinent problem is the economic profitability of projects realised over such a great distance. Because of the distance, the financial cost of such a project would be very substantial. The second difficulty is the level of the country-risk, which is linked to the geopolitical uncertainty in the area; there are many such risks, mostly to do with tension between states and conflicts within some of the states, whose political and social situation is far from stable. This is particularly the case in Afghanistan, the transit country for the coast and South Asia, but also in Tajikistan and Kirghizstan, transit countries for the South and for China. The conflicts also include the problem of the Kyrgyz minorities living in Xinjiang, in China. This creates many uncertainties in terms of risk and economic profitability to be researched for these projects.

In the medium term, the motive for the realisation of some Trans-Asiatic projects will be more political than economic. China is well aware of what it stands to gain from developing the resources in Central Asia. Its interest in becoming involved in exploiting the Kazakh deposits is born of its anxiety to diversify its supplies, which in turn is the result of anxiety for

security of energy supplies. China's other motive, however, is its wish to play a leading role in Central Asia and to counter-balance the influence of Russia and America in an area currently undergoing a major change. It remains to be seen whether China is willing to pay an inflated price for the privilege¹⁵.

In this incipient new geopolitical situation, Russia's gas policy will be highly influential, as it holds the key to some of the gas export routes to Asia, including Kazakhstan and Turkmenistan.

2.3. The Russian choice of diversifying exports to Asia from the Siberian deposits

Russia's choice of diversifying exports to Eastern Asia to include the East Siberian and Far Eastern deposits is fast becoming a viable alternative, in many ways less problematical in terms of gas supplies than the Central Asian countries. The size of these reserves could also make developing the long-distance gas pipelines carrying supplies to Asia more profitable. The proven resources in these deposits total 5.3 Bcm, and the resources total is reckoned to be 56.5 Bcm¹⁶; this means that exports could total 12-24 Bcm for a total production of 20-34 Bcm at the 2010 horizon, and 35-50 Bcm for a production of 55-75 Bcm by 2020¹⁷. Three new gas regions could be developed: one in the Sakha area in the Far East, the second in the Irkutsk and Krasnoyarsk areas in Eastern Siberia¹⁸, and the third in the Sakhalin area, where three major production sharing agreements have already been signed. Other regions of less importance, but still worth mentioning, are the Kamchatka Peninsula and the Magadan Region¹⁹.

The Russian option is also being considered by a growing number of Asian countries, especially Japan, South Korea and China, as gas could be supplied to them under two main projects: one based in the Irkutsk area, and the other on Sakhalin Island (see map 1).

¹⁵ Waelde, T. "International Good Governance and Civilised Conduct among the Caspian States: Oil and Gas as a lever for Prosperity or Conflict". Chapter 3 in Asher, W. and Mirovitskaya, N. *The Caspian Sea : A Quest for Environmental Security*.- Kluwer Academic Publishers, 2000, p. 40-41.

¹⁶ Khartukov, E. "East Asia's Energy Security: A Russian Perspective". *The Journal of Energy and Development*, Vol. 24, No 2, 2000, p. 226.

¹⁷ E. Khartukov, 2000, op. cit., p. 244.

¹⁸ For administrative purposes, Siberia and the Far East are divided into three economic regions: Western Siberia, Eastern Siberia and the Far East. In M. A. Crosnier's "Siberia and the Russian Far East: Instability and Reduced Growth", *Le Courier des Pays de l'Est*, No 422, September 1997, p. 4-28.

¹⁹ Khartukov, E. "East Asia's Energy Security: A Russian Perspective", *The Journal of Energy and Development*, Vol. 24, No 2, p. 223-257.

Map 1 : Projects for gas pipelines from Russia to Asia



- **The Irkutsk Corridor Project (ICP)**

Using the resources being developed in the Irkutsk region, and more specifically the Kovyktinskoye deposit, a gas pipeline known as the Irkutsk Corridor Project, or ICP, would transport gas to Mongolia, China, Korea and Japan²⁰. This pipeline, 3,500 km long, would allow about 20 Bcm per year to be exported to China by 2010²¹. Exports from this deposit are expected to begin in about 2010. A 1,200-km extension across South Korea to Japan, currently being studied, would allow Korea to import about 10 Bcm of Russian gas²² per year. A major asset for this region, these deposits are no further removed from the major Asian markets than the Western Siberian deposits are from the European markets.

This project is therefore being given priority over the Sakha projects, which are more distant from the major consumption centres. However, Sakhgaz, which was aiming to export 30 Bcm per year from its deposits to South Korea and Japan, could be redefined by being linked to the Irkutsk Corridor Project; this would allow it to benefit from supplying the major economies²³.

²⁰ Development of the pipeline is being led by RUSIA Petroleum, a Russian company controlled by the Burovik Siberian Far East Oil Company (22,3%), a subsidiary of BP-Amoco and the Russian enterprise Sidanko (6.6%). The other main shareholders are the oil business Angarks (9.97%), the electricity producer Irkutskenergo (12.79%), the Irkutsk Regional Property Fund (16%), and the Korean enterprise East Gas Asia (8.37%).

²¹ The main point of discussion between China and Russia is the route to be followed. Russia favours a shorter route, via Mongolia, while China favours a direct access from the North-East via Manzhouli. Cf. "China launches massive gas pipeline campaign", *Oil and Gas Journal*, June 5, 2000, p. 63-66.

²² "South Korea to join Kovyktinskoye gas development", *Gas Briefing International*, November 1999, p. 7.

²³ E. Khartukov, op. cit., p. 240.

Table 7 : The main East Siberian deposits and pipelines planned for export to Asia

Gas Fields	Gas reserves Gm ³	Oil reserves Gbarils	Operators	Gas pipeline projects
Irkutsk				
Kovyktinskoye	870 (estimated reserves)	0.4(estimated reserves)	Rusia Petroleum	China, Mongolia, South Korea, Japan. 20 Gm/year
Verhnechonskoye		1.6(recoverable reserves)		
Krasnoyarsk				
Yurubchonskoye		2.6 (recoverable reserves)		
Rep. de Sakha				
Chaiyandiskoye	165 (probable reserves)			
Sredne-Botuobinskoye	152 (probable reserves)	0.44 (probable reserves)	Sakhaneftegaz	Project abandoned for the time being
Taas-Yuriakhskoye	103 (probable reserves)			
Talakanskoye		0.65 (probable reserves)		

The other area of importance is Sakhalin Island, where three production sharing agreements have already been signed in relation to exploitation of oil and gas deposits. Production would mostly be sent to Japan and Korea from both gas pipelines and LNG chains. The production partitioning agreement relating to Sakhalin II, the first to be developed, should ensure exportation of the first supplies of LNG to these countries in 2005.

Table 8 : The main planned gas exports from Sakhalin

Joint venture	Gas Fields	Production	Projects	Countries	Remarks
Sakhalin I					
Exxon :30% Sodeco (1) :30% SMNG(2) :23% Rosneft : 17%	Chaivo, Artun-Daginskoye Odoptu	2016	Gas pipeline to China	Japan (Hokkaido), North East of China (3)	Production Sharing agreement in revision
Sakhalin II					
Sakhalin Energy Investment :51% (4) Rosneft : 49% (5)	Lunskoye, Piltun-Astokhskoye,	16 Gm ³ in 2007	Gas pipeline and LNG (exports of LNG in 2005)	Japan (Hokkaido), South Korea Taiwan	The only PSA implemented
Sakhalin III					
Exxon : 100%	Bloc d' Ayash et d'Odoptu Est				PSA in negotiation

- (1) Sodeco : Sakhalin Oil Development Cooperation Co (Idemitsu, Marubeni, Nissho, Iwai, JNOC, Japex, Overseas Petroleum Corp, Itochu, Cosmo Oil, Kyodo, Kyushu Oim, Kaneat, Sogoshu, Sumitomo, Nichimen),
 (2) :SMNG : Sakhalinmorneftegaz-Shelf. - (3) The Japan Petroleum Exploration Co, Marubeni Corporation and Itochu Corporation have agreed to start a three-year feasibility study into the construction of a 1,300-km pipeline for transporting natural gas from Sakhalin to Niigata, Japan. The pipeline should cross Hokkaido (1000 km of it under water). - (4) Consortium consisting of Marathon (37.5%), Shell (25%), Mitsui (25%) and Mitsubishi (12.5%). Shell may take over the share held by Marathon if Marathon leaves the consortium.- (5) Because of financial problems, Rosneft may sell some of its shares in the Russian companies Gazprom and Lukoil.

More generally speaking, these projects are part of a political movement to rebalance the “centre” of scope of Russia's interests towards Asia. This wish is evident from the recent increase in exchanges between Russia and China, following on from recent commercial agreements concluded between Russia and Japan and between Russia and Korea. The emphasis of Russian politics has always shifted between the “Euroatlantic” orientation, one aspect of which has been the economic liberalism of the reformist followers of Anglo-Saxon economic paradigm, and the anxiety to acknowledge Russia's presence on the Asian continent²⁴. Russia, in order to limit the influence of America in the former Soviet Central Asian republics and to reassert its position on the international scene, may be tempted to take the step of forming strategic alliances not only with China, but also with Iraq and Iran. In addition, both Russia and China have a common need to make their borders safe, and have everything to fear from the political instability in the Central Asian countries and the risk of destabilisation by their ethnic minorities. This is the reason for the interest in agreements on the development of regional energy markets, which would help make their borders safer²⁵.

Of course the economic criteria are still of first importance in this strategy. The development of the deposits and the construction of gas pipelines require substantial capital outlay. The financial commitment needed is too great for Russia alone to make, be it through the State, the regions, the dominant gas holding Gazprom or the oil holding companies. These enterprises, which are firmly stuck in the internal economic quagmire of barter and non-payment, are unable to finance investments of this magnitude. The projects will not therefore be realised without substantial international investment.

- **The insufficiency of the economic reforms to attract international investors**

The large-scale development of Eastern Siberia and the Russian Far East will not occur without major involvement by international investors, as it requires very substantial financial commitment. The two projects that are currently most likely to become reality, namely Sakhalin and Kovyktinskoye, are a case in point. However, despite the economic reforms instituted and the gradual development of a legislation more in keeping with international principles, Russia is still not an attractive country. The law on production sharing agreements, signed in 1997, has done very little to change things, and the Sakhalin II project is still one of only two production sharing agreements that have been properly implemented in Russia. In the absence of recognised suitable institutions able to consolidate and enforce contractual practice, the legal framework does not currently seem strong enough to guarantee protection of foreign investors and their massive financial commitment.

Furthermore, opposition between the Federal Government and the Provinces on the question of who owns natural resources have provoked conflicts that have weakened the power of the decision-making bodies and greatly complicated the business of making investments. Russia has seen the emergence of several powerful regions anxious to cast off the yoke of the central Moscow government and carry out their own reforms. The whole question of ownership of

²⁴ Cf. in particular the special article by Mouradian, C. “Russia and the Orient”: *Problèmes Politiques et Sociaux*, No 796, 16 January 1998, 79 p.

Gratchev, A. “Russian Foreign Policy, towards the East”. *Les pays de la CEI*, Studies by Documentation Française, 1997 Edition, p. 131-143.

Tsepkalo, V. “The remaking of Eurasia”, *Foreign Affairs*, March-April 1998, p. 107-126.

²⁵ Yergin, D., Eklof, D., Edwards, J. “Fuelling Asia's Recovery”. *Foreign Affairs*, March-April 1998, p. 34-50.

hydrocarbon resources and who should enjoy their benefits is at the very centre of this struggle. Hydrocarbons are a source of foreign currency and therefore of tax revenue, and as such, they guarantee a measure of independence for the regions from a State that remains very highly centralised despite the reforms instituted.

Despite this uncertainty, some aspects of the current situation could work in favour of the Asian gas option, which was neglected during the years of the Soviet Union, whose export policy was geared exclusively towards Europe.

- **The credibility of the new economic players in Russia**

As Russia's economic system has changed, a number of new economic players have managed to form businesses despite the weakness of the market institutions. In the oil and gas sector, the main development has been the advent of powerful holding companies whose privatisation processes offered foreign investors the chance to obtain part of their capital. These foreign investors have therefore become involved in the development of some gas basins, which will undoubtedly be of great help in making certain gas deposits developed, especially the Kovyktinskoye deposit in Irkutsk Region. BP-Amoco is directly involved, as a shareholder both in Sidanko and in the Burovik Siberian Far East Oil Company, two shareholder companies in RUSIA Petroleum, which holds the licence for the development of this deposit.

This general picture, however, is influenced by the prospects of stabilisation of the Russian legislative and judicial framework, as shows the risk of expropriation inherent to possibilities of forced bankruptcies²⁶. In Russia, ownership rights confer few economic rights on the shareholders. The development of the Siberian deposits will depend on the oil and gas holding companies' capacity for allying themselves with Western companies.

Finally, the place which will be given to the dominant Russian gas holding company will influence the chance of development of the Asian gas option. Can the development of gas production and transportation in Eastern Siberia be envisaged without the powerful Russian holding company Gazprom becoming involved in one form or another? Paradoxically, this company, although it holds a quasi-monopoly on production and transportation in Russian territory, is not currently greatly involved in the development of the East Siberian and Russian Far East projects. However, the licences for the development of several major gas deposits are currently in the hands of regional oil holding companies such as RUSIA Petroleum, and this state of affairs is opposed by the federal authorities who are anxious to reallocate the licences to better-constituted and more reliable players such as Gazprom, which, as it happens, is anxious to reorientate itself towards Asia²⁷. Its anxiety to increase the number and scope of its outlets, as well as the closeness of the Asian markets, have led it to reorientate its gas policy towards Asia. Gazprom could already look to export part of its production in West Siberia

²⁶ There are two conflicting arguments on the recent bankruptcy of Sidanko, one of the major oil companies. Some believe that its bankruptcy was brought about by its own shareholders, the banks, and was a case of "self-bankruptcy". This is a common phenomenon in Russia, its purpose being to escape debts by transferring assets to other holding companies. Others maintain that the bankruptcy of Sidanko was initiated by the main shareholder in the Tyumen Oil Company and was an example of asset transfer. The second argument is the more probable one.

²⁷ "Gazprom stresses quality not quantity as gas price reform moves centre stage", *Gas Matters*, June 2000, p. 6-8.

(Yamal or Nadym-Pur-Taz basins) to Asia by creating a 6,500-km long pipeline transporting 30 Billion m³ of gas per year. This project would form the backbone of a whole system of pipelines that would allow the various plans for transportation from Eastern Siberia, Sakha and Sakhalin to become reality (see map 1). The position of foreign investors in relation to Gazprom would weigh in its favour, being realised in scale projects. Gazprom has already asserted itself as a role-player capable of negotiating both with the Russian State and with the Regions, and as such would be an invaluable partner for the Western companies.

2.4. Competition on Caspian and Siberian exports from other import projects to Eastern and South Asia

- **The limited competition from the Middle East-South Asia pipelines**

Plans for a first set of pipelines from the Middle East or Central Asia to South Asia have already been studied. This would be a method for linking the vast resources of Iran, Qatar or other countries in the area (including Turkmenistan) with the considerable potential need in South Asia.

Table 9 : Plans already studied for regional pipelines leading to South Asia

Exporting Countries	Importing Countries	Volume (Bcm/y)	Length (km)	Remarks
Oman	Inde	20	3150	1150 km under water
Iran	Inde	18-20	2200	1200 km under water and possible way by Pakistan
Iran	Pakistan	10	1600	
Qatar	Pakistan	16.5	1600	

Source : Morita (1998), op. cit., p 35.

These planned pipelines would be costly (\$5-15 billion) and there would be numerous problems in realising the project because of the political and military risks present in the area: the political instability in Afghanistan, ongoing tension between Pakistan and India, and so on²⁸. Avoiding the trouble-spots by passing submarine pipelines under the Arabian Sea poses technical problems (the sea is over 3,000 metres deep), and would incur considerable additional costs. On top of that, the effects of America's policy towards Iran would have the effect of discouraging any foreign investment in that country, until the US foreign policy will change. It follows from all this that exchanges of gas along the Middle East-South Asia will certainly follow the LNG route, and no other, during the next fifteen years.

- **The strong competition on cross-border projects from the plans to import LNG into India and China**

In the light of increasing demand for gas in India and the fact that local gas production will be limited to 20 Bcm if no new discoveries are made, there are numerous plans to import LNG. In June 1997 the Federal Government gave the green light to the creation of a consortium known as Petronet LNG, consisting of Gas Authority of India (GAIL), Bharat Petroleum, Indian Oil Corp and Natural Gas Corp, responsible for building the terminals. Seven

²⁸ Sen, A. "Natural gas import into South Asia: a study in international relations". *Energy Policy*, No 28, 2000, p. 763-770.

companies were selected to form partnerships with this consortium: Amoco, BHP, Mobil, Shell, Texaco, Unocal, Essar Indian and the Indian private industrial consortium Petronas, itself active in a number of projects with various foreign groups (Enron, Shell, British Gas etc)²⁹. India was not greatly affected by the crisis of late 1997, and is now the “escape lane” for exporting countries looking to place excess capacity somewhere following the postponement or cancellation of a contract. Currently there are about twenty terminals currently in project, representing a capacity of over 40 Mt per year, and seven of them are under construction or contractual installation. These projects will be systematically linked with electricity production (table 10). This is the case with Petronet’s project at Dahej, which uses LNG originating in Qatar, Essar’s project at Hazira using LNG originating in Oman, and Enron’s project at Dabhol using LNG from Qatar; all of these projects are linked to 2,500 MW electricity stations projects. The electricity industry should account for more than half of all gas consumption in India between 2010 and 2020, according to national forecasts.

The LNG option can be realised much more quickly than the option of supplying via gas pipelines coming from the Middle East or Central Asia, because of the nature of the restrictions and the associated risks (see below).

Table 10 : The main projects for importing LNG into India at the beginning of 2000

Projects	Proposed suppliers	Capacity Mt/y	Import start-up
Cochin (Kerala)	Qatar	7.5 pour Cochin et	-
Dahej (Gujarat)	Qatar	Dahej	-
Dabhol (Maharasta)	Oman	5	2001
Ennore (Tamil Nadu)	Australia, Malaysia, Oman, Qatar	nd	2003
Hazira (Gujarat)	Oman	2.7	-
Mangalore (Karnataka)	Oman, Qatar	6.5	2004-2008
Pipavav (Gujarart)	-	2.5	2001
Manappad (Tamil Nadu)	-	2.5	-
Trombay (Mumbai)	-	3.0	2003

Sources : Petroleum Economist et Shell - *The Global LNG Map* - CDRom, March 1998 et “India LNG projects boom”.- *Oil and Gas Journal*, 19 june 2000, p. 62-75.

Note: Once the American embargo has been lifted, Petronas is likely to import 2.5 million tonnes of LNG from Iran each year. Its destination will be Hazira in Gujarat Province see “LNG in Asia: a fuel for niche or mass markets?” FT Energy Economists op. cit., p. 4.

China is less involved in developing LNG projects than India is, because of competition between its internal gas pipeline projects coming from its four productive zones and the possibility of importation via pipelines from Eastern Siberia (Irkutsk) and Central Asia. Three LNG terminal projects are likely to be completed in the next ten years. Two of these (Pearl River Delta and Yangtse Delta) are included in the 2000-2005 plan, and the first was approved in 1999 and the second in 2000. The first will import gas from Australia and will involve the partners in the Australian Northwest Shelf (Chevron, BHP and Woodside) in a 35% stake. The terminal should be able to take 3.6 Mt per year from 2005 onwards. The projects completed by 2020 could reach a capacity of 10-15 Mt (27-34 Bcm) per year. This development will provide support for the electricity industry, although 30% of total volumes should be set aside for industrial and commercial use³⁰.

29. *Pétrostratégies*, 17 November 1997.

30 K.W. Paik & W. Lan, “China prepares to expand gas output and distribution amid challenges”, *Oil and Gas Journal*, 20 July 1998, p. 27-32.

Table 11 : The three LNG projects in China

Projects	Capacity (Mt/y)	Import start-up	Associated electricity generation capacity (MW)
Pearl River delta (Guandong)	(3.5) 6.0	2005	8400
YangTsé delta	6.0	2005 (?)	5100
Fujian	2.0	2005 (?)	1200

Source : Morita.- *Energy in Japan*, Mars 1998, p. 31

The countries that sell to China should first of all be the South-East Asian LNG exporters (Malaysia, Indonesia, Brunei, Australia etc). However, the Chinese government is also planning to import from the Middle East (Qatar, Yemen, Iran etc), with the possibility of the Chinese oil company becoming involved in developing certain LNG projects.

2.5. The specific restrictions on implementing transcontinental projects

The development of major transcontinental pipelines has run up against bigger problems than has the development of the LNG chains: a higher level of unitary investment is needed, outlets need to be found for the gas quantities contracted, operators with access to substantial financial resources need to be involved, and the country-risks added territorial risk.

- **The need to find significant outlets**

Significant markets need to be found progressively in order to provide enough outlets to make a major continental gas pipeline profitable in countries whose infrastructures are not well developed. The smaller LNG projects could rely on coastal electricity projects and in addition supply a few major industrial users close by. The question of outlet quantities is currently hanging over the Siberia-China pipelines and the Central Asia-China pipelines, and will probably be a bar to the realisation of the 3,000-km pipeline between Kazakhstan and Western China planned in the agreement between those two countries, as the quantities planned (20 Mt per year) will not readily find suitably large outlets.

More generally at present the development of national pipelines, local distribution networks and interconnections between local and regional networks is very limited everywhere, with only minimal development in Malaysia (1,000 km of main lines and 200 km of secondary lines), Pakistan, South Korea and Japan. Even Japan, which is still the region's main importer, needs to develop the interconnection between the local networks associated with the twenty LNG projects if the planned Siberian pipeline to China and Japan is to become reality; and this will restrict any involvement by the major Japanese buyers. India has a number of regional pipelines (3,500 km) running from the coast to the interior; some industrial establishments and electricity production plants are connected to these pipelines.

Gas needs to come out of the fields of electricity production and chemistry (fertiliser and petrochemical industry) in order for the major cross-border infrastructures to be developed on a large scale. In China and India, this would necessitate the development of a network of both vertical and horizontal lines and, in the cold regions of China, urban distribution networks with a horizon of 20 years. In 1999, it opened up the development of city gas networks to foreign investors, in the BOOT contractual framework. In addition to that, the development programme for the Chinese network plans for three horizontal 30-BCM arteries capable of

being connected respectively to Turkmenistan, Kazakhstan and Western Siberia (Yamal), a North-South artery running from Irkutsk across Mongolia, and a connection with the LNG-importing area (Shanghai), which would be the point of competition between Siberian exports and the LNG coming from South-East Asia or the Middle East.

The possibilities for development of gas outlets in China and India will to a considerable extent determine the financial viability, and therefore the completion, of gas infrastructures more than 4,000 km in length coming from Siberia, Central Asia or the Middle East. National and local networks are either non-existent or limited, and this will severely restrict the number of outlets in addition to electricity production plants or major chemical users³¹. In addition, while India has already chosen to complement coal-based electricity generation by opening gas-fired power stations, China is still only at the definition stage of its gas option for power generation (50 Bcm of the 95 Bcm planned for 2010). Economic and environmental protection factors weigh more and more heavily in favour of turning over to gas in many quarters.

In China, which is the leading “coal country”, the gas policy is influenced by foreign policy. However, in addition to the question of independence in energy production, the questions of employment and macroeconomic balance are influencing, and will continue to influence, the options taken. Although the question of whether to choose gas to add to electricity production in future has already been resolved, the choices are still not clear with regard to the development of medium-term international projects, given that none of the inter-regional gas pipeline projects has confirmed any such orientation.

- **The scale of the geopolitical risk³²**

The organisation of exchanges in the context of long-term contracts for imports via LNG or regional gas pipelines will in itself guarantee supplies. Once the contracts have been signed and the infrastructures put in place, the parties will be mutually bound by the investments associated with the contract. Often, however, the countries in question will need to increase the security of their supplies. In the case of the regional pipeline projects, the potential instability in countries applying to export (the Central Asian Republics, Russia, Iran, Indonesia), to say nothing of the instability in the countries of transit, is significant; this will favour the LNG projects. For an importer diversifying the sources of supply is the response to the need to reduce the risk when demand is sufficiently high: Japan buys from six different countries, while South Korea buys from three and will soon add a fourth to that list. China could both buy LNG from several countries and import gas from Eastern Siberia and from the Central Asian Republics by pipelines; and India could also do that with the pipelines coming from the Middle East, alongside its LNG projects.

Importation by gas pipeline is however conducive to diversification of sources of supply in addition to LNG. One way of increasing security, especially where importation by pipeline is involved, is to develop a national network with several different entry points. The absence of an inter-linked internal network limits the possibilities of replacing one foreign seller with another, and this, for a regional power such as China, would provide additional incentive to develop such a network.

³¹ Paik, K. W. and Lan. O. “China prepares to expand gas output and distribution amid challenge”, *Oil and Gas Journal*, July 20, 1998, p. 27-32.

³² Mitchell, J. *The news geopolitics of energy*, The Royal Institute of International Affairs, London, 1997, p. 111.

Relying on the political Regions is a third method of making exchanges more secure, by the creation of communal infrastructures. In Asia, for example, some ASEAN countries are looking into the question of integrating gas and power in such a way as to give priority to the development of ASEAN members' gas deposits and to install a major submarine transportation structure in order to limit imports from other areas, especially the Middle East. At another level, China is investigating the possibility of developing regional gas (and oil) pipeline systems with Central Asia, promoting the gas pipeline project with Turkmenistan with extensions to Kazakhstan, Iran and even Central Siberia.

- **The need to rely on outside operators and finances**

The credibility of these projects still relies very much on the involvement of financial players from developed importing countries, namely Japan and South Korea. For Japan, choosing the Irkutsk region would be more costly, and is therefore less interesting from an economic viewpoint, that the possibility of obtaining gas supplies from Sakhalin Island under a LNG or gas pipeline arrangement. On the other hand, South Korea is more directly involved with the Irkutsk option. However, the Japanese are anxious to diversify their supply sources in order to make supplies secure, and there is therefore a possibility that they will participate in the Irkutsk-Asia project, even though it is unlikely that the project will be developed before 2010.

In addition, the direct involvement of certain international oil companies in the development of the Siberian deposits and in the gas pipeline projects will do wonders for the credibility of these projects. In this regard, the strategies adopted by BP in Eastern Siberia and by Shell in Turkmenistan should be followed especially closely, as they could open the way to more substantial investments in opening up these regions.

3. Conclusion

As the national resources of the principal countries of Asia are limited or non-existent (with the exception of Indonesia and Malaysia), the need for imports is becoming more and more a dominant factor. Under the projects currently being developed and studied, or postponed following the financial crisis, the annual use of gas in Asia could increase by an amount of 120 Bcm between 2000 and 2010. The current Asian exporters (Indonesia, Malaysia, Brunei and Australia), together with the new Middle Eastern exporters (Qatar since 1997, Oman from 1999 and Yemen from 2003) will ensure the development of international flows under the LNG chain project³³. North America (Alaska and Canada) could become involved in these new supplies by the end of the decade, as could Papua New Guinea.

It is not until after 2010, however, that competition will start between LNG and the continental gas pipeline projects coming from new players on the Asian markets: Russia with its Eastern Siberian deposits (Irkutsk and Sakhalin) to North-East Asia (Northern China, South Korea and Japan), Turkmenistan to China, and Iran, Qatar or Oman to South Asia (Pakistan, India)³⁴. Gas imports from India and China via pipeline should therefore remain

³³ In Eastern Asia (China, South Korea, Japan and Taiwan), it is anticipated that half the LNG projects will come from Indonesia, Malaysia and Australia, and the other half mainly from Qatar, complemented later by Oman and Yemen.

³⁴ Given the need to make energy supplies secure, international gas pipeline projects (some of them submarine) could also become reality in South-East Asia, connecting the producer and consumer countries of ASEAN (the

limited between now and 2020, while imports via pipeline from Eastern Siberia to China and from the Persian Gulf to India should begin. This point of view is opposite to the official Chinese forecasts, which planned for two-thirds of its imports to be made by pipeline in the period 2010-2020. It will not be possible to create regional pipeline infrastructures before gas consumption development and without the participation of Western companies and financially secure countries able to give the guarantees required, as has happened with the Eastern Siberia - China pipeline.

However, international investors will not become involved in such projects without major changes in the institutions and economic structures of the Caspian and Central Asia Republics and of Russia - only this kind of change will guarantee any investment made. It will be essential for economic reforms to be pursued in order for the transcontinental gas pipeline projects to become feasible. In this regard, given the possibility of competition between the Caspian states and Russia on the Asian markets, Russia will have a number of trump cards in the form of reliable Russian industrial players, who will have the effect of reducing the institutional, economic and legal uncertainty that always accompanies an economy "in transition". This competition, however, may also become complementary between countries and as such have the effect of limiting the risks inherent in such projects and therefore make supplies secure.

Whatever lines of development are followed, the growth of the Asian market will require huge investment of capital. The market will only grow if the major international oil and gas companies, anxious to diversify their activities into these potential major growth markets, participate. Growth will be easier if oil prices are sufficiently stable to prevent them from becoming too distant from gas prices and limiting the expansion of the market in consequence.

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