

Executive Summary

After decades of insignificant volumes of cross-country electricity trade and absence of any trade in natural gas through pipelines among the countries in the South Asia, political leaders and businessmen of the region have recently evinced a great deal of interest and enthusiasm in cross border electricity and gas trade, not only within South Asia but also with its neighbors in the west (Central Asia and Iran) and in the east (Myanmar). This brief desk study welcomes this political commitment and advocates the rapid commencement (in the short term) of such trade in the simpler bilateral form, making the best use of the immediately available opportunities and the expansion and development of such trade into a more integrated regional energy market with multiple buyers and sellers over the medium to long term.

The Rationale for Regional Energy Trade

Such widespread regional energy trade provides a win-win situation to all the participants and is a logical and rational public policy choice because of:

- The mismatch between energy demand growth and energy resource endowments. Relatively smaller economies (Tajikistan, Kyrgyzstan, Nepal, Bhutan, Myanmar, Turkmenistan) and Iran have hydropower or hydrocarbon resources far in excess of their energy demand. The remaining countries (India, Pakistan, Bangladesh, Sri Lanka and Afghanistan) have energy demand growth far outstripping domestic supply and in the foreseeable future the demand-supply gap would become wider unless the domestic supplies are supplemented by imports.
- Implications of trade to energy security. Reliance on energy trade for meeting a part of the domestic demand can actually enhance national energy security by diversifying energy forms and supply sources and lowering the cost of energy supply.
- The substantial benefits to the smaller exporting economies. Energy exports could make dramatically significant contribution to the GDP growth of economies like Bhutan, Nepal, Myanmar, Tajikistan and Kyrgyzstan and enable their export led growth. For example, Bhutan's electricity export in FY2007 is expected to constitute nearly 25% of its GDP and 60% of its state revenues.
- The significant relief from energy constraints to rapid economic growth. This is especially true in the importing economies, India, Pakistan and Afghanistan. For example, in India alone, the volume of unserved electricity in FY 2007 is estimated at 54,916 GWh valued at \$12.1 billion on the basis of the short term marginal cost in the Indian grid. The value of the corresponding industrial production foregone would be several times more.
- The environmental imperatives. This is especially relevant for India which relies very heavily on domestic coal. Its carbon dioxide emissions will rise from 4% of the world total today to about 13% by 2030 unless low carbon strategies are adopted. Imported hydropower and natural gas would help in moderating this increase to some extent.

- Climate change imperatives. Carbon emissions are increasing and Himalayan glacial resources are shrinking. The management of regional water resources and the use of other primary energy sources have to be optimized for the benefit of the region as a whole, and trade enables such optimization for the benefit of all.
- Reduction of supply costs. Trade could reduce system development costs and enable lower cost supply. Nepal, for example, could dramatically reduce its cost of power supply (compared to its attempt to meet its demand by the expensive all-hydro generation option) by optimizing its power system with sale of hydropower to, and import of thermal power from, India.
- Cash flow implications. Often energy import options improve cash flow and enable postponement of lumpy and large domestic capital investment needs, to avoid crowding out other important investment needs (the classic make or buy choice).

Scope of the Study

This study seeks to highlight the potential and prospects for such trade, analyze the factors which have inhibited the trade so far and take note of the emerging favorable trends in the region. *It recognizes that trade is a logical corollary to the availability of opportunities for arbitrage and can take place under a variety of sector policies, structures and conditions (including the present conditions in the region), but that capacity building and sustained sector reforms would help to expand and sustain trade and enable the evolution of a more integrated regional energy market.* Against this perspective, it seeks to outline the regional trade opportunities and identify the role of the regional governments as well as the multilateral and bilateral development partners in promoting such trade, taking fully into account both global concerns (such as environmental impact and climate change) and regional concerns (such as optimal management and use of water resources and primary energy resources and benefit sharing among all participants).

Energy Constraint to Economic Growth

Driven by the first generation reforms relating to the correction of macroeconomic imbalances and the adoption of more liberal regimes relating to trade, investments and exchange rates South Asia has become one of the fastest growing regions in the world during the last several years. India is targeting an annual growth rate of 10 percent with Pakistan, Bangladesh and Sri Lanka following closely behind. Such buoyancy of growth is expected to continue through 2015, halving the regional poverty levels.

Such a dynamic growth in the past had been driven by global, rather than regional integration. The intra-regional trade in South Asia was only about 2 percent of its GDP compared to more than 20 percent in East Asia in 2005. Per capita income in the region was still less than \$700 in 2005 and the region's growth has to encompass not merely the services sector (in which remarkable progress had been registered) but also the industrial and agricultural sectors. The key impediment to achieve and sustain such broad based growth at the targeted rates is the lack of adequate infrastructure, which is especially acute in the energy sector and especially in the larger economies of India, Pakistan and Bangladesh as well as in Afghanistan.

Lack of adequate and reliable energy is proving to be a major constraint to growth in production and productivity. Relieving this through the sustainable provision of secure energy supply remains a significant challenge.

Mismatch Between Resource Distribution and Demand Growth Distribution

The region has an installed power generation capacity of about 152 GW and an annual generation of the order of 740 TWh and the demand is expected to grow annually in the range of 6.6 percent to 11.5 percent during the next 15 to 20 years, if supply growth could keep pace with the demand growth. Bhutan, Nepal, Myanmar and the Central Asian economies (such as Tajikistan and Kyrgyz Republic) have energy resources far in excess of their domestic needs. Total hydropower potential of these five countries exceeds 170,000 MW of which less than six percent has been developed. The combined peak demands of their systems amount to no more than 60 percent of the developed capacity. The development of even a part of their undeveloped resources for export would enable the export led growth of these relatively smaller economies.

India and Pakistan had a total annual gas consumption of the order of about 2.5 tcf (in FY 2006) divided approximately equally between them. Gas demand in India and Pakistan are forecast to grow annually at the rate of 8 percent and 7 percent respectively in the next 25 to 30 years. In Pakistan supply shortfall would be about 4 percent to 10 percent till FY 2010 and thereafter widen to 20 percent or more. India's import dependency for gas is expected increase from the present modest level of 7% to the 49%-58% range by FY 2032. Total gas reserves of Turkmenistan, Iran and Myanmar exceed 1000 tcf. Bangladesh is also believed to have significant potential for export of gas or gas fueled electricity.

India and Pakistan could provide the major import markets for the surplus energy from these countries as well as from Iran and Turkmenistan and secure additional energy supplies to relieve shortages and sustain economic growth.

Existing Level of Trade

Presently there is no cross border pipeline or trade in natural gas. Cross border electricity interconnections and electricity trade are insignificant except for the following:

- Bhutan's export of 5664 GWh in FY 2007 to India from three hydropower projects with total generating capacity of 1,416 MW constructed with substantial grant assistance from India;
- Import of about 430 GWh (or about 28% of the total supply) by Afghanistan from Iran, Turkmenistan, Uzbekistan and Tajikistan;
- Nepal's import from India of 266 .23 GWh (or 9.6% of its total supply) and its export of 101 GWh (or 5% of its total sales) to India
- Pakistan's import of about 25MW of power from Iran to the isolated grid of Baluchistan near Gwadar deep sea port

Factors which inhibited trade in the past

The most important among the factors which inhibited regional energy trade in the past relate to the political tensions, security issues and the past economic policy choices. These factors include:

- Prolonged political tension between India and Pakistan over Kashmir, war like conditions in Afghanistan, internal armed conflicts in Sri Lanka and Nepal as well as the political turmoil in Bangladesh;
- Past pursuit of inward looking, import substitution based policy approach aimed at the elusive goal of national self sufficiency. This approach regarded energy imports as diluting energy security;
- Lack of cross border transmission links and a lack of adequate transmission infrastructure even for transferring power among the various regions within the large countries such as India, Pakistan and Bangladesh. The dilapidated and war-damaged infrastructure in the key transit country of Afghanistan was a major constraint to trade between Central Asia and South Asia
- Poor operational efficiency and lack of creditworthiness (arising from inadequate tariffs, high system losses and poor collections) of most power utilities in the region, which did not encourage trade with them, as payment risks with them were perceived as unmanageable;
- Pervasive state ownership of the utilities, their poor earnings and the lack of resources to invest for their own domestic needs let alone the investments for export.

In addition, in a large country like India progress in sector restructuring, open access to transmission systems and fair and transparent sector regulation at least at the level of national and regional grids, as well as the emergence of licensed power trading firms were needed even for stimulating internal trade among the various regions of the country.

Emerging favorable factors

Since the late 1990s, several new factors favorable to trade have emerged. The most important of these factors is the change in the political mindset of the politicians away from inward looking import substitution based development strategies relying on controls on trade, investment and exchange rate regimes. Newer approaches to growth led by liberalized trade and investment regimes, and with an expanding role to the private sector and the markets are coming into vogue, resulting in a greater degree of global integration and significant growth dynamism, and increasing foreign exchange earnings and reserves, which in turn enable further liberalization. Increasing growth rates translate into rapidly increasing energy demand and the urgent need for timely supply augmentation to meet such demand both from internal and external resources. Other key factors include:

- Emergence of national transmission companies in India, Pakistan and Bangladesh paying special attention to increase the inter-regional transfer capacities within the country. In India such transfer capacities have nearly doubled during FY2002-FY 2006 to reach 9,450 MW. It would increase to 16,540 MW by the end of FY 2007 and further to 37,150 MW by FY2012. This would effectively enlarge the markets for imports, by giving the exporter a substantially wider choice of buyers.

- Emergence of national and regional power markets in India enabled by the new Electricity Law of 2003. The law has enabled the creation of regulatory bodies, the phased open access to the national and regional transmission grids and the emergence of licensed and regulated energy trading companies. The adoption of availability based tariffs with a frequency linked Unscheduled Interchange charge in the national and regional grids has led to the emergence of lively electricity trade and a spot market sending reliable price signals to the market. Such trade became possible, in part, by the special steps taken by the government and the central bank to reschedule the past debts of provincial power utilities and to enforce payment discipline.
- Increasing role of the private sector. Private sector has a total generation capacity of nearly 24,000 MW (or about 16% of the total installed capacity) in the region. Distribution systems in Delhi, Orissa, Bombay, Calcutta, Surat, Ahmedabad, and Karachi are in the private sector or have recently been privatized. The privately owned tiny distribution system in the city of Ghazni in Afghanistan and the rural electric cooperatives in Bangladesh are the heart warming examples in an otherwise bleak environment of the sector in these countries. The 400 kV transmission link between eastern and western regions of India (enabling the absorption of Bhutan power imports) has been constructed by a joint venture between a private investor and the Power Grid Corporation of India. There are more than 20 private sector licensed power trading companies in India besides the PTC Limited (in which both public sector and private sector hold shares). Indian private investors are actively looking for opportunities to invest in export power projects in Bangladesh, Bhutan and Nepal. Majority state-owned NTPC of India is considering investing in a large thermal power plant in Sri Lanka. The Tata group is pursuing investment in a 1000 MW plant in Bangladesh.
- Commercialization of the distribution segment, through enterprise reform, privatization and through regulatory prodding is going ahead, though often frustratingly slowly, in India, Pakistan and Bangladesh
- Structural changes involving the separation of transmission from generation and distribution functions, open access to transmission and creation of independent regulatory bodies are progressing at different speeds, with India leading the pack and with Pakistan, Bangladesh closely following.
- Political tensions between India and Pakistan are becoming less through a series of high level talks and confidence building measures. Internal conflicts in Nepal have subsided and that in Afghanistan still seems to be under control.
- There is an increasingly serious interest in discussing energy related cooperation, cross border energy investments and trade possibilities in a range of regional organizations such as SAARC, ECO and BIMSTEC.

Evolution of the Regional Trade

The nascent bilateral energy trade is expected to increase among the countries in the region and its neighbors. India, Pakistan and possibly Bangladesh would emerge as major importers while Central Asia, Iran, Nepal, Bhutan and Myanmar could emerge as significant exporters. Afghanistan would be both an importer and the important transit country. Experience and confidence gained through bilateral trade are expected to help

the evolution of regional energy markets with multiple sellers and multiple buyers. It is envisaged that initially trade would be clustered around two energy markets -- a Western Energy Market (in which Central Asia and Iran would sell electricity and gas to Afghanistan and Pakistan and possibly to India) and an Eastern Energy Market (in which Nepal, Bhutan would export hydropower to India, and Myanmar would export both natural gas and hydropower to India. Bangladesh could also export gas or gas based power and could import some hydropower from Nepal, Bhutan and Myanmar. Eventually interconnection of the grids of India and Pakistan would create the full regional electricity and gas market serving a population of 1.5 billion people. This market would be one of the largest in the world, whose sheer size would make it easier to mitigate the various risks, bear external shocks, reduce cost, create additional and more profitable trading opportunities, and attract investments.

Opportunities in the Western Energy Market

Energy trade opportunities currently being discussed or pursued include:

- Power imports to Afghanistan. Afghanistan's power demand is expected to grow to the level of 905 MW by 2020 and agreements in principle have been reached to import 300 MW each from Tajikistan, Uzbekistan and Turkmenistan. Arrangements for the reinforcement of transmission links with Tajikistan and Turkmenistan are in place and that for the link to Uzbekistan is being reviewed and is likely to be pursued in the context of projects to decongest the Uzbek grid. Imports from Iran of 60MW to 100 MW to serve the Herat and Nimroz provinces would continue and adequate transmission links for this have already been constructed. Funding is in place and construction is in progress for the North East Power System in Afghanistan to transmit the imported power to various load centers.
- Power import from Iran to the Gwadar port area in Pakistan will increase from about 25 MW now to about 100 MW when the proposed 220 kV link is completed.
- Hydropower import from Central Asia to Afghanistan and Pakistan. This prominent multilateral trade project is being currently discussed and formulated with the help of multilateral and bilateral development partners led by the World Bank. It relates to the export of 1000 MW of power from Tajikistan and Kyrgyz Republic to Pakistan and Afghanistan. A World Bank study (2004) showed that the completion of the partially constructed Central Asian hydropower projects (including new transmission links) would enable Tajikistan and Kyrgyzstan to supply power to Afghanistan and Pakistan at a delivered cost lower than the marginal cost of generation in Pakistan. Pakistan's present power demand at the generation level of about 14,000 MW is expected to reach 20,000 MW by FY2010 and 44,700 MW by FY2020. Among the several options to meet such growing demand import of power from Central Asia has a prominent place. About 670 MW would come from Sangtuda I hydropower project under construction by a joint venture between RAO UES of Russia and the Tajik government. Surplus power from the existing generating stations of Tajikistan and Kyrgyz republic would supply the remaining 330 MW. An MOU among the four governments had

been signed and a Council of Ministers and a multi-country working group have been set up to coordinate further efforts. Studies for the dedicated transmission line and other technical, legal commercial and risk mitigation related studies are ongoing under the technical assistance provided by the World Bank and the Asian Development Bank. Private participation in the transmission component is also envisaged. Should this initial project prove cost effective and reliable, Pakistan is expected to increase its import from Central Asia to about 4000 MW in the second stage.

- Natural gas import by India and Pakistan from Iran (IPI Gas project). This project, which is in an advanced state of negotiation, is for importing annually (for 30 years) 33 bcm of gas by India and 21.7 bcm of gas by Pakistan from Iran in two phases. In the first phase one pipeline with a diameter of 56 inch would be built to transport 21.7 bcm of gas. In the second phase the pipeline capacity would be doubled to transport the remaining gas. Iran would build the pipeline up to the Pakistan border and Pakistan would build it further up to the Indian border. Pakistan would buy the entire gas at the Iran-Pakistan border and transport it across its territory and sell to India the latter's share of gas at a price which would include Pakistan's transmission charges and transit fees. The total distance involved is about 2,670 km. Total pipeline costs are believed to be about \$7 billion. Many private investors appear to be interested in participating in the project. Russian Gazprom has also expressed interest to invest in this pipeline. Completion of the first phase is expected by 2013
- Natural gas import by Pakistan from Turkmenistan via Afghanistan (TAP Gas project). This project involves the construction of a 1680 km long 56 inch diameter pipeline at a cost of about \$5.3 billion to supply about 30 bcm of gas per year from Turkmenistan to Pakistan via Afghanistan. India has also been invited to join this venture and it has attended the steering committee meetings as an observer. Further progress would depend on the robustness of the gas reserves data, certification of the reserves, extent of possible private interest, ability and willingness of Turkmenistan to fulfill its commitments to Gazprom of Russia and still supply Pakistan and India, and finally on the gas pricing.

The overall prospects for energy trade in the Western Energy Market in the near term are summarized in Table ES 1.

Opportunities for Trade in the Eastern Energy Market

Rapid increase in the peak power demand of India (from 93,255 MW in FY 2006 at an annual rate of about 7% through FY2032) and the country's inability to meet it fully from domestic resources are key drivers for energy trade in the eastern market. Indian policy makers envisage import hydropower from Bhutan, Nepal and Myanmar and gas based power from Bangladesh as well as import of gas from Myanmar and Bangladesh. Key opportunities for trade in the eastern market include:

Table ES 1: Summary of the Prospects for Trade in the Western Energy Market

Importing countries	Exporting Countries					
	CARs	Turkmenistan	Iran	Afghanistan	Pakistan	India
CARs	x	Some gas exports are possible; mutual electricity support	Unlikely (uncompetitive)	No scope	Limited (some emergency support possible)	No scope
Turkmenistan	Mutual electricity support	x	Unlikely (similarity of resources – gas; little scope in electricity)	No scope	No scope	No Scope
Iran	Limited power exports possible	Power exports are ongoing	x	No scope	No scope	No Scope
Afghanistan	Power exports are ongoing and should grow	Power exports are ongoing and should grow	Power export ongoing and may grow	x	Small cross-border power export possible	No scope
Pakistan	Potential for power exports	Significant potential for gas exports	Significant potential for gas export; cross-border electricity trade could grow	No scope for trade; Transit of electricity and gas	x	Mutual short-term trading support in power
India	Gas and power exports possible	Significant potential for gas exports	Significant potential for gas exports	No scope; Transit of gas	Mutual short-term trading support in power; transit of gas	x

Notes on color coding for Tables ES 1 and ES 2: **Red Color** denotes that trade prospects are significant and are either being exploited or can be brought to fruition in the short-to-medium term. **Green Color** denotes that prospects of the trade are good and may materialize in the medium term. **Yellow Color** denotes that prospects for the trade are more limited and may materialize in the medium-to-long term, and **Grey Color** denotes that the prospects for the trade are weak.

- Hydropower exports from Bhutan. Bhutan’s unexploited hydropower potential exceeds 23,000 MW and there is a wide shelf of projects to choose from. Bhutan’s power system master plan envisages the construction of six new hydropower projects with a total capacity of 4,484 MW through 2024. The government has also signed an umbrella agreement with the government of India for the preparation of projects and feasibility studies for several hydropower projects and many of the studies are ongoing. Most large Bhutanese projects are run-of-the-river type with little firm energy and with substantial wet season energy and tend to have high capital costs and

modest internal rates of return not likely to be attractive to private investors. However, the evolution of the power trading market in the Indian grid provides an opportunity for Bhutan to choose that part of India which has a demand pattern matching its supply pattern and marginal costs exceeding its supply cost. Major increase in Bhutan's power exports to India in the medium to long term could materialize mostly in the context of the continuation of the present financing arrangement under which the Indian government provides a grant to cover 60% of the capital cost and soft loans for the remaining 40%. Modest increases through medium sized projects could come through investments by private investors.

- Hydropower exports from Nepal. Construction of two 220 kV links between India and Nepal, would help increase the present modest level of power exchange between the two countries and would also enable many of the privately owned IPPs in Nepal to export their surplus power to India. Nepal's unexploited hydropower potential exceeds 43,000 MW and it has a large shelf of proposals for run-of-the river and storage projects of large and medium sizes, which have been studied over the last several decades. They have not made much progress as intergovernmental agreements were not easy to reach. The situation has dramatically changed with the emergence of private sector investors with keen interest in investing in Nepal projects for exports to India. The government has recently invited RFPs in respect three hydropower projects(Upper Karnali, Arun III, Buri Gandaki) totaling about 1300 MW and several major Indian investors - - some, in collaboration with international investors- - have responded. The focus which is mainly on the simpler run-of-the-river projects needs to shift to storage hydropower projects to realize better values in the Indian market. In this context, it is heartening to note that after efforts lasting over 12 years, the 750 MW West Seti Storage Hydropower project, sponsored by SMEC of Australia appears likely to achieve financial closure in the next few months with equity participation from Australian, Chinese, Indian and Nepalese investors and debt substantially from China. Ninety percent of the electricity output (2,970 GWh) had already been contracted for export to India at a price of 4.95 cents/kWh.
- Grid Interconnections. Interconnection of the grids of India, Nepal, Bhutan and Bangladesh through the junction of the borders of these four countries has been shown by studies to be beneficial for all four parties to improve the reliability of their systems. Similar benefits are expected from the proposed interconnection between the Indian and Sri Lankan grid across the sea, for which preliminary intergovernmental agreement has recently been reached.
- Export of hydropower from Myanmar. Myanmar has unexploited hydro potential of about 39,000 MW and is developing about 10,400 MW of new capacity through joint ventures with Thai and Chinese businessmen and utilities mainly for export of power to Thailand. Indian and Myanmar governments have a history of cooperation in designing and building hydropower projects in Myanmar and are again collaborating in the design and formulation of Tamanti multipurpose project located near the Indian border initially with a power component of 1,200 MW, essentially for export to India. This is likely to be developed as a joint venture between Myanmar and Indian power entities.
- Power and Gas Exports from Bangladesh. Several proposals have been made by public and private sector entities of India and other countries for establishing large

gas fired combined cycle power projects in Bangladesh mainly for export to India, but perceived uncertainties about the volume of gas reserves in Bangladesh have led its government to hesitate to concur. Recent discoveries and development of coal in Bangladesh and the expected changes in the political condition of the country could perhaps lead to an early concurrence. Most observers believe that Bangladesh has abundant gas reserves and that it has the potential for significant gas exports to India. However the Bangladesh government is not yet fully convinced about the adequacy of its reserves.

- Gas Exports from Myanmar. ONGC and GAIL of India have invested in successful gas exploration in two blocks in Myanmar. In order to transport gas from those blocks to India they have designed alternative gas pipelines from Myanmar off-shore fields to India—one passing through Bangladesh and other bypassing that country. Depending on the outcome of discussions with Bangladesh one of these pipelines is expected to be selected. Meanwhile the government is also considering piping gas to China and exporting gas as LNG. Final decisions would be taken after the evaluation of the reserves in both the blocks during the next several months.

The overall prospects for energy trade in the Eastern Energy Market are summarized in Table ES 2.

Table ES 2: Summary of prospects of Trade in the Eastern Energy Market

Importing Countries	Exporting Countries					
	India	Bhutan	Nepal	Bangladesh	Sri Lanka	Myanmar
India	x	Significant quantities of hydropower (H)	Significant hydropower export possible	Significant amounts of gas or power possible. Some resource uncertainty	Some peak power support possible	Significant gas and power supply possible
Bhutan	Dry Season Support	x	Unlikely. Similarity of resources and seasonal shortages	Small amounts of thermal power and gas; connection via India (L)	No scope	Unlikely (far off; too small market)
Nepal	Thermal power support. Dry season support	Unlikely. Similarity of resources and seasonal shortages	X	Small amounts of thermal power and gas; Connection via India (L)	No scope	Unlikely
Bangladesh	Sharing reserves; Electricity swaps	Some hydropower. Connection via India (L)	Some hydropower. Connection via India (L)	x	No scope	Unlikely (although some potential in hydropower)
Sri Lanka	Dry season and thermal power support	Unlikely (far off)	Unlikely (far off)	Unlikely (far off)	x	Unlikely (far off)
Myanmar	No scope	Uncompetitive	Uncompetitive	Uncompetitive	No scope	x

What the Governments need to do to promote energy trade?

As noted earlier trade is a corollary to the availability of opportunities for arbitrage. Energy trade can take place even under the *present circumstances* and under a wide range of sector policies, structures and conditions and their levels of development and sophistication. The regional governments should make use of the present political consensus on the need for developing regional energy trade, in the light of the strong commitment expressed at the highest levels at the recent SAARC conference (April 2007) and SAARC Energy Ministers' meeting (March 2007). Some of the trade opportunities described in the earlier sections should be within reach. Based on their state of preparation, the priority deals for such immediate action would include: (a) Central Asia-South Asia 1000 MW electricity trade project; (b) West Seti Hydropower project in Nepal; (c) Iran-Pakistan-India gas pipeline project; (d) strengthening transmission interconnections between Nepal and India; and (e) the "four-borders" transmission interconnections linking the power systems of India, Bangladesh, Bhutan and Nepal. These projects could jump-start regional energy trade and lead the way for more active regional cooperation whose benefits would spill over into other economic areas.

While these and possibly some other energy trade projects could be implemented under the present circumstances, to facilitate a more vigorous pursuit of regional trade opportunities, the governments may have to focus in the *near term* on a number of measures:

- Articulate further and strengthen the public support for the emerging policy approach treating energy imports as enhancing energy security in the major importing countries such as India, Pakistan and Bangladesh and energy exports as driving rapid economic growth in the exporting and transit countries;
- Encourage both national and or international private sector to play a major role in the form PPP structures in cross border investments on export projects, as they have better credibility and are perceived as more neutral than pure state-ownership based arrangements;
- Subscribe to, and become members of the Energy Charter Treaty, as Pakistan has done, in order to place the cross border energy trade on a firmer multilateral footing in relation to investment protection, regulation of cross-border energy infrastructure and flows, provide additional comfort and confidence to all participants, and minimize the political risks to prospective investors;
- Reduce political tensions within and across the countries, with special attention to the integrity of transit countries (such as Afghanistan) and the viability and operational stability of their energy systems. Trade flourishes under peaceful conditions.
- Adopt a sustainable commercial approach to trade (rather than a political ad hoc approach) and use standard commercial contracts which allocate risks fairly. Let the private investors and market forces play a major role in actual buying and selling.
- Create the capacity in smaller economies such as Afghanistan, Bangladesh, Kyrgyzstan, Nepal and Tajikistan to prepare, negotiate, monitor and enforce such

commercial contracts. Solvent and regulated energy traders may have a very useful role to play.

- Keep the price expectations realistic based on reliable market signals and ensure that both the buyer and seller see advantage in the trade.
- Let the momentum of political commitment built by recent SAARC summit drive the prioritized available opportunities towards the conclusion of inter-governmental agreements and trade contracts.

To sustain and expand energy trade and minimize trade risks and to enable the evolution of a more integrated and more efficient regional energy market in the *medium-to-long term*, governments have to deepen and advance sector reforms aimed at creating appropriate sector structures, financially viable entities and an environment of predictable and neutral regulation. The governments may have to focus on the following initiatives:

- Review and re-optimize the least cost power and gas development plans of the individual countries with energy trade as an explicit option to meet part of the demand, minimize carbon emission and identify on the basis of such re-optimization priority regional energy projects to be constructed and operated.
- Carry out detailed feasibility studies, inter alia, to quantify trade benefits and to proceed with implementation.
- Construct the essential transmission links to move the imported energy to the demand centers, including the essential trans-border links and facilitate the technical coordination of interconnected systems and harmonization of grid codes and operational practices making the best use of the Energy Working Group of SAARC and its Energy Center securing for this purpose technical assistance and cooperation with UCTE, if needed. The same forum could be used to harmonize the regulatory practice and the evolution of a regional regulatory body.
- Complete the ongoing energy sector restructuring process especially, in separating the transmission systems (from generation and distribution) and ensuring their open access and enabling the evolution of national energy markets in which the distribution entities, large consumers and energy traders, could choose their suppliers and negotiate contracts with them. Indian lead in the power sector in this regard is noteworthy. Similar reforms in gas sector need to be undertaken urgently in India, Pakistan and Bangladesh
- Improve the operational and commercial efficiency and financial viability of the distribution entities through enterprise reform, inter alia, making the best use of technology such as remote/smart metering and GPS technologies and through privatization/concessions
- Adjust tariffs and cross subsidies to enable financial sustainability of the sector and shift subsidies from the utility to state budgets and evolve sustainable and targeted social protection schemes. This needs to be done both in exporting and importing countries to sustain trade.
- Make the best efforts to conclude international river basin agreements on a priority basis as storage hydropower projects are badly needed in the region to provide firm power and meet peak demands. These agreements which have a broader focus than mere power generation, have to take into account the concepts of benefit sharing and the imperatives of global concerns such as climate change

and the need to adopt low carbon strategies and the regional concerns such as integrated river basin management involving the regional optimization of the use of water and primary energy resources.

Possible Role for multilateral and bilateral development partners

Neutral parties such as the International Financing Institutions (IFIs) and their development partners have the significant role of an honest broker in facilitating cross border investments for export and associated trading arrangements. A World Bank study of 2004 identified the electricity export potential of Central Asia and demonstrated that export of power from Central to South Asia would be a win-win situation for both parties. This led to the relevant four countries coming together and pursuing the 1000 MW export project with the help of WB, ADB and other development partners.

The multilateral agencies have a key role in the structuring of PPP type projects and their financing arrangements and also in devising ways for mitigating a wide range of risks faced in such projects based on their world-wide experience. They could help the smaller low-income exporting countries to participate with some equity in the PPP arrangements. The presence of multilateral agencies in the project as equity holders and lenders (even with small amounts) discourages the parties from non-performance of contract obligations and thus provides a source of major comfort for both parties. They can also use their guarantee instruments to reduce a range of risks for the investors. MIGA could tailor transit country political risk cover to suit the needs of the project. Partial credit guarantees could extend effectively the maturity of debts and improve the cash flow of the projects.

The multilateral agencies could use their lending and non-lending services:

- To build capacity in the governments and the public and private sector energy entities of smaller economies such as Nepal, Bangladesh and Sri Lanka to negotiate, implement, monitor and enforce energy export contracts;
- promote the separation of the transmission (from generation and distribution) and its operation under an open access regime;
- help expand the inter-regional transmission capacity in large markets such as India, Pakistan and Bangladesh, and promote the evolution of national markets
- help the regulatory regimes to mature;
- encourage pricing reforms and support the enterprise reform and privatization of distribution entities, and
- help SAARC Energy Working Group and its Energy Center secure UCTE or other suitable assistance for technical coordination of regional power systems and also to develop regional regulatory oversight of the interconnected grids.

The multilateral and bilateral agencies need to give adequate priority to regional trade initiatives in their assistance strategies and need to fully coordinate among themselves to improve the synergy of their operations. The regional trade agenda should be appropriately integrated into the country strategies and country programs. Regional energy projects, as a rule, have higher risk profiles and may benefit from the involvement of the international agencies, which have complementary instruments that can

collectively cover wider range of risks, as well as help spread the risk over a large number of participants.

Reduction of political tension is usually considered a key requirement for cross-border investment and trade. Conversely, the world experience appears to demonstrate that cross border investments and trade and associated business interests help to lower political tensions. Entrepreneurial investment initiatives with imaginative financing and risk mitigation strategies – possibly with the involvement of multilateral financing institutions in some projects as neutral parties to help build the confidence and mitigate risks -- could help to start and strengthen the virtuous circle of trade growth and regional peace.

India, with its geographic position and the size and the buoyancy of its economy, plays a unique and critical role in regional integration in South Asia, including in the energy sector. Bilateral energy trade between India and its neighbors is a key building block of the integrated regional energy market. While it would be useful and perhaps necessary to develop an upfront understanding at regional (SAARC) level as to how such region-wide energy systems (regional electricity and gas grids) and trade could evolve, the pace of regional integration will be in large part determined by the pace of development of energy trade with India, especially on the eastern side of the region. In this context, it is very encouraging to see the reforms that are taking place in the Indian energy sector and the efforts which India is taking to strengthen its domestic electricity transmission grid. It is also encouraging to see that similar reforms are either under way or being planned in other countries in the region. This, with increased political consensus among the countries on the need to encourage regional integration in general, and regional energy trade in particular, should bode well for development of regional energy trade.

Chapter 1 INTRODUCTION

1.1 Context

This report seeks to review the potential and prospects for regional trade in the electricity sector in the South Asia Region (SAR), which -- for the purpose of the report -- includes Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka¹. Geographically, the region is bordered by the Himalayas in the north, the Baluchistan desert on the west, and a chain of mountains toward Myanmar on the east. Politically, the region borders with Iran and the three Central Asian States – Turkmenistan, Uzbekistan, and Tajikistan – on the west, with China on the north, and with Myanmar on the east.

India accounts for about 75% of the population and 64% of land area of the region and shares common borders with all other countries in the region, except Afghanistan. Bangladesh, India and Pakistan make up 95% of the region's population and GDP.

With a population of nearly 1.5 billion people (or about 23% of the world population), the region's combined GDP amounted to US\$996 billion in 2005 (or less than 3% of the world GDP). Though the region faced low rates of economic growth from 1950 to the late 1980s, largely on account of the pursuit of inward looking import substitution strategies, it is experiencing dynamic growth rates averaging 5.5% a year during the last two decades. Outward looking, export oriented reforms and liberalized trade, exchange rate and investment regimes have accelerated growth rates (especially in the services sector) in the recent years and in 2005 the region registered a GDP growth rate of 8.1%. It is now one of the fastest growing regions in the world, with India targeting annual growth rates of 10% and with the growth rates of Bangladesh and Pakistan exceeding 7%. Such buoyancy in growth is expected to continue through 2015, leading, inter alia, to the halving of the regional poverty levels.

Such economic growth was driven by global rather than regional economic integration. Adverse factors such as long standing dispute over Kashmir between India and Pakistan, internal political instabilities in Afghanistan, Nepal and Sri Lanka, and other political problems had overshadowed favorable factors such as geographic contiguity and shared languages, culture and history of the countries in the region, and inhibited the growth of regional trade.² Such a lack of regional trade is much more conspicuous in the networked energy sub-sectors (such as electricity and natural gas) since the necessary prerequisites such as electrical interconnections and natural gas pipelines across borders are practically non-existent or are limited only to a few instances. The situation of energy trade between the region and its immediate neighbors is not very different from that of the intra regional trade.

¹ Maldives, which also belongs in the SAR group of countries, is not considered in this report, given its geographic position which rules out electricity interconnections with other countries.

² The intra-regional trade in South Asia was only about 2% of its GDP compared to more than 20% in East Asia in 2005

Per capita income (based on World Bank Atlas methodology) in the region was still less than \$700 in 2005 and lack of investment resources and institutional constraints have resulted in supply constrained energy systems.³ In order to sustain dynamic growth rates in the medium to long term, growth has to be broad-based covering industrial production and productivity, and for this, lack of adequate infrastructure especially in the energy sector is proving a significant constraint.⁴

Securing adequate energy supply, thus, is one of the most important challenges facing most of the SAR countries, increasingly so, as their own significantly increasing energy demand growth is matched by neighboring countries such as China. While an adequate supply of coal and oil requires active participation in the *global* coal and oil markets, *regional* energy trade, especially in electricity and natural gas, is an important untapped resource which could be exploited to ensure energy security of the energy importing countries or add to economic development of those with energy export potential, offering win-win opportunities for all countries involved.

There are pronounced differences in energy resource endowments and energy consumption needs among the countries of the region and its neighbors. Nepal and Bhutan have hydropower potential far in excess of their domestic needs. Bangladesh and Myanmar are considered to have substantial reserves of natural gas which could be exported either as fuel and/or developed to generate electric power for export. India, Pakistan and to some extent Bangladesh provide major electricity and gas markets with considerable and growing demand. Further to the west and north, Iran holds significant oil and gas reserves, as do the Central Asian Republics-- Turkmenistan (gas), Uzbekistan (oil and gas) and Kazakhstan (coal, oil and gas). Tajikistan and the Kyrgyz Republic have large untapped hydropower resources relative to their needs, which could potentially be developed into competitive regional power plants. From the point of view of the energy resource endowments and energy markets, *prima facie* there appears to be a significant potential for electricity and gas trade within the region and with its neighbors on the east and the west.

The governments in the region are becoming increasingly aware of this potential and the win-win opportunities it offers. Modest bilateral electricity trade had been taking place between Nepal and India, Iran and Pakistan, and Afghanistan and its Central Asian neighbors as well as Iran. India had financed three medium to large hydro power projects in Bhutan, dedicated for power exports to India. Pakistan and Afghanistan are actively pursuing the possibility of importing 1000 MW of power from Tajikistan and Kyrgyz Republic. Similar initiatives in respect of gas imports from Central Asia and Iran are being discussed. Regional energy trade is a priority item in the Economic Cooperation Organization (ECO), as evidenced by the discussions in a number of regional meetings⁵.

³ For example Pakistan, Bangladesh and Russia have comparable populations while the power generation capacity of Pakistan at about 19,000 MW is about 10% of that of Russia. The generation capacity of Bangladesh at 5,500 MW is less than 3% of that of Russia.

⁴ Business surveys indicate that most responding firms have identified poor energy services as the most significant business constraint.

⁵ ECO (Economic Cooperation Organization) was created in 1985, first including Iran, Turkey, and Pakistan. The other seven members-- Afghanistan, Azerbaijan, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan -- were added in 1992.

Similarly, energy trade within South Asia has been highlighted during the annual summit meetings of the South Asian Association for Regional Cooperation (SAARC) and related bilateral and regional meetings.⁶ In 2004 the seven countries agreed to create a South Asia Free Trade Area (SAFTA), which actually came into existence on January 1, 2006. SAFTA aims to reduce tariffs and other trade barriers to promote regional trade among member countries. Energy ministers representing SAARC countries have endorsed the concept that regional energy trade is a key element in ensuring energy security. The region appears to be poised for exploiting the latent energy trade potential.

1.2 Objectives and Scope

In this context, the present study of the potential and prospects for energy trade in the region is considered timely. Its objective is to highlight the opportunities for increasing cross-border energy trade, examine the factors which have inhibited such trade so far, take note of the emerging factors in the region which are conducive to such trade and identify the conditions that are necessary for increased regional cooperation in energy trade and investment.

The report is essentially a desk study, based on the readily available materials produced by the Bank and other aid agencies in the course of their operations. Its main focus is on electricity trade but it also deals briefly with natural gas trade by pipeline, which, in addition to being a relevant element of regional energy trade in its own right, holds particular significance in conjunction with electricity trade, given the trade-off between transporting natural gas and transmitting electricity generated using natural gas (Box.1.1)

Box 1.1: Electricity and Gas Transport Alternatives

Gas transport by pipeline is considered economic in relation to gas transport as LNG up to distances of about 3,500 km. Further, pipeline option confers greater supply security to the importer, since it is not easy for the exporter to shift the pipeline to some other country, which offers a better price. However the choice between import of gas by pipeline and import of electricity produced at the wellheads using gas is not always straightforward.

If at the importing end gas has multiple uses (such as electricity generation, industrial and domestic use, and fertilizer production, etc.) then clearly gas transport by pipeline is the only solution. If, however, at the importing end the only use for gas is for electricity generation, comparative studies indicate that generating gas at the well head and transmitting power through HVDC lines to load centers as far away as 1000 km to 5,000 km is less expensive than transporting gas to the load center and generating power at the load centers.⁷ This is especially true in respect of small gas fields located far away from the load centers.

The choice between the two options is influenced by gas prices, gas volumes for transport, the distances, and the various risks, including security. Gas pipelines have major economies of scale for carrying large volumes of energy. As a rule of thumb, gas pipelines tend to be more economic for distances greater than 1000 km and volumes above 5-10 bcm of gas. In a recent study entitled Study of Electricity Trade Potential in the Black Sea Region carried out for the Bank in 2006, consultants found that for distances of 1000 km and volumes below 5000 MW (about 7 bcm of gas/year) electricity transmission is more economic. For larger volumes such as 13,000 MW (or 16-18 bcm/year) gas pipelines are more economic even at distances of 500 km and became even more so for longer distances.

⁶ SAARC (South Asian Association for Regional Cooperation) includes Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka and, since 2005, also Afghanistan. The Islamabad Declaration of the SAARC Summit, states: "A study on creating a South Asia Energy Cooperation including the concept of an Energy Ring should be undertaken by the Working Group on Energy".

However in the South Asian energy trade environment cases requiring a choice of this kind are unlikely to arise. In India and Pakistan, there are severe shortages of both electricity and gas and gas is required for multiple uses. At least presently import of electricity options focus on low cost hydropower from Central Asia and India's neighbors such as Nepal, Bhutan and Myanmar. Hydropower imports confer also significant environmental advantages from the point of low carbon strategy. When thermal power imports develop from Central Asia to South Asia, they are most likely to be from low cost coal fired power stations of Kazakhstan and Kyrgyzstan and such power, in conjunction with the seasonal hydro power will enable Central Asia to supply "firm power" and improve their export value. India and Pakistan need import of *both gas and power*. They are thus following the strategy of importing LNG, piped gas, and electricity to minimize their energy demand –supply gap.

¹See Alessandro Clerici and Andrea Longhi, Competitive transmission systems as alternative to pipeline gas transport for electricity delivery, World Energy Council available at http://www.worldenergy.org/wec-geis/publications/default/tech_papers/17th_congress/2_2_08

The main report

- Reviews the resource base, existing sector status and current level of energy trade;
- Analyzes the factors inhibiting trade and emerging factors conducive to future trade in the potential importing, exporting and transit countries;
- Identifies and prioritizes emerging regional energy trade opportunities;
- Discusses the priority actions and initiatives which the governments need to take to promote regional trade; and
- Outlines the role of International Financial Institutions and the aid community in facilitating regional energy trade and related investments.

Country profiles for each of the seven countries in the region were prepared by the Bank staff on the basis of the reports and documents available in the Bank, reports produced by national institutions and authorities and also taking into account major studies and reports prepared by other IFIs and donors.⁸ Much of the information used in the main report is based on these country profiles.

⁸ For example see "Regional Electricity Export Potential in Central Asia," November 2004, of the ECA region of the Bank. It deals with export potential of the Central Asian Republics (Kazakhstan, Kyrgyz Republic, Tajikistan, and Uzbekistan) and analyzes electricity markets in the neighboring countries (Afghanistan, China, Iran, Pakistan, and Russia). Bank's other work, such as on the India-Nepal hydro power trade, has provided important inputs, as has the work performed by USAID (under the South Asia Regional Initiative-SARI), ADB, and IsDB, as well as by other bilateral and multilateral agencies involved in the region's energy sector (JBIC, DfID, EU).