ENERGY SECURITY IN SOUTH ASIA: TRENDS AND CHALLENGES FOR FUTURE STABILITY

Dr. Gulfaraz Ahmed

Introductory Overview

South Asia covers eight countries including Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. It is one of the most populous regions of the world and is inhabited by over 20% of the global population. The whole region has a high incidence of poverty and nearly half the poor of the world live in these countries. South Asia is an energy deficit region and the rural population has limited and varying degree of access to commercial sources of energy of coal, oil, natural gas and electric supply. They still rely on traditional biomass including firewood, crops and animals waste for their subsistence level energy needs. The consumption of commercial energy per capita is very low which correlates directly with the level of poverty.

The economies of the major countries of the region led by India, Pakistan and Bangladesh have been picking up and maintaining a healthy growth rate of about 6-8% a year. Especially, Indian economy has been growing at about 8% a year for nearly a decade. There is a need for the countries of the region to sustain high level of economic growth over the coming decades to develop required infrastructure, boost industrial capacity, increase Gross Domestic Product (GDP), eradicate poverty and improve quality of life of their people. This underscores the need for an adequate, reliable and reasonably priced supply of commercial energy to sustain the required rate of the economic growth. Energy security is, therefore, a primary concern of all the countries of the region. All countries depend to a varying degree on import of energy mainly in the form of oil or refined petroleum products from international markets.

Energy deficit South Asia lies in a broader region adjoining energy surplus West Asia and Central Asia. Looking at the bigger picture Central Asia, South Asia, West Asia and Arabian Sea

together create a contiguous region of strong energy complementarities. This presents far reaching opportunities to exploit the complementarities through joint energy markets/sources and optimized cross border energy movements and trade. These opportunities when effectively exploited could provide a measure of energy security to the countries of South Asia.

Due to its vital strategic location Pakistan can serve as the regional hub for movement of energy from energy surplus West and Central Asia to energy deficit South Asia both over land and by sea. In fact Pakistan is an essential intermediary for energy movement in the broader region.

Afghanistan is a key link in the realization of the north-south energy corridor between Central Asia and South Asia. In view of the endemic socio-politico-religious conflicts and raging insurgency in that country it is difficult to visualize that it could play the role of energy conduit in the very near-term future of a few years. This scenario brings out the importance of sustainable political, social and economic stability in Afghanistan. A mega effort by an international consortium would be required to develop secure and efficient infrastructure for economical and unrestricted movement of all forms of commercial energy including oil, gas and electricity through Afghanistan for a north-south energy movement/trade corridor. National security in Afghanistan is thus a factor of energy security in South Asia especially for the two major South-Asian countries of India and Pakistan that lie to the West of the region.

Although the region encompasses eight countries as mentioned earlier, this paper is limited in scope mainly to an analysis of energy imperatives, complementarities, and potential of cooperation between India and Pakistan. Historically Pakistan and India have been locked in a perpetually adversarial relation. Kashmir remains the unresolved core dispute that has been triggering destructive wars and military stand-offs in the past 60 years since the independence of the two countries in 1947. There is only one isolated case of bilateral economic cooperation between Pakistan and India that has lasted through and survived the upheavals in their bilateral relation and that is the Indus Water Treaty (IWT). It was brokered by the World Bank in 1960 and addressed an economically

contentious and socially sensitive issue of sharing of waters of the six rivers including Indus, Jhelum, Chenab, Ravi, Beas and Sutlej that originate in the disputed Kashmir and flow through Pakistan to the Arabian Sea. Of these six rivers the Ravi, Beas and Sutlej flow though India (Himachal Pradesh, Haryana and Indian Punjab) and then enter Pakistan. The Indus, Jhelum and Chenab flow through Kashmir and Pakistan without entering India. This treaty led to perhaps the largest basin water restructuring and infrastructure development complex in the world. The IWT can serve as a model for cooperation in the energy sector even if a broader economic cooperation as a part of settlement of the core Kashmir dispute still remains distant. Cooperation in energy sector itself could catalyze broader economic cooperation that could in turn motivate the resolution of the core dispute for a lasting peace in the region.

In limited sense energy security may mean energy independence and freedom from imports. However, in a broader context energy security means a robust and reliable access to adequate supply of commercial energy at reasonable prices. Pakistan and India are energy deficit and are expected to rely heavily on energy imports in the foreseeable future. Both countries will need high economic growth for a healthy balance of payment position to finance the large scale energy imports. Both countries can improve their access to regional energy markets through broad-based cooperation in energy sector. They could exploit synergy and complementarities to minimize the price of imported energy. This may minimize energy import and movement costs to provide an edge to the two growing economies to meet their targets of development and eradication of poverty.

The recent trend since 2004 of Pakistan and India agreeing on a joint gas pipeline from Iran and possibly Turkmenistan is a welcome development that augers well for the future energy security of the two countries. UNDP Pakistan had taken a timely initiative and published a report in December 2003 on "Peace and Prosperity Gas Pipelines" written by this author which is understood to have attracted renewed attention to the joint pipelines prospects and shifted the subject to the front burners. As the trilateral negotiations between Pakistan, India and Iran got underway to tackle the issues of gas price, delivery off-takes, transit fees and construction

schedule, US expressed its concern publicly through the State Department against any large-scale energy related project with Iran.

Recognizing Indian energy needs US has offered India an access to modern nuclear technology to help meet her energy needs in the place of the Iran gas pipeline. As a result, India has taken a more cautious approach and has become a less active partner in the Iran-Pakistan-India (IPI) gas pipeline project. Pakistan, on the other hand, is facing precarious gas shortfall in the medium to long term and is pushing ahead for a Pakistan-alone pipeline even though it would miss the optimum benefits that could result from a joint pipeline. The paper identifies some tangible benefits that both Pakistan and India would reap only if they cooperated through joint gas pipelines.

South Asian Socio-Economic Review

Table-1 gives the statistics of population, Gross National Product (GNP), population below poverty line, life expectancy, Human Development Index (HDI) ranking in the world and per capita energy consumption of the South Asian countries. Nearly half the population in Bangladesh and slightly under a third in Pakistan and India are placed below the poverty line. In HDI Pakistan is placed at 144th, Bangladesh 139th and India at 127th in the world. HDI is a broad-based social indicator and the ranking has been published by the UNDP in their World Report 2003. Per capita energy consumption in Pakistan and India is very low and is nearly a fifth of the world average. This is a good indicator as well as a cause of the prevalent poverty. Low per-capita energy consumption is a parameter of economic insecurity and consequently of energy insecurity.

Table-1: Key Socioeconomic Indicators of South Asia, 2002–2003

Item	Unit	Afghanistan	Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka	World Avg.
Population	Million	22.2	138.1	0.7	1042	0.3	24.7	146	19.2	
GNP	Billion US$	4.1	55	2.9	568	0.5	6.0	85.0	18.0	
Per capita GNP	$/yr/person	186	398	1,400	534	1,800	243	582	938	
Population below poverty line	%	N.A.	49.8	N.A	28.6	N.A	42.0	32.6	25.0	
Life expectancy	Years	43	62	66	63	73	60	64	74	
HDI	Rank in no.	170	139	136	127	86	143	144	99	
Per capita commercial energy consumption (2003–2004)	KOE	16	89	243	351	759	44	355	200	1740

Table-2 gives statistical information about sources of energy including traditional (biomass) and commercial fuels. Traditional fuels (biomass from firewood, crops and animals waste) still provide 58% energy in Bangladesh, 30% in Pakistan and 23% in India. Traditional fuel based energy supports only a subsistence level of living and is a major cause of poverty in the region. There is a need to replace the traditional energy with commercial fuels as the animal waste and crop residue are more beneficial when recycled back into the soil. The other disturbing aspect of these statistics is the low consumption of energy per capita in all the countries of the region. Both Pakistan and India consume one-fifth of the world average. This underscores the need to increase the per-capita energy consumption in both countries, which would require maximizing the supply of energy and minimizing the cost. This could be facilitated by restructuring the primary energy mix through inter-fuel substitution for an optimal mix considering economics, efficiency of use and conversion, availability and accessibility, and impact on environment.

Table-2: Energy Status Indicators of South Asia, 2003–2004 (mtoe)

Item	Afghanistan	Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka	Total
Biomass (Traditional source)	6.91	16.64	0.29	106.00	0.19	7.40	23.36	3.58	164.37
Coal	0.00	0.00	0.01	171.00	0.0	0.17	3.30	0.00	174.48
Oil products	0.21	3.71	0.04	124.00	0.27	0.77	15.21	3.01	147.22
Natural gas	0.11	8.29	0.0	28.00	0.00	0.0	27.39	0.0	63.79
Electricity hydro	0.03	0.23	0.12	18.00	0.00	0.14	6.47	0.83	25.82
Electricity nuclear/ renewable	0.0	0.0	0.0	8.50	0.00	0.0	0.42	0.00	8.92
Total, primary electricity	0.03	0.23	0.12	26.50	0.00	0.14	6.89	0.83	34.74
Total, commercial energy	0.35	12.23	0.17	349.50	0.27	1.08	52.79	3.84	420.23
Total, biomass + commercial energy consumption	7.26	28.87	0.46	455.50	0.46	8.48	76.15	7.42	584.60
% share of biomass in total energy	95	58	63	23	41	87	30	48	33
Per capita commercial energy consumption (KOE)	16	89	243	335	759	44	355	200	302

Table-3 gives information about energy import dependence in the countries of the region. All countries are dependent on imported oil (crude and refined petroleum products). Bangladesh imports 30%, India 29% and Pakistan 26% of the total commercial energy consumed. Heavy dependence on import of oil at current high price regime is a serious challenge to the regional economies. This pressure on the economies assumes even more criticality when seen in the context of export earnings. Primary energy imports as a percentage of total export earnings is an important parameter of energy security and will be analyzed further in the paper.

Table-3: Import Dependence of Energy Sector in South Asia

Item	Unit	Afghanistan	Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka
Total energy consumption	mtoe	7.26	28.87	0.46	455.5	0.46	8.48	76.15	7.42
Total commercial energy consumption	mtoe	0.35	12.23	0.17	349.9	0.27	1.08	52.79	3.84
Import of coal	mtoe	-	0.0	0.004	11.6	0.0	0.17	1.4	0.0
Import of oil	mtoe	0.21	3.71	0.04	107.4	0.27	0.77	12.30	3.01
Import of natural gas	mtoe	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Total imports	mtoe	0.21	3.71	0.04	109.4	0.27	0.94	13.70	3.01
Import dependence as a percent of total energy	%	3	13	9	22.0	59	11	18	41
Import dependence as a percent of commercial energy	%	60	30	24	29	100	87	26	78

Table-4 gives details of electrification of households in the region: 67% households in Bangladesh, 50% in Pakistan and 44% in India are not yet electrified. This constitutes a major cause as well of index of energy/economic poverty and underdevelopment in these countries. Access to electricity and per capita electricity consumption provide direct correlation with quality of life and/or incidence of poverty. Expanding electricity infrastructure and increasing electrification would require enormous additional energy supply.

Table-4: Details of Electrification of Households in South Asia

Country	Population (Millions)	% of Population That Is Rural	Total No. of Households (Millions)	No. of Households to Be Electrified (Millions)	% of Electrified Households
Afghanistan	22.2	80	4.4	4.1	6
Bangladesh	143.8	78	28.76	19.3	33
Bhutan	0.7	79	0.14	0.1	31
India	1,064	72	199.7	79.9	56
Maldives	0.34	90	0.068	0.007	90
Nepal	23.15	84	4.63	3.2	31
Pakistan	148.7	80	29.74	14. 9	50
Sri Lanka	19.3	84	3.86	1.3	67

Table-5 gives the cost of dependence on imported oil. As the demand for imported oil grows at around 4-5% in India and Pakistan and the international price of oil increases (which reached a record high of US$ 147.50 a barrel on July 11, 2008), the oil import bill is touching unprecedented levels. Oil import as a percentage of total exports was 30% in the case of India and 26% for Pakistan in 2003. This percentage has increased steeply in the recent months because

of spiraling oil prices. This has affected Pakistan very adversely as its exports have not maintained a healthy growth which has strained its balance of payments position. Increasingly large burden of energy import bills of the two countries have rendered the two economies vulnerable which threatens the sustainability of the present rate of their economic growth.

Table-5: Cost/Dependence on Imported Oil

Country	Commercial Energy Consumption (mtoe)	Oil Consumption (mtoe)	Oil Imports (mtoe)	Oil Import Expenditures ($ million)	Oil Import as % of Exports
Afghanistan	0.35	0.21	Nil	Nil	-
Bangladesh	12.23	3.23	3.23	805.4	17
Bhutan	0.17	0.038	0.038	15.0	13
India	335.66	111.0	78.0	18,918.0	30
Maldives	0.271	0.271	0.271	120	20
Nepal	1.08	0.840	0.840	138	23
Pakistan	55.46	15.21	12.28	3,138.0	26
Sri Lanka	3.84	1.685	1.685	402	16

Low consumption of commercial energy per capita is not the only challenge facing the countries of South Asia. Energy intensity that reflects the efficiency of converting energy into wealth is also quite adverse. Figure-1 shows the energy intensity of a few countries for comparison. High energy intensity means higher amount of energy used for producing one unit of Gross Domestic Product (GDP). Energy intensity is high in Pakistan and India but low in Bangladesh.

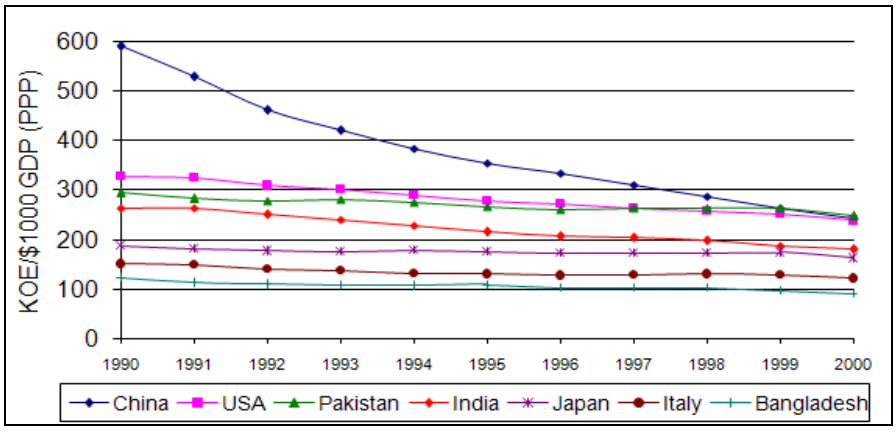

Figure-1: Kilograms of Oil Equivalent (KOE) Supply per $1000 GDP Purchase Parity Power (PPP)

Energy Security Matrix

Figure-2 sums up the implications of high energy intensity and import dependence for economic as well as energy security of Pakistan and India. Both countries are placed in the risky quadrant that means vulnerable economies due to high import dependence, inefficient use of energy toward GDP generation and high sensitivity to international price of petroleum.

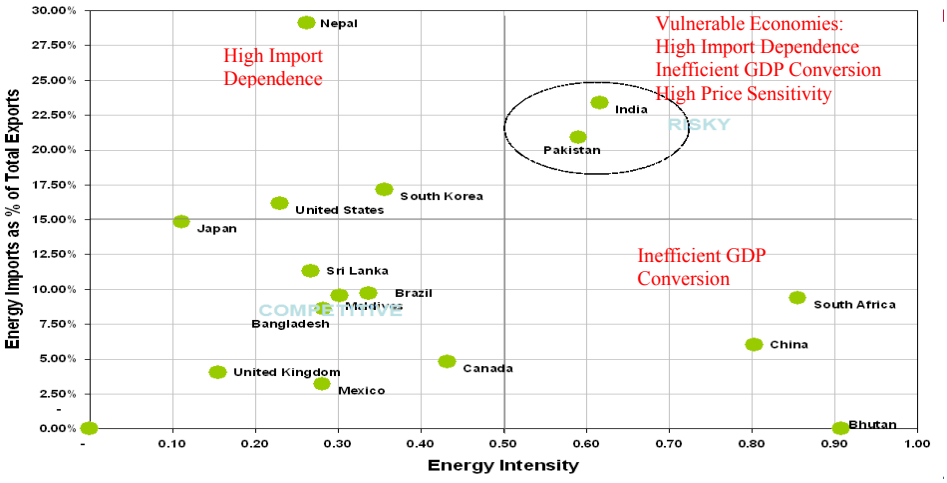

Figure-2: Economic/Energy Security Matrix

It is quite apparent that both Pakistan and India face serious energy insecurity. But the picture gets even more challenging if one adds to it the third dimension of low energy consumption per-capita. Turning current energy insecurity into required level of energy security would require a multi-pronged approach including: increasing indigenous energy supply, reducing energy imports, importing optimal energy mix, increasing export earnings to improve balance of payment position, and reducing the energy intensity by increasing end-use efficiency.

Pakistan's Energy Demand and Supply Projections

Primary energy demand/consumption is linked with rate of economic (GDP) growth. In view of the relatively high energy intensity the growth in energy demand/consumption has to be a bit higher than percentile rate of economic growth. Figure-3 shows a correlation between the growth of the primary energy consumption and economic development for the decade from 1995/1996 to 2004/2005 for Pakistan. It clearly shows that higher economic growth requires high of energy consumption or in other words higher energy consumption leads to higher economic growth. If Pakistan aims at the economic growth rate of over 7% per year, it has to sustain primary energy supply growth rate of around 8%. This underscores the importance of Pakistan's robust access to adequate sources of energy at reasonable prices, large scale investment on expansion of energy infrastructure and healthy balance of payment situation.

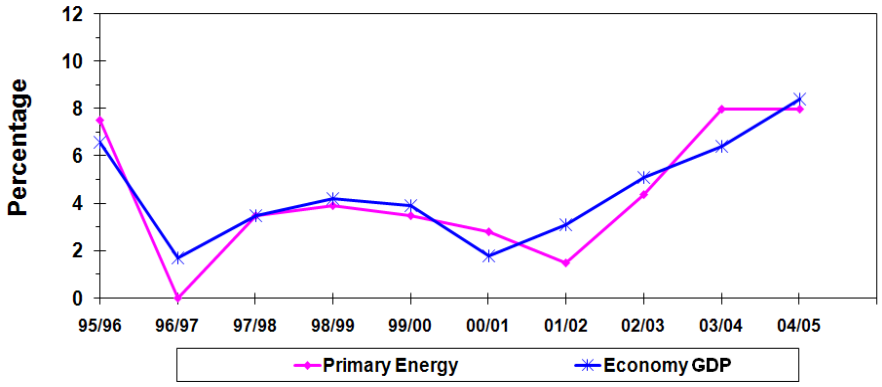

Figure-3: Pakistan Economy and Primary Energy Growth

Table-6 gives projection about Pakistan's energy supply-demand scenario from 2005 to 2030. This table is part of the Government of Pakistan's strategic plan known as the Mid Term Development Framework (MTDF). The projection is based on unrealistically optimistic growth in indigenous energy supply as is evident from Figure-4. The projected growth in the indigenous supply of energy far exceeds the historical pattern. Even then there is an unaccounted for gap between the projected energy demand for the target economic growth and the optimistically projected indigenous supply of energy.

Table-6: Energy Supply-Demand Gap Summary

Year	2005	2010	2015	2020	2025	2030
Indigenous Supply	39.4	59.9	66.7	81.8	110.4	153.7
Imported Oil	14.6	18.8	30.3	43.3	55.7	63.5
Imported Coal	1.0	2.0	2.0	2.0	2.0	2.0
Grand Total	54.0	80.7	99.0	127.1	168.2	219.3
Demand	53.8	79.5	123.0	176.6	255.4	361.5
Gap	0.0	0.8	25.9	51.5	89.2	144.1

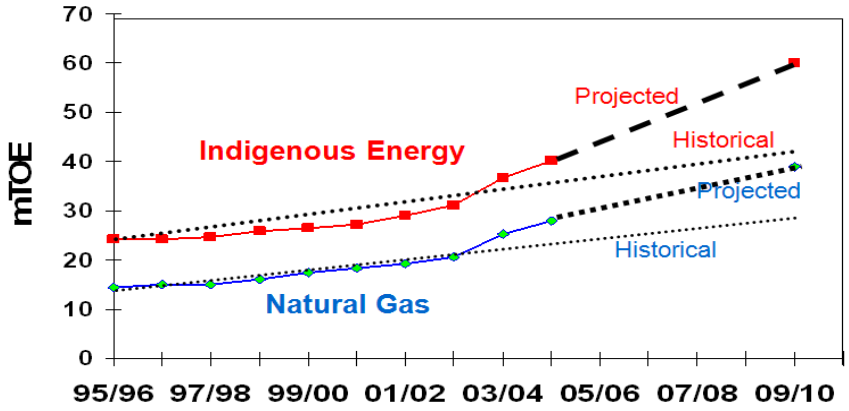

Figure-4: Indigenous Commercial Energy Supply: Historical Pattern and Projected Growth

Figure-5, a graphical representation of Table-6 data, shows the widening gap that starts from around 2010 and grows to about 40% of the expected demand for commercial energy by 2030. This gap symbolizes the challenge to Pakistan's energy, and indeed the national, security. The gap cannot be filled without large scale import of natural gas through multiple pipelines as well as Liquefied Natural Gas (LNG). The energy sector remained neglected during the current decade and this has resulted in formidable challenges for the new government in all areas of energy sector especially power capacity. The gap in energy supply plan spotlights the serious nature of challenges to Pakistan's energy security in medium to long term.

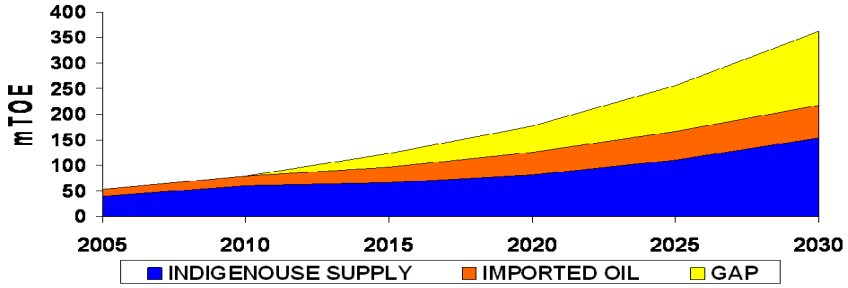

Figure-5: Energy Supply-Demand Gap

Figure-6 shows a tentative picture of the natural gas supply and demand forecast up to 2030. The production from the existing gas fields is based on Ministry of Petroleum and Natural Resources official forecast of 2008. Production from future discoveries has been assumed on the basis of historical growth in indigenous gas reserves/supply of about 5% a year. Import of gas through Iran-Pakistan pipeline has been assumed at 1.0 billion cubic feet/day (bcfd) in 2013-2014 and 2.1 bcfd from then onward.

An effort has been made in this analysis to cover the primary energy gap of 144.1 million tons of oil equivalent (mtoe) in 2030 (as shown in Table-6 and Figure-5) through natural gas alone. This may not be feasible as nearly 16 bcfd of additional natural gas would be required by 2030 to cover the gap. That would require three additional gas pipelines and multiple LNG receiving terminals. The

requirement of additional gas may go even higher if Pakistan is unable to add the planned 8500 MW of nuclear power capacity in the timeframe. This picture underscores the need for Pakistan to secure abundant access to natural gas in the region through multiple pipelines as well as LNG terminals.

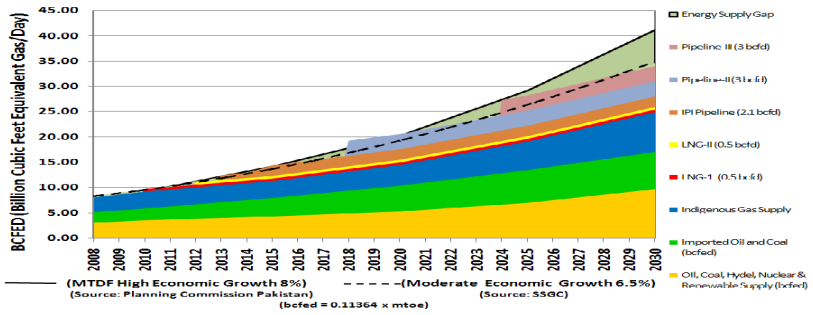

Figure-6: Natural Gas Demand and Supply Forecast (Tentative)

In the MTDF, Pakistan has planned to increase nuclear electricity capacity from under 500 MW presently installed to 8500 MW by 2030. This target would mean commissioning 500 MW of nuclear capacity every year from 2013 onward. This is an unrealistic target given that Pakistan has no access to modern civil nuclear power technology especially for larger and more economical power plants. It looks unlikely that Pakistan could achieve the nuclear capacity target unless it also is allowed access to nuclear technology. The gap in energy supply would widen even more as a consequence.

India's Energy Demand and Supply Projections

India has maintained a high economic growth rate of around 8% per year for nearly a decade. India currently imports a third of its commercial energy requirement from international markets mainly in the form of crude oil. The unprecedented increase in oil consumption in India and China, together with fall of US dollar value, war in Iraq and oil price speculation, has sent the world oil price soaring to record US$ 147.50 per barrel.

India's demand for commercial energy is expected to increase by a factor of 3 and electricity generation capacity by a

factor of 5 by the year 2030.

Table-7 gives projections of India's natural gas demand and supply balance as part of its Vision 2025. It shows an increasing shortfall amounting to 10 bcfd in 2025. India needs to diversify its commercial energy mix by increasing its import of natural gas through multiple pipelines and LNG.

Table-7: India's Natural Gas Demand-Supply Balance (Vision 2025)

	2001/2002	2006/2007	2011/2012	2024/2025
Demand (bcfd)	5.33	8.15	11.5	13.08
Supply (bcfd)	2.47	3.35	3.71	3.88
Shortfall (bcfd)	2.86	4.80	7.34	9.92

Natural Gas Transportation Economics

Natural gas transportation economics follow the economies of scale and the unit cost of transportation reduces substantially for greater throughput capacity due to the following underlying factors:

- Doubling the diameter of a gas pipeline may, at the most, double its cost but the throughput capacity is increased by 5 to 6 times.
- Increasing the compression in the pipeline raises the capacity of the gas pipeline by more than the factor of compression increase.
- Capital costs like those of right of way, engineering and management etc. are relatively insensitive to variation in capacity.
- Operating costs are relatively insensitive to increase in throughput capacity.

Figure-7 shows cost per unit capacity as a function of throughput capacity. Per unit cost of gas transportation through a high capacity 60 inches diameter pipeline is only one-twelfth of the unit cost in case of a smaller capacity 18 inches diameter gas pipeline. Larger pipelines operating at ultra high pressures offer the most economical means of transporting natural gas over distances up

to 4000 kilometers. Large capacity gas pipelines also lead to lower gas production costs due to economy of scales gas fields' development. The economy of scales economics of gas transportation offers an opportunity to Pakistan and India to combine their markets and go for large capacity shared gas-pipelines to minimize the unit transportation cost.

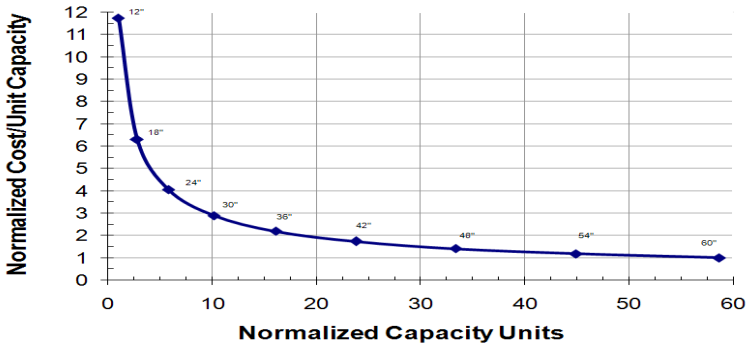

Figure-7: Gas Pipeline Cost vs. Capacity

Figure-8 shows gas transportation cost comparison for onshore and offshore pipelines and LNG over varying distances. It is evident from this figure that for distances in the range of 1600 to 4000 kilometers onshore gas pipelines yield the most economical transportation. Therefore, shared onshore gas-pipelines over the shortest distance from sources of gas in West Asia or Central Asia to Pakistan and onward to India minimize the transportation as well as fields' development cost.

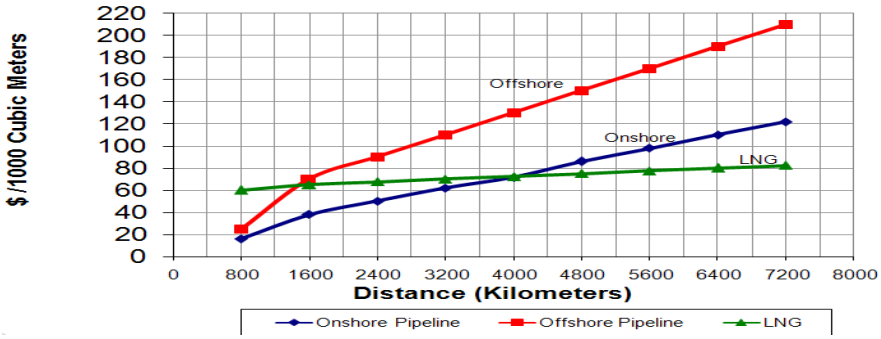

Figure-8: Gas Transportation Cost Comparison

Figure-9 shows some options of oil and gas pipelines as well maritime routes for LNG transportation including onshore gas pipeline from Turkmenistan, oil pipeline from Kazakhstan through Uzbekistan to Pakistan coast, onshore gas pipeline from Iran to Pakistan and onward to India, and offshore gas pipeline from Qatar.

Figure-9: Options of Sources and Routes for Gas & LNG Import

Figure-10 shows projected gas infrastructure for 2020 which depicts the potential options of optimal cross border gas transportation/trade and prospects for shared gas pipelines. As depicted in this figure multiple gas pipelines would be needed by 2020 to meet the gas needs of Pakistan and India.

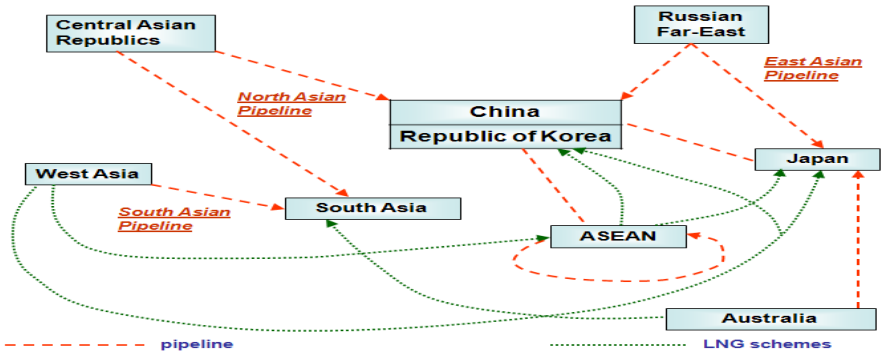

Figure-10: Projected Gas Infrastructure for 2020

Shared gas pipelines promise substantial benefits over

exclusive gas pipelines for all stake holders, which include:

- Unit cost of gas transportation and field development can be minimized by exploiting economics of scales for larger volumes of gas throughput.
- Inter-state gas pipelines could provide impetus toward regional economic integration which would benefit all the countries involved. This is a case of win-win situation for all stake holders (producers, consumers, transit countries, pipeline operators, financing institutions etc.)
- Shared gas pipelines will improve energy security for both countries through stable and secure access to gas supply over the life of the pipeline(s).
- Shared gas pipelines could catalyze far reaching and broader cooperation between the two neighbours that may lead to peaceful settlement of the contentious disputes.

Summary of Challenges Facing India's Energy Sector

Coal Depletion and Pollution: Coal accounts for 54% of India's primary energy mix and over 60% of power is generated using coal. India is the world's third largest coal producer (after USA and China) but its coal reserves could run out in 40-50 years. Indian coal is of poor quality and it lacks infrastructure to clean it which poses formidable environmental threats. By 2015 India could become the third largest emitter of Carbon Dioxide in the world. India needs to diversify to cleaner fuels like natural gas, establish infrastructure for clean-coal based technologies and increase use of better quality imported coal.

Rising Oil Imports: Oil presently contributes nearly a third of India's primary energy mix. The consumption of oil has increased six folds during the last 25 years. India currently imports about 65% of its petroleum needs which is likely to go up to 90% by 2025. Rising oil imports and high price of oil pose a substantive threat to India's energy security in terms of cost and access to reliable supply.

Natural Gas Demand: Natural gas currently contributes about 9-10% to the primary energy mix. Natural gas demand is rising faster than any other fuel but India has limited gas reserves and is unable

to meet the demand without large scale imports of natural gas through multiple pipelines and LNG. Besides, India's ambitious plan to increase its electricity generating capacity by nearly 10,000 MW every year cannot be achieved without gas imports. Currently India is unable to move fast on IPI gas pipeline project due to certain strategic/political compulsions on the western side of its border and has also not been able to convince Bangladesh for tapping into their natural gas reserves on the eastern side.

Inefficient Electric System/Infrastructure: Nearly 80% of the country has access to electricity but unreliable power grids result in regular blackouts. India lacks an integrated countrywide power grid and suffers about 30% loss of power in the delivery chain itself.
Limited Nuclear Energy: India's 14 nuclear power plants contribute about 3% of the electricity generated. The new nuclear deal with the US will enable India to access modern civil nuclear power technology including economies of scale nuclear power plants, fuel and equipment. However, the development of sizeable nuclear power capacity would take decades and require massive investment.

Lack of Coherent Energy Policy/Plans: Energy management at federal government level is divided among four Ministries of Coal, Petroleum & Natural Gas, Non Conventional Energy Sources and Power. Planning Commission and Atomic Energy Commission also play their roles in the energy sector. There is a lack of an effective coordinating mechanism which results in lack of coherence in energy policy/plans.

Summary of Challenges Facing Pakistan's Energy Sector

Shortfall in Energy Supply: The MTDF projects a shortfall in energy supply starting from 2010 and increasing to 144 mtoe or 40% of the total demand of energy by 2030. Pakistan needs to move fast on materializing import of gas through Iran-Pakistan pipeline without further loss of time. The recent press report of the first gas in September 2012 is already late by 3 years.

Access to Nuclear Power Technology: The MTDF includes 8500 MW of nuclear power capacity by 2030. This translates into 500

MW of new nuclear capacity added every year from 2012 onward. Presently Pakistan has no access to economy of scales, efficient and safe nuclear plants in the world. Its only source of civil nuclear power technology is China, which itself is in the process of developing larger power plants. Lack of adequate access to civil nuclear power technology is threatening to Pakistan's energy and economic security. It could inhibit Pakistan's economic growth and stability.

Inadequate Power Capacity and Inefficient Power Grid: Pakistan was surplus in power capacity in 2000. During the following seven years electricity demand grew by 5-6% yearly whereas the generating capacity grew only by 2% a year. This has now resulted in major capacity shortfall and mopping of redundancies and backups in the system. New projects would take time, heavy investment and more importantly additional supply of fuel. Due to limited gas supply the government is likely to go for oil based power plants that would increase dependence on imported oil and cost of generated power. Import of natural gas and access to civil nuclear power technology become even more critical in this context. Pakistan has an elaborate countrywide power grid but loses over 20% of generated power in the delivery chain.

Lack of Coherent Energy Policy and Plans: Pakistan also suffers from lack of coherent energy policy and plans as there exist a number of energy related Ministries and Institutions. The MTDF developed by the Planning Commission still remains a paper exercise. There is no consideration given to the financing options and no commitment of public money has been identified to implement the strategic plan. The government discontinued the 5 years plans system in 2002-2003 but has not been able to come up with an effective system in its place.

Dependence on Imported Oil: Due to a number of major gas discoveries in the '90s Pakistan's gas reserves grew by 45% and gas production by nearly 50%. This reduced Pakistan's dependence on imported oil and share of oil in primary energy mix reduced from 40% to 30% as a result. This diversification from oil to domestic gas and major reduction in oil consumption provided a prop to the economy. However all the gas fields discovered in the '90s have

now been fully developed, and the share of imported oil is again on the rise. The increase in oil import at the prevailing steep prices will cause a serious strain on Pakistan's economy. There is a need for Pakistan to reduce use of oil in power generation in the existing plants and go for gas, coal and hydro electric based new power plants.

Low Energy Consumption (Per Capita): Pakistan consumes nearly a fifth of the world average energy consumption per capita. It still depends for 30% of total energy consumed on traditional sources of biomass for subsistence level energy provision. Half of the households in Pakistan do not have access to electricity. This is a major cause of poverty as a third of the population exits below poverty line in the country. Pakistan needs to improve energy consumption per capita through robust and adequate supply at reasonable prices. The cost of energy could be minimized through inter-fuel substitutions, efficient power and gas grids, energy efficient consumer appliances, weather related building codes/practices, energy saving incentives, increasing role of private sector and with due accountability of public sector energy institutions.

Summary of Potential for Energy Cooperation between Pakistan and India

Shared Gas Pipelines: There is a great potential for shared gas pipelines from West and Central Asia through Pakistan to India over the shortest land routes meeting demands of both countries by exploiting fully the economies of sale in gas transportation as well as gas fields' development costs. Multiple gas pipelines would be needed beyond 2020.

Interconnected Power Grids: The two countries could achieve substantial benefits by sharing the peak load power generation capacity through interconnected grids. In all the South Asian countries peak demand of electricity occurs daily in the evening due to lighting load. The peak demand is nearly 25% higher than the average demand and lasts for a brief period of 1-2 hours. These countries occupy a contiguous land mass stringing east west. The peak load moves with time zones and nearly half of the presently

required peak capacity for individual countries could be reduced through cooperation.

Shared Oil Pipelines: As the oil needs of Pakistan and India increase there might be an opportunity of a shared oil pipeline (Kazakhstan, Uzbekistan, Turkmenistan, Afghanistan, Pakistan coast and onward by sea to India). In fact oil pipeline infrastructure from Kazakhstan to Turkmenistan may be available already.

Energy Information Sharing: Pakistan and India lie on the same geological plate (Indian Plate) and have similar petroleum basins. Indus basin straddles across both countries onshore as well as offshore. Both countries could share geological/petroleum information to improve the quality of basin modeling on both sides of the border. This could help both countries in improving the success rate in exploration and also in reducing the cost of exploration.

Joint Energy Planning: Greater degrees of freedom could provide more chances of optimization for maximizing the supply of energy and minimizing the cost. Joint planning could exploit the inherent synergy and economic complementarities to the mutual benefit of all the cooperating countries.

Cross Border Energy Trade: It may be convenient to cooperate in cross border energy trade for supplying the local communities and reducing the need for expensive infrastructure. Isolated population centers in the bordering areas could greatly benefit form local cross border energy trade on both sides of the borders.

Existing Barriers to Regional Cooperation

South Asian Association for Regional Cooperation (SAARC) was formed in 1985 to foster and promote regional cooperation. Even after 23 years of SAARC formation intra-regional trade among the member countries remains negligible in view of several barriers (political, institutional, technical and investment/financial) that inhibit the regional cooperation.

Political Barriers: The two major countries of South Asia, Pakistan and India, have not been able to resolve their differences on the core issue of Kashmir dispute. Their often hostile and usually contentious bilateral relations have come in the way of a meaningful cooperation in the region.

Institutional Barriers: Lack of a regional coordinating institution/mechanism, especially in the field of energy, acted as a barrier in the past. A new initiative by SAARC to establish a Regional Energy Center at Islamabad has now provided a mechanism for exchange of information and networking that may lead to regional cooperation in the energy sector.

Technical Barriers: Power grids follow different design and operating specifications. These differences may not allow interconnecting of grids for cross-border electricity trade/cooperation.

Investment and Financial Barriers: Cross-border energy trade will require investments for compatible infrastructure. It will also require autonomous regulatory framework for fixing the cross-border energy tariffs. These arrangements do not exist at present.

Trends for Future Stability

Pakistan and India have moved closer from their historical positions and are now interested in shared gas pipelines. Iran-Pakistan-India gas pipeline is a case in point. This project could forge a new kind of economic cooperation in the region among all the stake holders of gas producers, consumers and transit countries. The sharing of stakes could catalyze broader cooperation that could add to the stability and peace in the region.

The countries of South Asia have set up a SAARC Energy Center at Islamabad for forging cooperation in all areas of the energy sector.

USAID's South Asia Regional Initiative for Energy (SARI/Energy) has been launched which is aimed at bringing the countries of South Asia together for cooperation in the energy

sector. A publication with the title of "Regional Energy Security for South Asia" has recently been released under the auspices of SARI/Energy. This draws focus from individual countries toward cooperation in energy sector.

Indus Water Treaty of 1960 (IWT) could provide a model for cooperation in energy sector between Pakistan and India. As the IWT was brokered by the World Bank in 1960, there may be a need for a credible interlocutor in the case of energy cooperation as well. I think there is a good case for starting an energy specific dialogue at the level of public/private institutions as well as members of civil society on the pattern of Track Two diplomacy or Neemrana Group. Settlement of longstanding core issue of Kashmir could usher South Asia into an era of peace and economic cooperation. World bodies need to focus on this aspect with greater seriousness. But the actual change of hearts has to be demonstrated by the two nuclear neighbours themselves. They must realize that the solution of this issue would drastically reduce colossal defense expenditure that can be diverted to development projects.

End Notes

1. "Dynamics of South Asian Peace and Energy Security" Presentation by Dr. Gulfaraz Ahmed to Pakistan-India Track II Diplomacy Neemrana Group, September 03, 2006, Islamabad, Pakistan.
2. "Peace and Prosperity Gas Pipeline" UNDP (Pakistan) Report 2003 by Dr. Gulfaraz Ahmed.
3. "Strengthening Global Energy Security Through Alternative Petroleum Storage and Loading Terminals Outside the Strait of Hormuz" by Dr. Gulfaraz Ahmed NDU Margalla Papers (Under Publication).
4. "Regional Energy Security for South Asia, Regional Report", by USAID's South Asia Initiative for Energy (SARI/Energy); www.sari-energy.org
5. USAID SARI/Energy Presentation to Pre-Solicitation Conference January 27, 2006; www.sari-energy.org
6. "Regional Energy Cooperation in South Asia: Benefits of Integrating the Primary Energy and Electricity Markets", Chapter 8, of Development and Climate: An Assessment for India; http://developmentfirst.org/india/report/fullreport.pdf
7. "The Brookings Foreign Policy Studies Energy Security Series: India" by Tanvi Madan, November 2006; www.brookings.edu/reports/2006/11india.aspx
8. "Medium Term Development Framework 2006" Planning Commission of Pakistan; http://www.nttfc.org/reports/Logistics%20costs%20study%20Pakistan%20report%20June%2006.pdf
9. Pakistan Energy Yearbooks, 1997 to 2007; Hydrocarbon Development Institute of Pakistan; Ministry of Petroleum and Natural Resources; Government of Pakistan.
10. "Gas Production Forecast 2008-2030" Official Record of Ministry of Petroleum & Natural Resources 2008
11. World Human Development Report 2003; UNDP

Author

Dr. Gul Faraz Ahmed is Honors graduate and Gold Medalist in civil engineering and holds MS and PhD degrees in Petroleum Engineering from Stanford University, USA. He has rich and diverse experience in energy sector policy, planning, operations management and regulation as Chairman/CEO Oil & Gas Development Company Limited (OGDCL); Chairman National Electric Power Regulatory Board/Authority; Federal Secretary to the Government of Pakistan in the Ministry of Petroleum & Natural Resources; and Consultant to UNDP on Energy. Dr Gulfaraz Ahmed has authored numerous publications and articles.