OPPORTUNITIES IN THE DEVELOPMENT OF THE OIL & GAS SECTOR IN SOUTH ASIAN REGION

Usman Aminuddin

World Energy Outlook

Before we address the issue of opportunities in the development of the oil & gas sector in the South Asian region, it is important to look at the world energy outlook over the next thirty years. If one looks into the future over the next thirty years, it depicts a future in which energy use continues to grow inexorably, fossil fuels continue to dominate the energy mix and developing countries fast approach consumption levels of OECD countries, becoming possibly as the largest consumers of commercial energy. Whilst the earth resources have adequate reserves to meet rising demands for at least the next three decades, but beyond that time frame there are serious concerns about the availability and security of energy supplies, the huge investments in energy infrastructure and the threat of environmental damage caused by energy production.

Energy trade is expected to expand rapidly in the coming years and, in particular, the major oil and gas consuming regions will see their imports grow substantially. This trade will increase mutual dependence among nations. But it will also intensify concerns about the world's vulnerability to energy supply disruption, as production is increasingly concentrated in a small number of producer countries. As such, supply and price security has moved to the top of the energy policy agenda. The governments of oil and gas importing countries will need to take a more proactive role in dealing with the energy security risks inherent in fossil fuel trade. They will need to pay more attention in maintaining the security of international sea-lanes and pipelines, and they will have to look anew at ways of diversifying their sources of fuels, as well as the geographic resources of those fuels.

Necessary expansion of production and supply capacity will call for massive investment at every link in the energy supply chain. Greater investments will be needed in developing countries, and it is unlikely to materialise without a huge increase in capital inflow from industrialised countries.

World energy use will increase steadily through to 2030. Global primary energy demand is projected to increase by 1.7% per year from 2004-2030, reaching an annual level of 15.3 billion tons of oil equivalent. This increase will be equal to twice the amount of current demand.

Fossil fuels will remain the primary sources of energy, meeting more than 90% of the increase in demand. Global oil demand will rise by about 1.7% per year, from 75mb/d in 2000 to 120mb/d in 2030. Almost three quarters of the increase in demand will come from the transport sector. Oil will remain the fuel of choice in road, sea and air transportation. As a result, there will be a shift in all regions towards light and middle distillate products, such as gasoline and diesel, away from heavier oil products, used mainly in industry. The shift will be more in developing countries, which have a lower proportion of transportation fuels in their products mix.

The demand for natural gas will rise more strongly than for any other fossil fuel. Primary gas consumption will double between now and 2030, and the share of gas in world energy demand will increase from 23% to 28%.

The consumption of coal will also grow, and China and India together will account for two-thirds of the increase in world coal demand over the projection period. In all regions, coal use will become increasingly concentrated in power generation, where it will remain the dominant fuel. Power sector coal demand will grow with the expected increase in gas prices. The deployment of advanced technologies will also increase coal's attractiveness as a generating fuel in the long run.

The world's energy resources are adequate to meet the projected growth in energy demand at least for the next three decades. Increased production in the Middle East and the former Soviet Union, which has massive hydrocarbon resources, will meet much of the growth in the world oil and gas demand. OPEC producers, particularly those in the Middle East, will meet most of the projected 60% increase in global oil demand in the next three decades. Output from mature regions such as North America and the North Sea will gradually decline. More oil will become available from Russia and the Caspian region, and this will have major and far-reaching implications for the diversity of supply sources for oil importing countries.

The production of natural gas, resources of which are more widely dispersed than oil, will increase in every region. International energy trade, almost entirely in fossil fuels will expand dramatically. Energy

trade will be more than double between now and 2030. All the importing regions, including the three OECD regions will import more oil mostly from the Middle East. The increase will be more striking in Asia. The biggest growth market for natural gas is going to become much more dependent on imports. In absolute terms, Europe will see the largest increase in gas imports. Similarly large gas reserves in Middle East and former Soviet Union states will find potential markets. Cross border pipelines in many regions will multiply, and trade in natural gas, and liquefied natural gas will surge. Where do the oil and gas reserves lie? *(Figures 1 & 2).*

Figure 1 (a):
World Oil Reserves

World Oil Reserves

Crude Oil Proven Reserves (in 2004)			
Country	bbl	Share %	Ranking
Saudi Arabia	262.77	24.39%	1
Iraq	112.50	10.44%	2
Iran	99.53	9.24%	3
UAE	97.80	9.08%	4
Kuwait	96.50	8.96%	5
Venezuela	76.86	7.13%	6
Former USSR	65.31	6.06%	7
Libya	36.00	3.34%	8
Nigeria	34.48	3.20%	9
Mexico	28.26	2.62%	10
China	24.00	2.23%	11
USA	21.77	2.02%	12
Norway	13.18	1.22%	13
UK	5.00	0.46%	14
Others	103.61	9.61%	
TOTAL	1,077.62	100.00%	

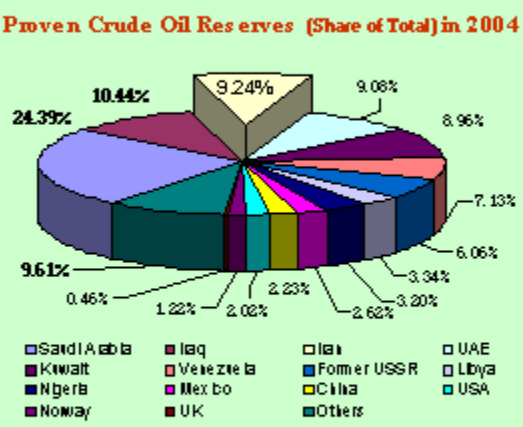


Figure 1 (b): World Oil Reserves

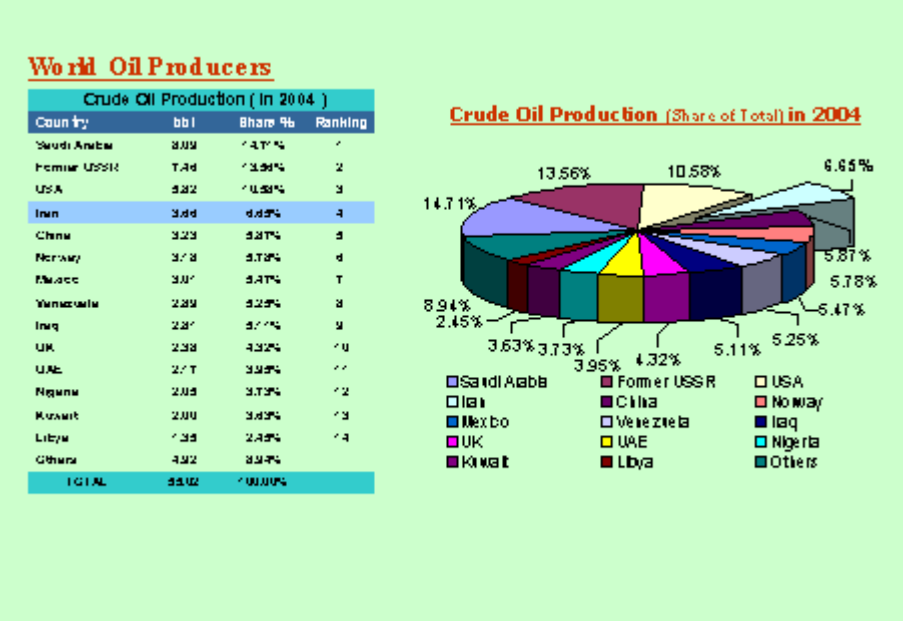


Figure 2 (a): World Gas Reserves

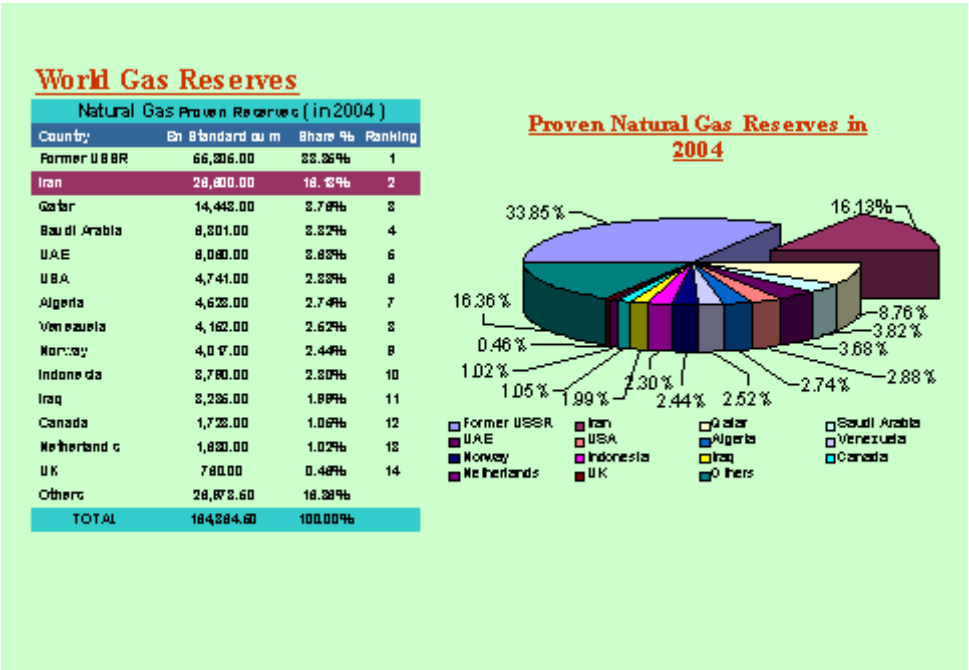
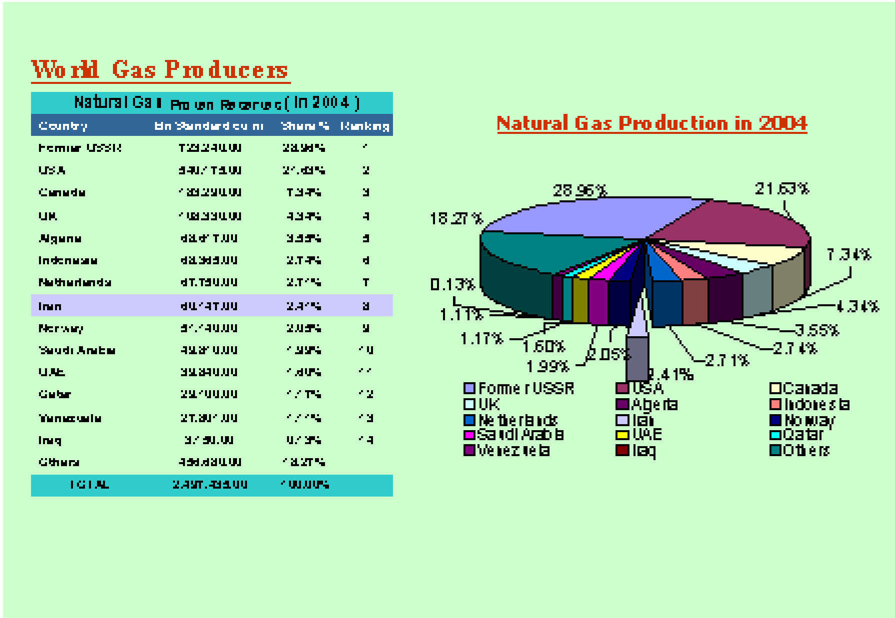


Figure 2 (b): World Gas Reserves



I will briefly touch on the three OECD regions, i.e. North America, Europe and the Pacific. While China, Russia, India, Iran and Pakistan will be covered separately.

OECD-North America

The future scenario shows an average annual growth rate of 1% in the primary energy demand of the United States and Canada. Demand will rise more slowly after 2010 due to gradual slow down in economic growth and rising energy prices.

The United States and Canada will remain heavily dependent on oil. If the US and Canadian governments take no new action to reign in demand and boost production, net imports of oil will continue to rise, reaching 15.5 mb/d or 57% of the region's consumption by 2030. A large and growing share of these additional imports will come from OPEC countries.

OECD-Europe

Primary energy demand in the European Union will rise by 0.7% a year to 2030, underpinned by a GDP growth rate of 1.9%. Demand will rise slightly more rapidly in the rest of OECD Europe. In both regions oil and gas will dominate the fuel mix. The European Union will need to import progressively more fossil fuels and the share of net imports in the European Union oil supply will climb from 73% in 2000 to 92% in 2030.

OECD-Pacific

Primary energy demand in Japan, Australia and New Zealand will grow by 0.8% p.a. from 2000 to 2030. In this group of countries, the share of natural gas, nuclear energy and renewable energy resources will grow at the expense of coal and oil. The trend results partly from government measures to promote less carbon-intensive fuels. Nonetheless, their oil import dependence will rise sharply, reaching 92% in 2030.

Korea's primary energy demand will grow by 2.3% per annum over the next 30 years. Oil will continue to dominate Korea's fuel mix but the share of gas and nuclear energy will expand further.

China

The world's second largest consumer of primary energy is a key player in world energy markets, accounting for more than 10% of the world's total energy demand.

The Chinese economy is very dependent on coal of which it has large resources, but the share of natural gas, oil and nuclear in the primary fuel mix will grow.

Imports of crude oil and refinery products are growing fast. By 2030, net oil imports are expected to reach almost 10 mb/d - more than 8% of world oil demand. Imports will also have to meet 30% of the country's natural gas needs in 2030. These trends will make China a strategic buyer. However the

investment in energy supply infrastructure needed to meet projected growth in China is enormous. More than $800 billion will be needed for power generating capacity.

Russia

Russia will play an increasingly important role in world oil and gas markets. The development of Russia's vast resources will be crucial to the energy security of countries within the OECD.

If Russia is to consolidate its role as the largest gas exporter to Europe, it will have to secure investment to develop new fields in less accessible areas and to build more pipelines. Russia is also expected to start exporting gas to markets in the Far East, including China. Russia will continue to remain the third largest energy consumer in the world, after the United States and China, as the following figures show:

Russia's Gas Industry Status in the World:

Gas	Reserves:		1/3
Gas	Production:		1/4
Large dia Pipelines:	1/2		

GazProm's proven reserves are estimated at 28800 BCM, but only 7.4 % have been sold. European consumption at 508 BCM constitutes 25% from Russian sources. EU dependence on gas supplied from third world countries will increase from 45% in 2004 to 72% in 2020.

Iran

Iran has a US $10 billion investment plan for the gas sector during the fourth economic development plan (2005-2010) and a strategy to export gas to Europe from 2010 onwards. The South Pars projects will serve as a starting point toward project finance for future gas development projects. The Research Institute of Petroleum Industry is leading the way in the development and utilisation of technology, to convert natural gas to liquids in Iran. The concept of GTL is considered to be a suitable option for transferring gas to the world's energy markets. This takes on an added significance due to its enormous gas reserves.

There are various options for Iran to utilise its natural gas such as increased home consumption, injection to oil reserves to enhance oil recovery, export through pipelines, LNG, feed stock for petrochemicals, and converting gas to liquids. Iran has about 18% of world's natural gas reserves. *(Figure 3)*

Figure 3: The present status and forecast for 2030 (figures in billion cubic meters per year).

Natural Gas Application	2004	2030
Domestic use	70	350
Injection	30	075
Export (pipeline/LNG)	03	080
Import	06	020
Total	109	525

The South Pars gas field is the world's second largest reservoir accounting for approximately 8% of the world's reserves. Estimated reserves of gas are 464 TCF.

Pakistan

I have talked about the supply and price security having reached the top of the agenda of the energy policy of consuming countries. North America which consumes 30% of world's oil supply is vulnerable to the developments in the Middle East, as the global proven reserves of oil are more than 1 trillion barrels, out of which 65% are located in the Middle East.

Pakistan's energy security is highly vulnerable being dependent on imported oil, whose supply is extremely sensitive to market mechanisms, cartel formation, as well as political developments. The methods to price crude oil in international trade have changed on several occasions in the past five decades. Different regimes have been in place at different times. The change from one regime to another was not caused by the desire to improve the economies of price differentiation. Changes in pricing

regimes have solely reflected the interest of whosoever happened to be the dominant force at the relevant time.

Crude oil volatility has a direct impact on developing economies like Pakistan. The current oil-pricing regime is imperfect since the reference crudes used do not satisfy either the volume criteria because of small producing streams, or the market criteria because the relevant physical markets are illiquid and the future market not sufficiently rooted in physical trade. Volatility will therefore remain a feature of the coming decades, unless the current pricing regime is abandoned by OPEC. Despite the declared band of $22-$28, the current crude price has already crossed $40 a barrel.

Pakistan's Energy Situation

Pakistan consumed 45.5 million tons of oil equivalent (TOE) primary commercial energy during year 2000-01, comprising 40.6% oil, 43.6% gas, 10.1% hydro, 4.6% coal and 1.1% nuclear. Nearly 83% of the oil was imported at a cost of almost US $3 billion i.e. about 30% of our total export earnings. OPEC pressure will always remain in ensuring the price band upwards of $22, and it is anticipated that the price of oil by 2005 onwards could register an increase beyond $50 per barrel. If this happens, Pakistan's import bill would constitute almost 80% of its export earnings.

With this background it is vital for Pakistan to develop its own resources of oil and gas and at the same time bring coal into the major focus through power generation on coal and gasification technology.

Gas comprises about 43% in our energy mix, coal only 5%. Over the next ten years, coal can easily play a major role in meeting our energy requirements. The new coal-based power technologies, the integrated gasification combined cycle and the integrated gasification fuel plants are the most promising technologies in view of much higher thermal efficiencies and lower emissions of environmental pollutants. Indian technology on power generation from coal could be of enormous benefit to Pakistan.

Small gasification plants for our rural communities and large coal gasification plants will substantially enhance pipeline quality gas into our reticulation system.

Pakistan's Thar field is the fifth largest single coalfield in the world. The current production of coal in Pakistan is only 8 million tons out of an established reserve of 200 billion metric tons.

Pakistan is endeavouring to bring coal into an immediate focus for its power generation, industrial and domestic use.

China and the United States produce 80% and 52% of their electricity on coal-fired plants. Pakistan produces only 1.4% of electricity through coal generation, and 40% on oil.

If Pakistan concentrates on its coal, it can easily take coal’s share to 50% in its energy mix. Pakistan has the potential capability to be self-sufficient in energy based on indigenous gas, coal, hydel and oil.

Pakistan is nevertheless examining gas import options for itself. It has recently in May 2004 floated an international study covering financial and economic aspects of gas import projects. This will cover the Gulf-South Asian (GUSA) pipeline project, the Turkmenistan project (TAP), and Iran Gas Pipeline project.

India

India is the seventh largest consumer of primary energy in the world. India’s current consumption per week was its consumption in one full year 54 years ago. The crude oil production has declined from a high of 60% in 1988-89 to 34% in 1998-99, a further decline to 14 % by 2020 and less than 10% by 2030. Crude imports represent 27% of India’s total import bill. Rising crude prices will seriously impact India also.

India will become an increasingly important player on world energy markets, as estimated rapid expansion of the population and strong economic growth drive up energy demand. Primary Energy supply will rise by an average of 3.1% per year between 2000 and 2030. Demand for oil, gas and electricity will increase rapidly.

With limited domestic resources, India will have to import more oil and gas. Coal imports will also increase, as demand shifts to higher quality grades that can be acquired more cheaply from abroad.

The country’s import dependence will increase sharply from 65% in 2000 to 94% in 2030.

I will separately cover the regional pipeline from Iran. This project was initially examined in 1992 with a deep-water study, then in 1995-1998 and again in 2002-2004 through shallow waters and overland study.

The Indian gas demand is projected to double in the next four years and has the potential to treble in the next eight years from current levels. The demand/supply gap will persist in spite of emerging domestic sources. Gas imports will, therefore, form an important position in the supply mix.

India has the favourable geographic disposition to emerge as the potential growth hub of natural gas consumption in the Asian region.

Natural gas will play a much bigger role in India's energy mix and the future cross border pipelines could meet much of the projected growth.

According to a Wood Mackenzie Report, India's remaining oil reserves are an estimated 4.67 billion barrels. With production at 693 thousands barrels per day these are expected to last 18.5 years. Similarly, remaining gas reserves are estimated at 28.61 TCF, and at current production level of 2.86 BCF per day they are expected to last 27.5 years.

India's gas infrastructure map shows the gas distribution system in India. *(Figure 4)*

Figure 4: Gas Transmission System of India

GAIL only has a gas distribution system of 4400 kms of pipelines supplying about 2129 mmcfd of gas to a wide range of customers. In comparison Pakistan's gas distribution system include 8000 kms transmission lines, and 56,000 kms of distribution system.

India's plan to construct fourteen projects on LNG are facing difficulty. That the majority are officially delayed or cancelled perhaps says more about the reality of the Indian energy market than about the soundness of these proposals (source: Wood Mackenzie).

Oil vs Gas

The fundamental driver of the 20th century's economic prosperity was the abundant supply of cheap oil. Oil is traded in international markets at a price set by the marginal barrel, giving rise to an unpredictable volatility that obscures the underlying trends of supply and demand.

The Middle East fields are ageing and these countries will have to invest in the mammoth task of off-setting the natural decline of their ageing fields.

Exactly when the decline starts will depend on many factors, but there may be a turning point from 2005-2010, when $50 per barrel could become a reality.

Replacement of imported crude oil for India, or any country, with imported gas, increases energy security, both in security of price as well as security of supply in view of the long-term contract with dedicated source of supply and guaranteed consumption.

If the price of imported gas is $2 per thousand cuft (MCFT), it would translate to $11.62 per barrel of oil equivalent (BOE), at $2.50 per MCFT, it would be $14.53 BOE. The price of crude is already at $40 per barrel.

Pipeline vs LNG

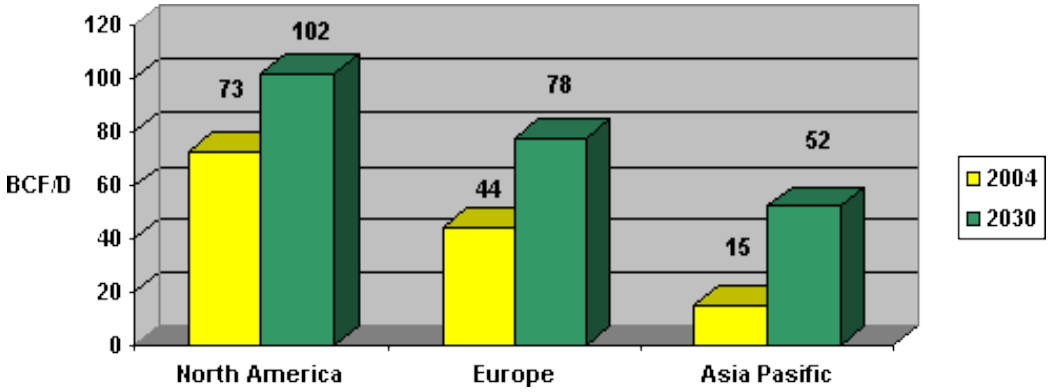
The following points suffice to underscore the advantages of the pipeline.

a. There is no better substitute to pipeline gas. Pipeline gas can be transported with present technology up to 6000 km.
b. Natural Gas is the fuel of the 21st Century. It satisfies the global need for an environment friendly energy source.
c. Pipeline gas provides the best opportunity for the development of economy due to its competitive price, stable and long-term supply.
d. The volume of gas supplied can be easily increased.
e. The security and quality of supply is guaranteed by long-term contracts on take or pay principle.
f. The demand will continue to grow and triple by 2030.
g. An investment of $900 billion-$1800 billion will be required from 2004 – 2030.

The global demand in the three major markets is expected to grow from 2004 to 2030 as *Figure 5* illustrates.

Figure 5: The Global Demand

In three Major Markets Between 2004 to 2030



Pipeline gas is economically superior to any other alternative. However issues such as the following will have to be tackled:

1. Transit terms.
2. Security of supplies.
3. Need for multilateral framework for addressing critical issues.
4. Regional geopolitical sensitivities.
5. Global politics need to be addressed.

Regional Pipelines

In examining the prospects for regional pipelines, the economic backdrop of Pakistan and India, a regional energy overview, the energy supply mix, Pakistani and Indian gas demands, and supply projections are examined: *(Figures 6-18)*

Figure 6: Economic Backdrop

ECONOMIC BACKDROP

	PAKISTAN	INDIA	ITALY	EUROPEAN UNION	NORTH AMERICA
Population (Million)	141	1000	58	379	306
Area (Sq.kilometer)	794,880	3,300,000	298,821	3,049,008	19,228,610
Gross Domestic Product (Billion US$)	52	497	1,273	8,479	10,592
Real GDP Growth Rate (%)	4.5	6	3	3	4
Per Capita GDP (US$)	443	497	22,100	22,446	34,591
Merchandise Exports (Billion US$)	8	44	241	2,415	1,050
Merchandise Imports (Billion US$)	10	63	231	2,400	1,402
Number of People per Vehicle	143	143	2	2	1
Per Capita Energy Consumption (Million BTU)	13	13	139	166	362

Sources: *1. Energy Information Administration (EIA), USA, 2. Asia Pacific Economic & "Strategic Focus (April 2001), Merrill Lynch, 3. Economic Survey of Pakistan.*

Figure 7

REGIONAL ENERGY OVERVIEW

	PAKISTAN	INDIA	BANGLADESH	SRI LANKA
Proven Oil Reserves	33.9	629.8	7.6	-
Oil Production	2.7	37.7	0.1	-
Oil Consumption	18.8	97.8	2.9	3.4
Net Oil Import	16.1	68.5	2.9	3.4
Crude Oil Refining Capacity	10.8	102.7	1.6	2.4
Natural Gas Reserves	461.8	533.3	247.9	-
Natural Gas Production	17.5	17.6	7.5	-
Natural Gas Consumption	17.5	17.6	7.5	-
Coal Reserves	1,790.2	36,832.8	-	-
Coal Production	1.4	146.2	-	-
Coal Consumption	2.0	155.5	-	-
Coal Import	0.6	12.5	-	-
Thermal Power Generation Capacity (GW)	12	78	3.1	0.5
Thermal Power Generation (B. KW-hr)	44	359	11.3	1.8
Hydel Power Generation Capacity (GW)	5	24	0.2	1.1
Hydel Power Generation (B. KW-hr)	18	95	0.8	4.2
Total Energy Consumption	43.2	312.5	11.0	4.9

Sources: 1. Pakistan Energy Year Book 2000
2. EIA MTOE = Million Tons of Oil equivalent

Figure 8: Primary Energy Supply Mix

PRIMARY ENERGY SUPPLY MIX

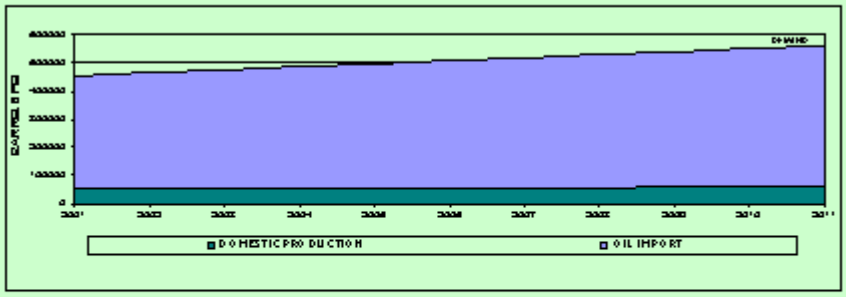
PERCENTAGE

	PAKISTAN	INDIA	ITALY	EUROPEAN UNION	NORTH AMERICA
OIL	44	31	51	44	35
NATURAL GAS	41	7	30	22	24
COAL	5	55	6	13	17
HYDEL	10	6	6	5	15
NUCLEAR	<1	<1	-	14	8
OTHERS	-	1	7	2	1

Sources: *1. Pakistan Energy Year Book 2000*
2. EIA

Figure 9: Pakistan Oil Demand & Domestic Production

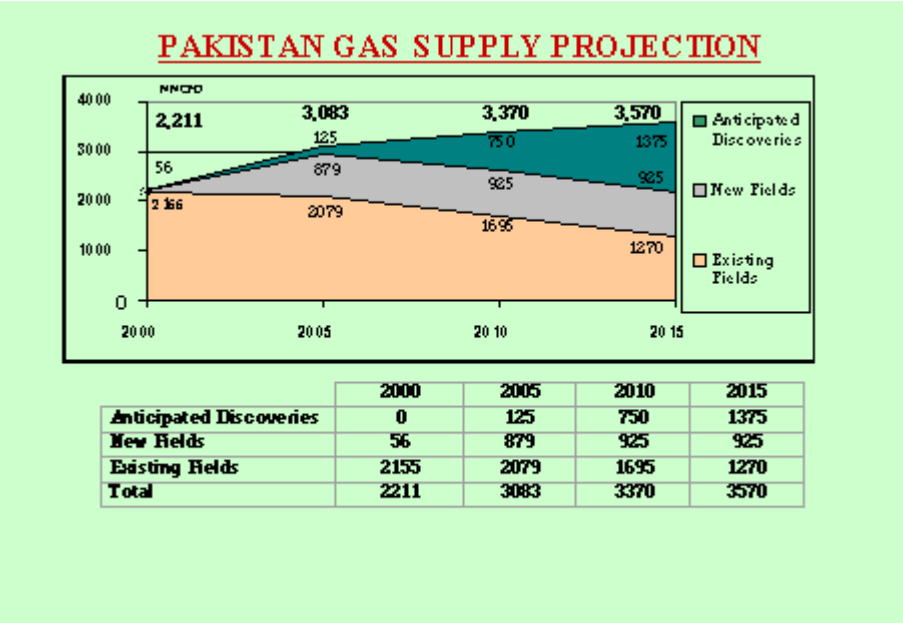
PAKISTAN OIL DEMAND & DOMESTIC PRODUCTION



PAKISTAN OIL IMPORT DEPENDENCE

	2000-01	2005-06	2010-2011
Million TOE	17.1	19.5	22. 2
Oil Import Bill (Billion $)			
@ $20 / barrel	2.66	2.91	3.33
@ $30 / barrel	3.32	4.36	4.96
@ $40 / barrel	5.08	6.2	6.61
@ $50 / barrel	6.38	7.26	8.26

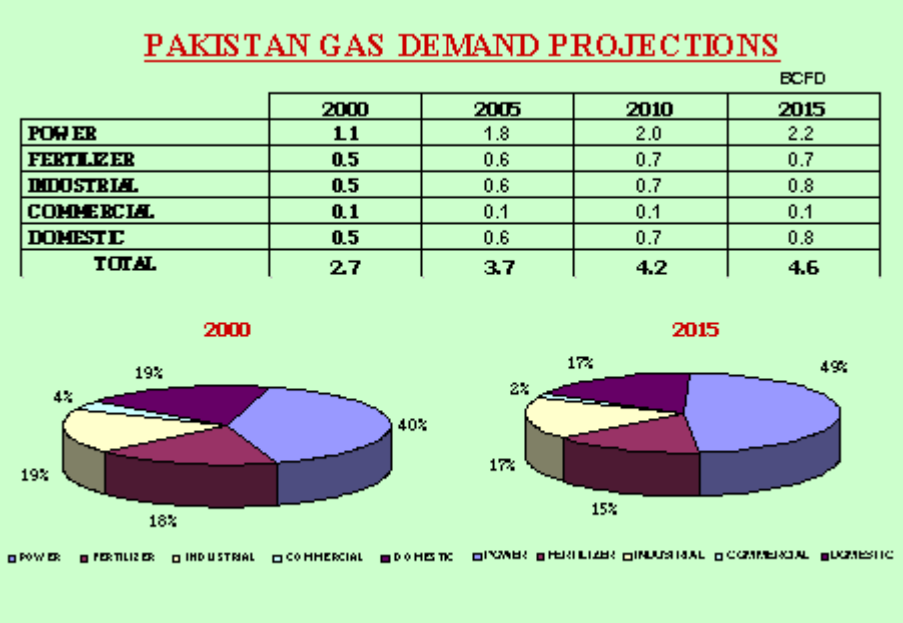
Figure 10: Pakistan Gas Supply Projection



	2000	2005	2010	2015
Anticipated Discoveries	0	125	750	1375
New Fields	56	879	925	925
Existing Fields	2155	2079	1695	1270
Total	2211	3083	3370	3570

Anticipated Discoveries from exploration activities assumed at incremental volume of 125 MMCFD per year from 2005

Figure 11: Pakistan Gas Demand Projections

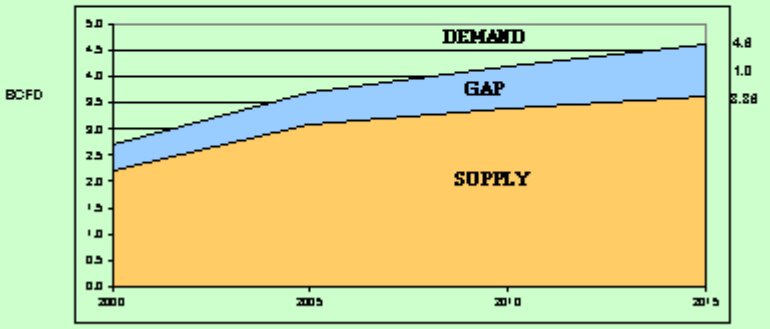


	2000	2005	2010	2015
POWER	1.1	1.8	2.0	2.2
FERTILIZER	0.5	0.6	0.7	0.7
INDUSTRIAL	0.5	0.6	0.7	0.8
COMMERCIAL	0.1	0.1	0.1	0.1
DOMESTIC	0.5	0.6	0.7	0.8
TOTAL	2.7	3.7	4.2	4.6

Figure 12: Pakistan Gas Supply & Demand Projections

PAKISTAN GAS SUPPLY & DEMAND PROJECTIONS

	2000	2005	2010	2015
DEMAND	2.7	3.7	4.2	4.6
SUPPLY	2.2	3.1	3.4	3.6
GAP	0.5	0.6	0.8	1.0



Source: *1. SSGP, 2. SNGPL*

Figure 13: India Gas Demand Projections

INDIA GAS DEMAND PROJECTIONS

	2000	2005	2010	2015
POWER	1.3	3.3	4.8	4.2
INDUSTRIAL	1.3	1.8	2.0	3.2
COMMERCIAL & DOMESTIC	0.1	0.1	0.1	0.4
TOTAL	2.7	5.2	6.9	7.8

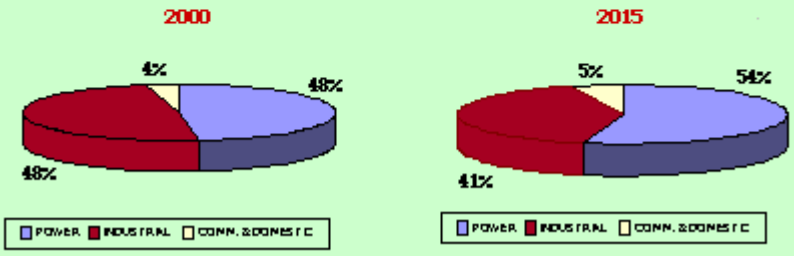
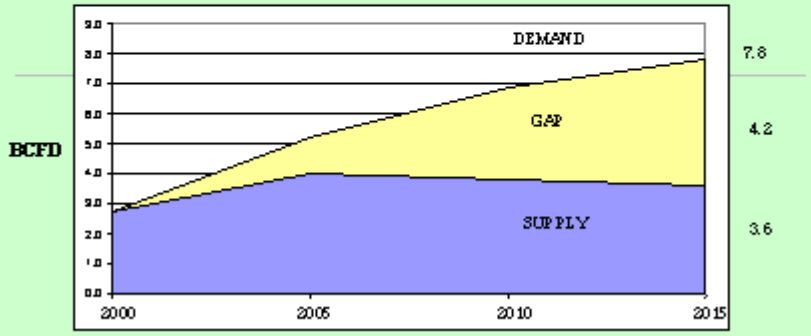


Figure 14: India Gas Supply & Demand Projections

INDIA GAS SUPPLY AND DEMAND PROJECTIONS

	2000	2005	2010	2015
DEMAND	2.7	5.2	6.9	7.8
SUPPLY	2.7	4.0	3.8	3.6
GAP	0.0	1.2	3.1	4.2

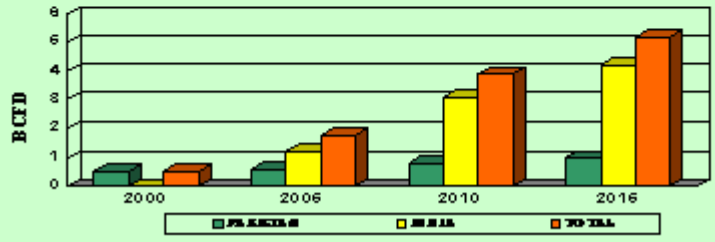


Source: *1. Wood Mackenzei report - Asia Pacific Markets Services.*

Figure 15: Pakistan and India Natural Gas Demand & Supply Gap Projections

PAKISTAN AND INDIA
NATURAL GAS DEMAND & SUPPLY GAP PROJECTIONS

	2000	2005	2010	2015
PAKISTAN	0.5	0.6	0.8	1.0
INDIA	0.0	1.2	3.1	4.2
TOTAL	0.5	1.8	3.9	5.2



Sources: SSGC &SNGPL, Wood Mackenzie, Asia Pacific Markets Services

Figure 16:Underground Gas Storage – Fields in Pakistan

UNDERGROUND GAS STORAGE – FIELDS IN PAKISTAN

THERE ARE TWO POSSIBLE STORAGE SITES IN PAKISTAN CENTRAL AND NORTHERN FIELDS.

- CENTRAL FIELDS (SUI)
  - POROUS LIMESTONE STRUCTURE
  - HOMOGENOUS STRUCTURE
  - FEWER INJECTION/WITHDRAWAL WELLS REQUIRED
  - PROXIMITY TO TRANSMISSION LINES (NORTH AND SOUTH)
- NORTHERN FIELDS
  - FRACTURED LIMESTONE STRUCTURE, LOW POROSITY BUT PERMEABLE
  - DEEPER THAN SUI
  - NON-HOMOGENEOUS STRUCTURE (COMPARTMENTALIZED FIELDS)
  - MORE INJECTION/WITHDRAWAL WELLS REQUIRED
  - NEAR LOAD CENTRES

Figure 17: Exporters & Importers of Natural Gas*

EXPORTERS & IMPORTERS * OF NATURAL GAS

EXPORTERS	BCF/D
Russia	18.2
Canada	10.4
Algeria	5.97
Norway	4.88
Netherlands	4.76
Turkmenistan	3.66
Indonesia	3.06
Malaysia	1.83
Qatar	1.58
United Kingdom	1.22
Rest of the World	9.08
World**	64.7

IMPORTERS	BCF/D
United States	10.98
Germany	7.61
Japan	7.51
Ukraine	5.5
Italy	5.29
France	3.89
Korea	2.04
Netherlands	2.0
Spain	1.66
Belarus	1.65
Rest of the World	16.6
World**	64.8

* Export & Import include pipeline gas and LNG
** World trade includes trade of Former USSR Source: Key World Energy Statistics 2002, IEA

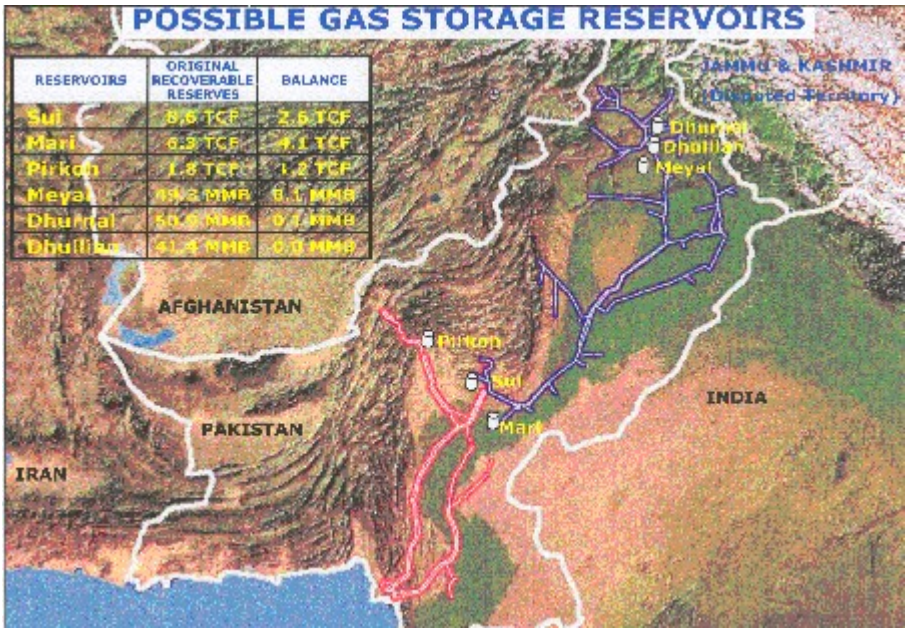
Figure 18: Natural Gas Prices in US $ MCF

Natural Gas Prices in US $ MCF

COUNTRY	DOMESTIC	INDUSTRIAL
IRAN	0.21	0.41
PAKISTAN	1.15	2.88
BANGLADESH	2.04	2.39
INDIA OLD SYSTEM	2.58	-
SLOVAK REPUBLIC	2.95	2.74
INDIA NEW FIELDS	4.00	-
TURKEY	6.79	5.47
UNITED KINGDOM	7.31	3.50
UNITED STATES	7.44	3.42
CANADA	7.98	2.70
AUSTRALIA	8.38	3.42
GERMANY	9.41	4.74
FRANCE	10.63	4.50
ITALY	16.10	3.57
JAPAN	32.61	11.41

I am also presenting possible storage sites in Pakistan for gas, which could provide some comfort to India in dealing with its energy security *(Figure 19)*.

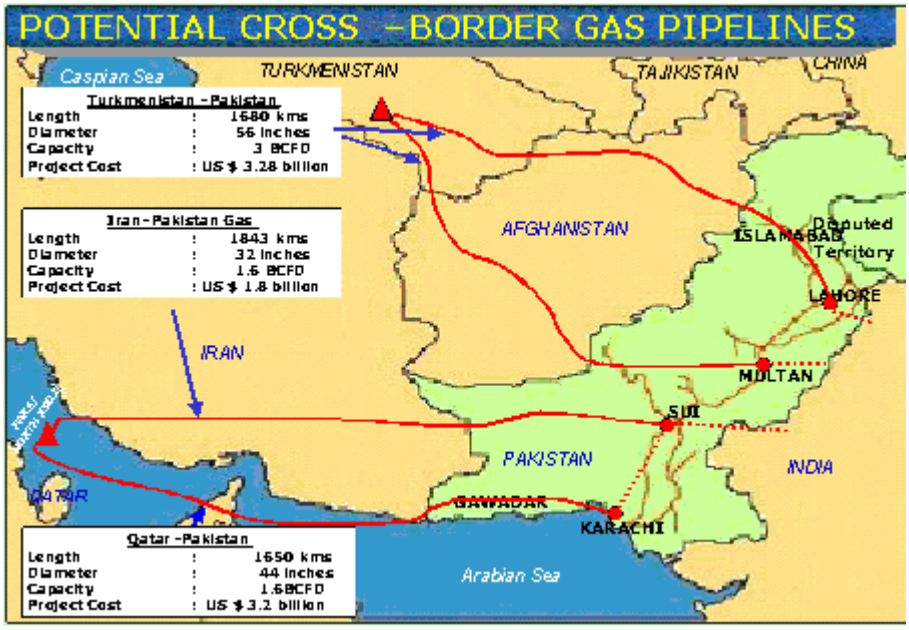
Figure 19: Possible Gas Storage Reservoirs



The following are the potential cross-boarder gas pipelines under consideration *(Figs. 20-22)*.

1. Turkmenistan
2. Qatar
3. Iran

Figure 20: Potential Cross – Border Gas Pipelines



Sources: *1. Penspen 2. British Gas International 3.Crescent Petroleum.*

Figure 21: Tap Gas Pipeline Turkmenistan – Afghanistan – Pakistan

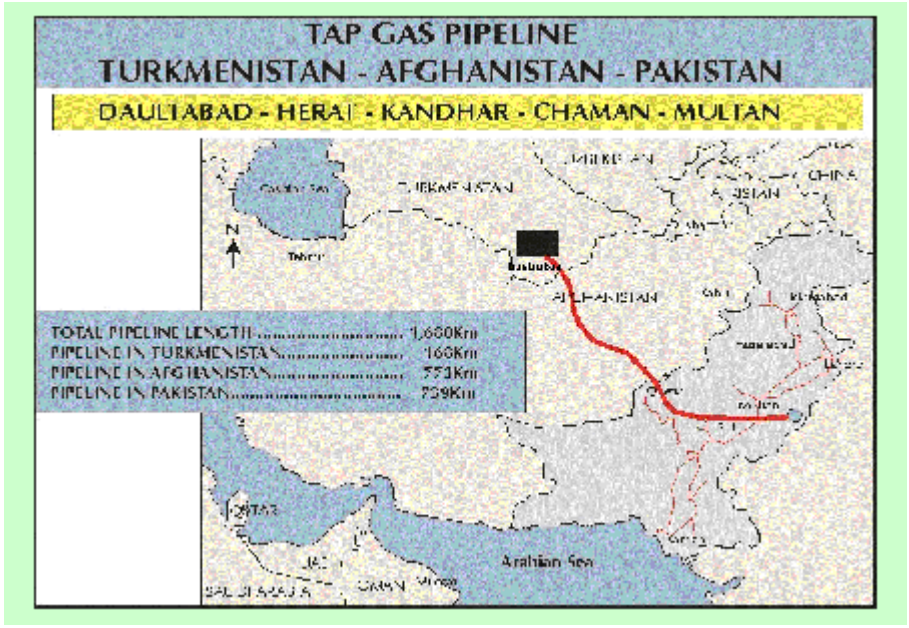
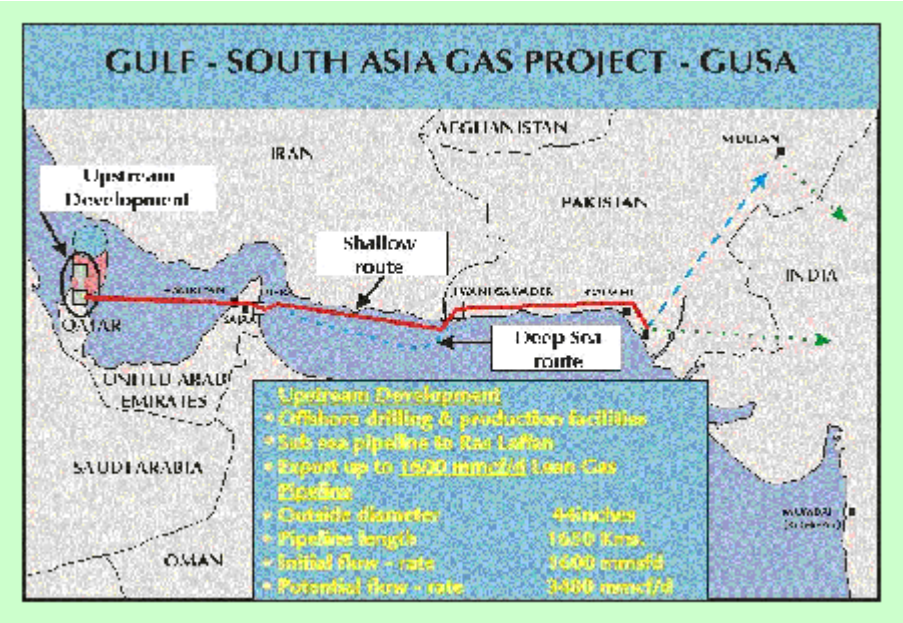


Figure 22: The Gulf – South Asia Gas Project – (GUSA)



Both Qatar and Turkmenistan projects are long-term, as they involve deep-sea routes and security concerns in Afghanistan respectively. There are also concerns about the potential reserves of the Doulatabad field. While the Iranian project seems to be the most attractive, as first gas supplies could be delivered to India in 32 months from financial closure.

This is a project whose time has finally come, and a number of factors reinforce this assessment:

- Pre-feasibility results are encouraging.
- Project fundamentals are strong.
- It provides long term energy supply to the mutual benefit of all parties.
- Meets emerging long-term energy needs in Pakistan and India.
- A political decision will move the project forward.

Once such a decision is taken, the political and legal issues, physical aspects, contractual and commercial aspects and financial issues will follow.

The sponsoring government's support will lead to appropriate inter-governmental agreements. The Iranian and Pakistani government support is already there, while the Indian support is lacking.

Private sector companies and investors in West and South Asia have rarely been involved in energy projects. But the Iranian, Indian and Pakistani private sectors have expanded over the last 10 years and are keen to participate in profitable oil and gas projects previously monopolised by international oil companies. Local capital markets in India, Pakistan and possibly Iran could finance much of the project. The aspect of South Asian Infrastructure Fund (SAIF) is covered separately.

Private sector participation would enhance the security of supply and markets by increasing pressure on governments to avoid unilateral acts that could close the pipeline. The involvement of international institutions would similarly reassure consumers, suppliers and international companies. The World Bank, Asian Development Bank and the Islamic Development Bank have a strong interest in such a project.

I do not believe that political aspects of India and Pakistan can today overshadow this project. US opposition to any project that would benefit Iran will be one of the biggest hurdles. A unified approach among these three countries would encourage US to change its policy.

Energy and Poverty

A few words on how energy impacts on development and poverty. Around 1.6 billion people – one quarter of the world's population – have no access to electricity. In the absence of vigorous new policies, 1.4 billion people would still lack electricity in 2030.

Four out of five people without electricity live in rural areas of the developing world, mainly in South Asia and the sub-Saharan Africa, but the pattern of electricity deprivation is set to change, because 95% of the increase in population in the next three decades will occur in urban areas.

Lack of electricity and heavy reliance on biomass are hallmarks of poverty in developing countries. Lack of electricity exacerbates poverty and contributes to its perpetuation, as it precludes most industrial activity and the jobs they create.

Investment needs to focus on various energy sources, including biomass, for thermal and mechanical applications to bring productive income-generating activities in developing countries. Electrification and access to modern energy sources do not per se guarantee poverty alleviation.

Pakistan – India Trade

There have been many views expressed from time to time about the enhancement of trade between Pakistan and India, but if we analyse the position of both countries there is so much needed to ameliorate the sufferings of the common man, who is under economic and social pressure to make ends meet.

According to the Pakistan commerce ministry figures, between them India and Pakistan import and export goods worth $200 million every year. Trade between India and Pakistan has great potential, if both sides focus on each other's specific needs and capabilities. Unofficial trade between India and Pakistan is around $2.5 billion, much more than official figures. Indian textile machinery, tannery equipment, machine tools and spare parts are ordered from Jakarta, Bangkok, Dubai, Hong Kong, and Singapore and then are exported to Pakistan at greater cost. Other than enhancing export of cotton yarn, textiles, leather products, surgical instruments, paper, vegetables, fruits, the transit gas to India and electricity from power plants in Thar would immensely benefit the whole region. *(Figure 23)*

Figure 23: Comparative Data – China, India, Pakistan

	China	**India**	**Pakistan**
GNP	8.5 percent	6.5 percent	5.2 percent
Reserves	$450 billion	$110 billion	$12.56 billion
Population	1.34 billion	1.05 billion	156 million
Per Capita Income	$1,300	$600	$500
Skilled Labor	200 million	400 million	50 million
Cost per Labor	$1.2	$0.90	$1.17
Poverty Level	57 percent	40 percent	38 percent
Foreign Investment	$3.00 billion	$1.64 billion	$850 million
Economic Level	Fast	Fast	Medium
Country Rating	A+	B+	B-
Political Level	Stable	Stable	Mixed
Country Risk	Low	Low	Medium
Country's Perception	Moderate/Open	Open	Moderate

Sources: (i) World Bank, (ii) Asian Development Bank-Country Report, (iii) IMF-Annual Report, (iv) State Bank of Pakistan, (v) IBA-Karachi Library, (vi) Fortune Magazine, (vii) Brooking Institute, (viii) Economic Intelligence Unit.

This chart clearly indicates the development and growth that the Indians have achieved in the span of just 12 years, since the advent of economic reforms. Pakistan can benefit by trading with India and can open up vistas for the entrepreneurs of both countries.

The most conspicuous factor for both India and Pakistan is that European and American governments are backing them up, thus paving the way for economic and social reforms in their countries in the shape of aid, war on terror, grant of loans from donor financial institutions like World Bank, IMF, ADB.

Both countries have made remarkable progress in their perception management strategies for the outside world. Independent studies on the other hand put bilateral trade at between $1 billion to $2.5 billion, most of which occurs through smuggling. Trade between India and Pakistan can boost the regional

organisation of SAARC, thus making it more competitive for other regional blocs like Asean, Nafta, and the European Union, compelling them to ponder over the strength and prosperity of the region.

Trade is an area that will bring economic benefits to both countries, and will be one of the most important peace dividends. With political and economic stability, India and Pakistan can expect large inflows of foreign investment. Cheaper cost of production, skilled labour, educated middle class, female literacy, booming economy, vital American and European interests in the region can change the fate of millions in the subcontinent within a span of 10 years.

It is a false notion, in my opinion, that Indian products would ruin Pakistan's industry. By 2005, trade barriers, quotas, tariffs would be history. Legalised trade will be favourable to Pakistan, as it will eliminate smuggling, increase government revenues, and provide Pakistan with about one billion consumers across the border.

The supply of energy to India will bring enormous financial benefits to the region as a win-win situation for all stakeholders. Trade will pave the road to peace.

The Need for Cooperation

In my perception, if India and Pakistan wish to move forward, the creation of a South Asian infrastructure fund could be an avenue of achieving results. I am noting my proposals in this context.

Proposal for SAIF – South Asia Infrastructure Fund

A. Overview

The objective of the Fund would be to achieve long-term capital appreciation through investment in infrastructure projects and infrastructure-related companies in South Asia. SAIF's equity can take a variety of forms, including member government equity, subscription of common and preferred stock, warrants, options and convertible debt instruments. In making its investments, SAIF will pay particular attention to government policies as they affect the protection of private ownership.

B. Fund Management

A private sector professional with proven track record of the Oil & Gas Industry will be the CEO of the SAIF Fund. The Governing Board/Board of Directors will consist of the participating investors & partners/sponsors.

C. Principal Sponsors and Investors

The sponsors of SAIF will consist of a variety of international institutional investors: member government equity (20%), industrial institutions (30%), pension plans (15%), commercial banks (15%), insurance companies (10%), and development banks (10%). SAIF's investors shall play an active role in its investments as co-sponsors and co-investors, as technical partners and as debt providers.

- SAIF shall form strategic alliances with a number of North American, Canadian, Japanese, Chinese, Asean and South Asian multilateral and developmental institutions.

D. Investment Policy and Criteria

SAIF shall invest in infrastructure and infrastructure-related companies and projects under the following investment guidelines:

- Financially attractive infrastructure ventures.
- Limited technology development or exploration risks.
- Appropriate cash-on-cash equity returns tied to risk.
- Investment size expected to range from $10 million to $75 million in projects with total costs from $50 million to over $1 billion.
- SAIF equity ownership of between 5% to 49% of individual project companies.
- Appropriate exit strategy. SAIF's maximum holding period will be ten years. SAIF must exit its investments either through a public offering on a local or international securities market, a private placement to strategic or institutional investors, or a sale to the project's sponsors/partners.

E. Sector and Industry Focus

- Natural resource development: Mining and oil and gas extraction, development and distribution.
- Petrochemical industries.
- Environmental services: Waste and water treatment; water transmission and distribution; treatment and other processing facilities, providing environmental services.

- Financial services: Private capital market institutions devoted principally to investing in the sectors mentioned above.
- Power and energy-related facilities: Power generation, transmission and distribution systems.
- Transportation: Toll roads, mass transit, rail systems, urban and inter-urban transport, shipping, bridges, tunnels, port facilities, airports and airlines.

F. Useful Points for Oil & Gas Exploration Projects by the SAIF Fund: Overview of Energy Fund Partners

- Private equity fund focused on making equity investments in E&P companies that focus on building their reserve base through acquisitions, exploitation as well as mid-stream, gas storage and independent power companies.
- Geographical focus to obtain equity, for example: South Asia, Mideast, Asean, US, Canada & EU.
- Capital under management: $500 million.
- Target investment size: $10 to $50 million.
- Target ownership: 40% to 95% and required Board's representation.
- Investment structure: common equity, preferred equity, sub-debt with warrants (no project financing) invested in a limited partnership or LLC.
- Portfolio target IRR and ROI: 25% + and 3.0x.
- Investment time frame: 3 to 6 years.

There is a finite limit to future hydrocarbons supplies. The exploration techniques such as surface geology (1900), refraction seismic technology (1925), electric logs (1930), 3D seismic (1978), Rotary drilling (1920), offshore drilling barges (1950), deep water drill ships (1956), semi-submersible rigs (1954), and horizontal drilling (1985) were significant steps in the improvement of land and marine exploration. There are today virtually no areas where petroleum exploration cannot be successfully carried out if geological studies indicate a good chance of finding major petroleum reserves, but the time has come to look for new and innovative avenues to resolve our energy problems. Are India and Pakistan going to remain hostage to poverty, and fluctuating oil prices impacting on their developing economies?

Hydrogen Vision and Conclusion

Hydrogen and Fuel Cell technology represents a strategic choice for energy deficient countries like India and Pakistan. Worldwide demand for energy has been forecast to grow at an alarming rate of 1.7%, for the period 2004-2030. Fossil fuels, as shown earlier, are confined to a few areas of the world, and these reserves are diminishing and as such will become much more expensive.

The launch of a South Asian hydrogen and fuel cell technology platform through the South Asian Infrastructure Fund (SAIF) could lead to a long-term South Asian strategy for hydrogen and fuel cells to guide the transition to a hydrogen future in the next 20-30 years.

This vision, on which many countries of the world are working, is a vital area of co-operation between the governments of India and Pakistan. This is a vision of peace and prosperity for the poor masses of both the countries.