

## 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 Lanka<sup>1</sup>. 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.<sup>2</sup> 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.

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<sup>1</sup> 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.

<sup>2</sup> 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.<sup>3</sup> 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.<sup>4</sup>

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 meetings<sup>5</sup>.

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<sup>3</sup> 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.

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

<sup>5</sup> 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.<sup>6</sup> 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.<sup>7</sup> 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.

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<sup>6</sup> 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.

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<sup>1</sup>See 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](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.<sup>8</sup> Much of the information used in the main report is based on these country profiles.

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<sup>8</sup> 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).