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SOUTH ASIA REGIONAL INITIATIVE FOR ENERGY COOPERATION AND DEVELOPMENT

ASSESSMENT OF ECONOMIC AND SOCIAL BENEFITS OF POWER TRADE BETWEEN INDIA AND PAKISTAN

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Acronyms

BOO	Build-Own-Operate
BOOT	Build-Own-Operate-Transfer
CASAC	Coalition for Action on South Asian Cooperation
CEA	Central Electricity Authority
ckm	circuit kilometers
CPD	Centre for Policy Studies
CRISIL	Credit Rating Information Services of India Ltd.
DISCOMs	Distribution Companies
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GENCOs	Generation Companies
HDI	Human Development Index
HVDC	High Voltage Direct Current
IA	Implementation Agreement
ICRA	Investment Information and Credit Rating Agency
IMF	International Monetary Fund
IOC	Indian Oil Corporation
IPPs	Independent Power Producers
JBIC	Japan Bank for International Cooperation
KESC	Karachi Electric Supply Company
kgoe	kilogram of oil equivalent
kW/ha	kilowatts per hectare
mkWh	million kilowatt hours
mmscm/d	million standard cubic meters per day
mt	metric tons
NATO	North Atlantic Treaty Organization
NEPRA	National Electric Power Regulatory Authority
NGC	National Grid Company, U.K.
NHPC	National Hydroelectric Power Corporation
NOC	Nepal Oil Corporation
NTDC	National Transmission and Dispatch Company
NTPC	National Thermal Power Corporation
PEPCO	Pakistan Electric Power Company
PFC	Power Finance Corporation
PGCIL	Power Grid Corporation of India Ltd.
PLF	Plant Load Factor
PPA	Power Purchase Agreement
PPC	Private Power Cell
PPIB	Private Power and Infrastructure Board
PSDEF	Private Sector Energy Development Fund
SAARC	South Asian Association for Regional Cooperation
SACEP	South Asian Centre for Policy Studies
SAFTA	South Asia Preferential Trade Association
SEBs	State Electricity Boards

SEPCO	Solar Electric Power Company
SERC	State Electricity Regulatory Commission
toe	tons of oil equivalent
UNDP	United Nations Development Program
WAPDA	Water and Power Development Authority
WIDER	World Institute for Development Economics Research
WUL	Water Use License

Executive Summary

This provides an assessment of the economic and social benefits of cross-border power trade between India and Pakistan. It also analyses the power sector reform initiatives of both countries as these directly affect the power sector's viability. Despite having large hydropower potential and coal reserves, both India and Pakistan continue to import hydrocarbon fuels in significant volumes. Petroleum products and other forms of hydrocarbons constitute 10-15% of their total imports in monetary terms, and sharp fluctuations in international oil prices severely impact their economies. Power shortages affect their industrial and agriculture production and adversely impact employment. The result is a lower than normal Human Development Index (HDI)[1] and a higher level of poverty. Availability of quality power at an affordable price, through cross-border power trading, would address a number of these critical problems.

Given the relative sizes of their economies, benefits have been assessed for Pakistan as a whole and for those parts of India that are likely to reap the benefits of cross-border power trade (essentially, the states close to the India-Pakistan border).

To assess the full scope of potential benefits, if Pakistan were to sell 3,000 MW of power to India, it could not only earn an annual net profit of US$ 160 million at a selling price of Indian Rs 2.86/unit (after deducting fixed and transmission costs) but also gain an additional US$ 300 million through a parallel 10% decrease in defense expenditure, due to improved relations with India. Thus, the direct savings to Pakistan would be on the order of US$ 460 million a year. India also would benefit from gaining access to lower cost power and improved system reliability. The major benefits that would accrue to the two countries are summarized in the following paragraphs.

EDUCATIONAL IMPACTS – PAKISTAN

Extension of Educational Services

Even if Pakistan were to spend only half of the aforementioned US$ 460 million on education, it could radically transform its educational sector. By spending these funds on primary education, an estimated 27,600 new schools could be built. With 200 students in each school, 5.52 million more children could be enrolled annually. Assigning five teachers to each school would employ 138,000 new teachers and constructing new buildings would employ thousands of skilled and unskilled workers from economically depressed rural areas.

Improved Quality of Instruction

Using its savings to install basic infrastructure would also improve teacher attendance in rural schools and colleges, and end the local "ghost school" phenomenon. As a result, the current school dropout rate of about 40% would likely decline significantly.

[1] Human Development is the process of enlarging people's choices. Enlarging people's choices is achieved through expansion of human capabilities and functioning. At all levels of development, the three essential capabilities for human development are for people to lead long and healthy lives, to be knowledgeable, and to have a decent standard of living. But the realm of human development goes further: Essential areas of choice, highly valued by people, range from political, economic, and social opportunities for being creative and productive to enjoying self-respect, empowerment, and a sense of belonging to a community. The United Nations (UN) has set up an office to measure and monitor a number of indices, such as longevity, the spread and scope of health and educational facilities and their acceptability, and observance of human rights, and it compiles these parameters on an inter-country comparable scale called the Human Development Index (HDI).

Positive Change in the Learning Environment

If US$ 115 million of the savings were allocated to higher education, Pakistan could double its current spending in this sub-sector. That additional funding would give it the flexibility to expand instruction in certain fields, attract more qualified teachers by offering better working conditions, provide better teaching facilities, and improve educational quality and standards.

HEALTH-RELATED BENEFITS – PAKISTAN

As an alternative option, assuming that US$ 230 million (half of the US$ 460 million) were allocated to the health sector, Pakistan would cover the entire cost of the health ministry's immunization and development budgets. Pakistan currently spends US$ 32 million on immunizations (covering about 70% of the child population) and US$ 142 million on development. An addition of only US$ 14 million would provide 100% child immunization. After covering 100% child immunization at US$ 46 million, the remaining US$ 184 million could be used to expand health care services, improve delivery of services, and add more beds and hospitals. Given Pakistan's 2003-04 federal health budget of U$ 533 million; this US$ 230 million contribution would constitute 43% of the national health budget.

ACCESSIBILITY

Electrification of rural areas along the border would bring about significant changes in poverty and related regional social profiles. Removing regional disparities through electrification helps reduce social stress and energizes the entire socioeconomic process. Rural electrification helps create cottage industries and product markets. It also stimulates the growth of better communications and transport services to cater to these markets, leading to more interaction between villagers and urban dwellers. New relationships develop indirectly within rural-urban and ethnic groups, contributing to the process of social integration.

POTENTIAL GAINS FROM ELIMINATION OF CROSS-SUBSIDIES

Most of India's state electricity boards incur huge losses every year. The total deficit of all state electricity boards in 2001-02 was Rs 2,483.70 billion [US$ 55.19 billion] (with subsidy) and Rs 3,317.70 billion [US$ 73.72 billion] (without subsidy). Power purchases from other countries would put pressure on the government to devise mechanisms to reduce across-the-board subsidies, enabling it to provide subsidies only to the most deserving segments of society. For India, reduction and eventual elimination of such subsidies would be one of the greatest benefits of cross-border power trade. Given India's higher electricity tariffs, Pakistani utilities would benefit from substantial markups (30% to 80%) by exporting power to nearby cities such as Delhi, where tariffs are 23% to 80% higher than in Pakistan. This higher tariff revenue could be used by Pakistan to fund many of its sector reallocations.

FROM INFORMAL TO FORMAL TRADE

The official or documented trade volume between India and Pakistan is Rs 476 million [US$ 10.57 million], well below 1% of Pakistan's total international trade. It is estimated that the Indo-Pak trade routed through third countries ranges between US$ 1 billion and US$ 1.5 billion, although no authentic sources for verification exist. Shifting this informal trade to formal channels would reduce negative stake holding and bring substantial customs revenue to the two governments.

Cross border trade in electricity could help promote Indo-Pakistan and other regional trade that now goes to extra-regional countries. For example, South Asian tea exports to Pakistan, the largest tea importer in the world (150 million kg), have been exceedingly low; only 13%

in 1998. South Asia is the largest and geographically the nearest possible tea producer for Pakistan. Kenya, despite its high tea prices has emerged as the most vital source of Pakistan's tea imports, securing over 60% of market share in 1998. If Pakistan had imported all its tea from South Asian countries, it could have easily forestalled the transfer of about US$ 110 million outside the region over a three-year period. Moreover, on a commodity like tea alone, Pakistan could save US$ 40-50 million a year.

POWER-INTENSIVE INDUSTRIES

Increasing the availability of reliable electricity to the industrial sector would encourage greater productive consumption of power and help speed the pace of economic development and prosperity. Ensuring higher availability of supply through cross-border power exchanges would help consumers in both countries meet their basic electricity needs and create an atmosphere of economic interdependence – which, in turn, would help create a friendly and congenial social and political environment. In essence, it would help resolve key issues such as the lack of confidence between the people of the two countries.

GDP IMPACT THROUGH AGRICULTURAL PRODUCTION

Electricity is a critical input for intensive agricultural production. Farmers in Indian states bordering Pakistan would benefit immensely from cross-border power trade. If power imports generate only a 1% increase in the output of goods and produce from these states, this increase could have a positive impact on both state and national gross domestic product (GDP). Even at below current market prices, a 1% increase in certain agricultural items could generate over Rs 17,904.46 million [US$ 397.87 million] (about 0.01% of the national GDP). If this produce were exported at only a 30% markup over the domestic price, it would equal almost 8% of the 2002-03 agricultural exports, which would have a significant impact on rural employment. With higher incomes, and access to electricity, the rural population would have greater purchasing power, increasing the demand for other manufactured products.

INVESTMENT CLIMATE

Cross-border energy sector investment and trading by India and Pakistan would send a very positive signal to multinational corporations and other investors. Pakistan would likely gain more than India in foreign direct investment percentages if their bilateral relations improve. There are two reasons for optimism. First, the current rate of foreign investment in Pakistan is very small and remains far below its potential due to domestic political and regional security factors that have discouraged investment. In the 1990s, Pakistan received US$ 2 billion to US$ 3 billion a year. Once it is internally stable and has better relations with India, this investment flow will likely increase substantially. Second, Pakistan’s oil and gas sector has already received relatively large investment and is likely to attract even more investors. Poor-quality energy infrastructure has been a major obstacle to its economic development. A study by Khatib and Munasighe (1992) estimated the cost of power shortages to India and Pakistan's industrial sectors to be 1.5% and 1.8% of GDP, respectively. It is estimated that the short-fall of every unit of required electricity, from any cause, results in an economic loss of five to ten times the cost of the electrical energy generated, due to wastage in labor, material, and loss of production.

CROSS-BORDER GAS TRADING

Power trading between the two countries would open up opportunities for trade in other forms of energy, such as trade in natural gas through a regional pipeline.

Section 1 Introduction

Although South Asia – and India and Pakistan in particular – has substantial indigenous energy resources, it continues to import energy form outside the region in significant amounts. Petroleum products and other forms of hydrocarbons constitute 10-15% of the region's total imports in monetary terms, and sharp fluctuations in international oil prices severely impact South Asian economies. Power shortages affect their industrial and agriculture production and adversely impact employment generation. The result is a low ranking on the Human Development Index (HDI) and a high level of poverty. Availability of quality power at an affordable price through cross-border power trading would address a number of these critical problems.

This study examines the scope for potential cross-border power trade between India and Pakistan and attempts to assess its economic and social benefits. It also analyzes power sector reforms in India and Pakistan, as these directly affect the sector's viability.

Section 2 Power Sector Reforms

2.1 SECTOR STATUS

Over the past decade, both India and Pakistan have initiated a series of reform measures to restructure their power sectors to make them commercially viable and financially self-sustaining. In the past few years, massive policy changes have been introduced to facilitate private participation, improve efficiency, and encourage competition in the power sector.

The vertically integrated power utilities in both the countries had diffused corporate structures and poor work cultures. Due to a lack of corporate governance and commercial independence, inefficient cost structures, exceptionally high system losses and pilferage, low collections, improper billing, and non-remunerative tariffs, these utilities became operationally inefficient and financially insolvent. Accordingly, public investment in power utilities declined sharply. Table 2-1 illustrates the transmission and distribution losses experienced by power utilities in India and Pakistan.

Table 2-1: Transmission and Distribution Losses [2]

Country	Transmission and Distribution Losses
India *	30.9%
Pakistan	23.6%

Note: *Transmission and distribution losses are those of state electricity boards in 1999-2000. Sources: Ministry of Finance, *Economic Survey, 2002-2003,* Government of India, 2003; Government of Pakistan, *Economic Survey 2002-03,* Finance Division, Economic Advisor's Wing, Islamabad, 2003.

In several cases, revenues of state-owned and state-run power utilities have been insufficient to cover additional investments after meeting operational and maintenance expenses. On occasion, these utilities have been unable to meet debt service obligations on time. Their precarious financial condition inhibited the addition of new generation capacity and limited their ability to maintain and augment their transmission and distribution systems. For instance, the financial health of the SEBs – the most vital power utilities in India – has been steadily deteriorating over the years. In 1999-2000, only seven out of the more than 30 SEBs in India had a positive rate of return.[3] Some of the main characteristics of the power utilities in India are listed in Tables 2-2 to 2-4.

The energy sector requires large inputs of physical, human, and financial resources for which there are competing demands from other economic sectors. The capital required for investment is a scarce commodity in both countries. Accordingly, power sector restructuring has become essential.

[2] System losses are both non-technical (pilferage and faulty metering and billing) and technical (low plant-load factors and other operational and technical inefficiencies). Transmission and distribution losses could be attributed to substantial energy sold at lower voltage, sparsely distributed loads over large rural areas, inadequate distribution system investment, improper billing, and high pilferage. Indiscriminate grid extension despite low load densities (measured by MW demand divided by the length of the transmission and distribution system) has resulted in efficiencies.

[3] Government of India, *Economic Survey 2001-2002,* Ministry of Finance, New Delhi.

Table 2-2: Restructuring and Policy Reforms in India

Major Issues	Policy Interventions
▪ Deteriorating demand-supply balance ▪ Adverse economic impact ▪ No finances available to bridge gap ▪ Large-scale SEB insolvency ▪ Huge financial burden on generating units (particularly in the central sector) ▪ Distortion caused by cross-subsidies ▪ Deteriorating electricity supply quality and reliability	▪ Encourage private investment in power generation (the most capital-intensive area) ▪ Remove regulatory functions from the government and vest them in independent regulatory commissions ▪ Unbundle components of vertically integrated units and separate them into distinct functional units ▪ Corporatize various units by vesting them in companies incorporated under the Companies Act, 1956 ▪ Reform tariffs ▪ Encourage private sector participation, wherever states considered it to be advantageous ▪ Establish electricity regulatory commissions at both the central and state levels for rationalizing tariffs and associated issues ▪ Implementation of the Electricity Act, 2003

Table 2-3: Principal Components of India's Reform Strategy

Reform Strategy Components	*Key Components of the Electricity Act, 2003*
▪ Reduce constraints on foreign equity participation, simplify licensing and approval procedures, and make rate of return for investments more attractive ▪ Allow foreign investment, both as a joint venture or as a fully owned operation with 100% foreign equity in thermal, hydro, wind, or solar energy without any limitation as to size ▪ Allow Reserve Bank of India (RBI) to automatically approve up to 74% foreign equity participation in generation and transmission ▪ Permit automatic approval of up to 100% foreign equity participation for electricity generation, transmission, and distribution (not to exceed Rs 15 billion [US$ 0.33 billion]) ▪ Allow private sector companies to operate as licensees distributing power in a licensed area using either their own generation or purchased power ▪ Allow captive industrial power plants to sell or distribute surplus power to SEBs ▪ Allow private companies a debt equity ratio of up to 4:1 (i.e., the equity component should be at least 20% of the total outlay. Establish promoter contributions of at least 11% of the total outlay and limit Indian public financial institutions to a maximum 40% of the total outlay ▪ Grant licenses for longer durations (30 years to begin with) ▪ Allow free imports of capital goods under mega-power policy (over1,000 MW) ▪ Launch the reform program first in power distribution; then introduce a nationwide program– the Accelerated Power Development Reforms Program – in the next three to five years to strengthen the sub-transmission and distribution network. Ministry of Power to assist the SEBs/utilities by providing financial assistance to improve distribution infrastructure, reduce technical and commercial losses, increase revenue realization, and ensure reliable quality power supply to consumers. Renew emphasis is on metering ▪ Create India Power Fund, with a corpus of US$1 billion, managed by Power Finance Corporation (PFC). This fund will be tapped to inject equity and debt into power projects	▪ Ushers in an era of multiple buyers and sellers ▪ Major focus on completing rural electrification and transferring management of rural distribution to panchayats, cooperative societies, non-government organizations, franchisees, etc. ▪ Generation to be de-licensed and captive generation to be freely permitted, with the exception of hydro projects, which need approval of state governments and clearance from the Central Electricity Authority ▪ Central- and state-level transmission utilities to be government companies with responsibility for planned and coordinated transmission network development. Provision for private transmission licensees ▪ Open transmission access from the outset, with provision for surcharge to cover current cross-subsidies (surcharge to be gradually phased out) ▪ Distribution licensees to be free to undertake generation; generating companies to be free to undertake distribution ▪ State electricity regulatory commissions (SERCs) are mandatory ▪ Provision for license-free generation and distribution in rural areas ▪ Trading recognized as a distinct activity, with regulatory commissions authorized to set ceilings on trading margins, if necessary ▪ Metering of all electricity made mandatory ▪ More stringent provisions relating to electricity theft of electricity ▪ Consumer tariffs to progressively reduce cross-subsidies and move toward actual cost of supply

Table 2-4: Indian Power Sector Reforms in the States[4]

Reform Initiatives	Impact
▪ Twenty-five of 28 state governments have signed memorandums of understanding/agreement with the Government of India to undertake reforms within fixed time periods.	▪ Credit Rating Information Services of India (CRISIL) and Investment Information and Credit Rating Agency (ICRA) state ratings (on behalf of the Ministry of Power reform initiatives) focus on specific areas for improvement and action.
▪ Twenty-five states have constituted (or issued notices for the establishment of) SERCs, and 13 SERCs have issued tariff orders.	▪ Trend toward tariff rationalization is visible. Punjab has introduced a tariff on agricultural consumption. Madhya Pradesh has also restricted free supply to the small and marginal farmers of SC/ST category.
▪ Nine SEBs have engaged in unbundling and corporatization.	▪ Distribution has been privatized in Orissa and Delhi. Calcutta, Mumbai, and Ahmedabad already have private distributors. A number of states have enacted anti-theft legislations making penal provisions regarding theft of electricity stringent.
▪ Accelerated power Development Reforms Program allocations were increased to Rs 35 billion [US$ 0.77 billion] in 2002-03. Designed to assist reforms in the distribution sector. Target 63 distribution centers and develop them as centers of excellence.	▪ Objectives: 100% metering, energy audits, better high tension to low tension ratio, distribution transformer replacements, and information technology solutions relating to power flow at critical points to ensure accountability at all levels.
▪ The Electricity Act 2003 provides the legal framework for enabling reforms and restructuring of the power sector. It is intended to simplify administrative procedures by integrating the Indian Electricity Act,1910; the Electricity (Supply) Act, 1948; and the Electricity Regulatory Commission Act, 1998 into a single act. ▪ Facilitates evolution of competition (including private participation) by reducing regulatory and policy uncertainties.	▪ Open access to transmission networks for socially optimal generation; ▪ Independent regulator and tariff setting; ▪ Removing cross-subsidization for efficient resources allocation and for enabling competition across geographical territories; ▪ Development of interstate markets; ▪ Establishes rational organizational jurisdictions and operating terms and conditions; and ▪ Penalties for unauthorized use or theft of electricity.

2.1.1 Power Sector Reform Initiatives in India

India's power sector reforms have been initiated at both the central and state levels. Aside from establishing central and state regulatory commissions, the Electricity Act, 2003 has introduced fairly advanced and comprehensive policy changes. One of the crucial provisions of Electricity Act, 2003 provides non-discriminatory open access to interstate transmission systems in the country on payment of specified transmission charges for all distribution companies, traders, and generating companies. Open access is expected to facilitate competition in the industry, creating a favorable environment for the development of an electricity market. The Electricity Act 2003 provides for a transition from the established cost-plus regulatory regime to a new regime of lighter regulation. The changeover from intrusive regulation involving detailed scrutiny of actual costs to less intrusive regulation based on normative performance parameters is to be adopted by all interstate generating and transmission utilities.[5] In other words, Electricity Act, 2003 promises to usher in an era of multiple buyers and sellers.

2.1.2 Power Sector Reform Initiatives in Pakistan

Power sector reforms in Pakistan have focused on all critical aspects, including supply and demand management and institutional reforms (Tables 2-5 and 2-6). Pakistan examined the possibilities of privatizing and deregulating the power sector, which suffered from higher

4 Source: Government of India, *Economic Survey 2002-2003,* Ministry of Finance, New Delhi, 2003, p 183; *India Infrastructure Report 2002: Governance Issues for Commercialization,* Oxford, New Delhi, 2003, p 272.

5 Interview with A.K. Basu, Chairman, Central Electricity Regulatory Commission, India, *Hindustan Times, 13 January 2004.*

costs, financial constraints on funding power projects, and organizational and institutional inefficiencies in the Water and Power Development Authority (WAPDA) and Karachi Electric Supply Company (KESC).[6] Until the early 1980s, the major focus of power sector reforms was on expanding generation capacity and improving the technical, administrative, and economic efficiency of the existing power system.

Table 2-5: Restructuring and Policy Reforms in Pakistan

Major Issues/Objectives	Policy Interventions
▪ Inadequacy of funds for the development work and ambivalent attitude towards the private sector involvements in the power sector; wide fluctuations in public investment in the energy sector ▪ Targets set in various plans could not be achieved ▪ Increasing dependence on imported energy ▪ Lack of coherent pricing policy ▪ Poor quality and reliability ▪ Prolonged supply interruptions, load-shedding, high plant unavailability, huge losses and pilferage, protracted delays in project implementation, distortions in tariff structure, leakage and delays in revenue collection, apathy towards consumers, and an organizational culture permeated by bureaucratic inertia and corruption	▪ Power Sector Strategic Plan –1992 ▪ Private Power Policy Framework –1994 ▪ Hydropower Policy Framework –1995 ▪ Policy for New Private Independent Power Projects – 1998 ▪ Policy for Power Generation Projects – 2002 ▪ National Electric Power Regulatory Authority (NEPRA) –1997 ▪ Restructuring of two vertically integrated public utilities (i.e., the power wing of Water and Power Development Authority (WAPDA) and the Karachi Electric Supply Company [KESC]) –1998 ▪ WAPDA has prepared a Hydropower Development Plan Vision 2025

Source: Government of Pakistan, *Economic Survey, Various Issues,* Finance Division, Economic Advisor's Wing, Islamabad.

Table 2-6: Principal Components of Reform Strategy in Pakistan

Electricity Production Declared to be an Industry – 1990s Reforms
▪ National Electric Power Regulatory Authority (NEPRA) established ▪ License for electricity generation, transmission, and distribution ▪ Procedures and standards for investment, performance, uniform industry standards, and code of conduct ▪ Tariff, rates, charges, and other terms and conditions for electricity supply by generation, transmission and distribution companies ▪ Power wing of WAPDA restructured in 1998 under Pakistan Electric Power Company Ltd. (PEPCO), with 12 independent power units – 3 thermal generation companies (GENCOs); 1 transmission company (National Transmission and Dispatch Company [NTDC]); and 8 distribution companies (DISCOMs) ▪ Policy Framework and Package of Incentives for Private Sector Power Generation Projects (1994) provides for internationally competitive rates for purchase of electricity where capacity payments at the load factor of 60% were ensured, local currency investment requirements reduced, and procedures simplified ▪ Incentives include incorporation of fuel price as a pass through item, tax cuts, import subsidies, and foreign exchange risk insurance ▪ One-window Private Power Cell (PPC) was established ▪ Private Sector Energy Development Fund (PSDEF) was created with financial assistance from the World Bank ▪ Private Power and Infrastructure Board (PPIB) to provide a one-window facility to the investors ▪ Privatization Commission is processing the sale of KESC and privatization of WAPDA GENCO-1 (Jamshoro Power Company); WAPDA's Hydropower Development Plan Vision 2025 ▪ Hydro projects in the private sector will be implemented on build-own-operate-transfer (BOOT) basis; thermal projects on either BOOT or build-own-operate (BOO) basis ▪ For projects above 50 MW, government will guarantee that terms and conditions of executed agreements (including payment terms) are maintained during the life of the agreements – Implementation Agreement (IA), Power Purchase Agreement (PPA), Fuel Supply Water Use License (WUL)

Source: Government of Pakistan, *Economic Survey, Various Issues,* Finance Division, Economic Advisor's Wing, Islamabad.

6 Hilal A. Raza et al, *Pakistan Country Study on Regional Cooperation in the Energy Sector in South Asia*, CPD-CASAC Research Programme, Dhaka, 2003.

The privatization package introduced in 1994 was the main feature of power sector reforms in the 1990s. The main aim of the package was to develop public-private partnerships to allow the private sector to play a key role in the rapid development of the power sector.

The package provided maximum incentives for private investment in the power sector. Responding to these incentives, there was a surge in both domestic and foreign investment in the sector. However, following a change in the government, most of the private sector power generation projects were engulfed in controversy generated by allegations of corruption and kickbacks, resulting in termination or suspension of contracts with many independent power producers (IPPs). The IPP issues have now been resolved after lengthy negotiations.

Following the declaration of electricity production as an industry in the early 1990s, the government announced generous incentives for private investors, including tax holidays and duty-free import of electrical plants and machinery, etc. In addition, a minimum load factor was assured. These incentives led to private-sector interest in power generation, and as a consequence the first large oil-fired power station (1,292 MW) was approved for construction in Hub.

In March 1994, the government devised a Policy Framework and Package of Incentives for Private Sector Power Generation Projects in Pakistan; the main features of this policy included internationally competitive rates for electricity purchases where capacity payments at the load factor of 60% were ensured, reduced local currency investment requirements, and simplified procedures. A favorable environment for private investment was created through a combination of fiscal incentives and institutional support. Among the many private-sector incentives were the incorporation of fuel price as a pass-through item, tax cuts, import subsidies, and foreign exchange risk insurance. In addition, to avoid bureaucratic delays, a "one-window" Private Power Cell (PPC) was established. To help the private investors meet their borrowing needs, a Private Sector Energy Development Fund (PSDEF) was created with financial assistance from the World Bank. These measures were complemented by the establishment of a regulatory body in the power sector, the National Electric Power Regulatory Authority (NEPRA) under the Regulation of Generation, Transmission and Distribution of Electric Power Regulation Act, 1997 (NEPRA Act). NEPRA is designed to act as an overseer and regulator of electricity generation, transmission, and distribution within the power sector.

The need for institutional reforms in WAPDA and KESC, though long felt, became more apparent with the initiation of the privatization process. To address WAPDA's structural inefficiencies, the government launched a medium-term reform program aimed at establishing a financially viable and efficiently run electric power system. This included breaking up WAPDA's power wing into 12 autonomous entities for power generation, transmission, and distribution. The 12 companies included 8 distribution companies (DISCOs), 3 power generation companies (GENCOs), and a single national transmission company with independent management (Pakistan Electric Power Company [PEPCO]). PEPCO was established to assist the new companies to autonomously conduct the business activities of the former WAPDA power wing.

Despite these measures, WAPDA remains financially fragile for various reasons. First, although bill collection from private consumers had markedly improved, collection from government agencies including KESC was still a serious problem, which, in recent years, has largely been resolved. Second, the theft and loss reduction campaign has led so far to a temporary fall in demand rather than a rise in cash collection. Third, operation and maintenance costs continue to be high. The liquidity crunch faced by WAPDA not only led to a buildup of arrears on some of its payables, including payments to contractors and debt

servicing, but it also necessitated a cut in development expenditure. The government is currently striving to improve WAPDA's financial health through a series of measures including streamlining bill collection, reducing power theft, and rationalizing power tariffs.

The government has continued WAPDA reforms in an effort to create a corporate-like entity. The following steps have been completed:

- Transferring staff in basic pay scales (BPS) 1-16 from WAPDA to the GENCOs, the National Transmission and Dispatch Company (NTDC), and the DISCOMs;
- Issuing valid NEPRA operating licenses to DISCOMs (April 2002), GENCOs (June 2002), and NTDC (December 2002); and
- Approving principles of supplementary business transfer agreements, providing for transfer of assets, liabilities, and other rights and obligations from WAPDA to GENCOs, DISCOMs, NTDC, and the residual WAPDA.

A financial improvement plan set out the measures needed for WAPDA to become financially viable. This included tariff and non-tariff adjustments, which would enable WAPDA to achieve an overall debt/service coverage ratio of 1.2 by the end of 2002-03. Under this plan, NEPRA imposed a tariff increase of Rs 0.045 per kW hour (kWh) due to fuel adjustment costs at the end of March 2002. An interim structural tariff increase of Rs 0.08/kWh was announced on May 15, 2002, and an additional structural tariff increase of Rs 0.40/kWh was imposed in July 2002 (subsequently revised to Rs 0.33/kWh on August 13, 2002). In December 2002, NEPRA approved a reduction in electricity tariffs of about Rs 0.13/kWh (under the automatic fuel cost adjustment formula), to reflect the decline in fuel costs during the first half of 2002-03.

This financial plan has not been successful as the overall increase in electricity tariffs in 2002-03 was substantially lower than the agreed level under the plan, and WAPDA's existing debt and poor collection rates continue to be problematic.

The government's *Policy for Power Generation Projects for 2002* reflects a new reform agenda. The main objectives of this policy are:

- Providing sufficient power generation capacity at least cost (to prevent capacity shortfalls);
- Encouraging and ensuring exploitation of indigenous resources (renewable energy resources, human resources) including participation by local engineering and manufacturing firms;
- Ensuring that all stakeholders are looked after in the process; and safeguarding the environment.

WAPDA has produced the *Hydropower Development Plan Vision 2025 (Vision 2025)*, which recommends a consolidated list of potential projects to be implemented in the short, medium, and long term. Hydro projects in the private sector will be implemented on a build-own-operate-transfer (BOOT) basis. Private thermal projects will be established on either a BOOT or build-own-operate (BOO) basis (to be determined case-by-case). BOOT projects are to be transferred to the government at the end of their concession periods. For projects above 50 MW, the government will guarantee that the terms and conditions of executed agreements (including payment terms) are maintained for the life of the agreements. These agreements include the Implementation Agreement (IA), Power Purchase Agreement (PPA), and Fuel Supply Water Use License (WUL). Power companies will be allowed to import plants and equipment not manufactured locally (for hydro, thermal, and renewable energy projects) at concessionary rates and income tax exemption will be available for all companies except those operating oil-fired power plants. To promote indigenization, the local engineering

industry will be encouraged to form joint ventures with foreign companies to develop power projects with a cumulative capacity of at least 2000 MW by the year 2015.

2.2 REFORMS–EMERGING GAINS

The impact of reform in India can be seen very distinctly in several major operational areas. For instance, the plant load factor (PLF), an important measurement of the operational efficiency of thermal power plants, has improved significantly – from 64.7% in 1997-98 to 71.1% in 2002-03 – indicating a steady improvement in the generation efficiency of the overall system (Table 2-7) and increased installed capacity in the private sector (Table 2-8).

Table 2-7: India – Thermal Plant Load Factor (%)

Sector/Region	1997-98	1998-99	1999-2000	2000-01	2001-02	2002-03*
State Electricity Board	60.9	60.7	64.3	64.3	67.0	67.5
Central Sector	70.4	71.1	72.5	72.2	74.3	75.7
Private Sector	71.2	68.3	68.9	76.4	74.7	82.0
Region						
Northern	66.7	67.2	71.0	72.0	75.1	74.8
Western	70.3	70.5	72.3	72.1	74.2	75.2
Southern	77.1	75.4	79.6	79.7	82.3	84.6
Eastern	43.0	44.3	46.1	47.0	48.7	50.6
North-eastern	21.3	18.7	18.3	18.2	16.8	14.4
All India	64.7	64.6	67.3	67.7	69.9	71.1

Source: Government of India, *Economic Survey 2002-2003,* Ministry of Finance, New Delhi, 2003, p 181.

Table 2-8: India – Installed Capacity in Private Sector (000 MW)

Installed Capacity	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000
Total Installed Capacity	66.08	69.06	72.33	76.75	81.17	83.29	85.79	89.10	93.24	97.83
Private Sector Contribution	2.74	2.91	2.90	3.02	3.54	3.87	5.01	6.25		
% Share of Private Sector	4.14	4.21	4.00	3.93	4.36	4.64	5.83	7.01		

Source: *India Infrastructure Report 2002: Governance Issues for Commercialization,* Oxford, New Delhi, 2003, p 338.

As result of a range of reform measures there is perceptible change in power supply ownership in the both India and Pakistan (Table 2-9).

Table 2-9: India and Pakistan – Private Sector Participation in the Post-Reform Period[7]

Country	Activity	Installed Capacity (MW)	% of Total Installed Capacity
India	IPPs	6250*	7.01*
Pakistan	16 IPPs	6007**	45.54

* This figure is for 1997-98. An addition of 5,061 MW was made by the private sector in the installed capacity of 19,015 MW during the Ninth Plan 1997-2002. ** Both hydro (30 MW) and thermal (6,977 MW). Sources: Planning Commission, *Tenth Five Year Plan (2002-2007),* New Delhi, p 901. WAPDA, *Power System Statistics*, February 2003.

6 The capacity addition of 19,015 MW in India during the Ninth Plan represents 47% of the targeted addition. In contrast, capacity additions during the Eighth Plan were 54% of the target (16,422 MW versus 30,538 MW). The shortfalls during the Ninth Plan were central sector 62.2%, state sector 12.1%, and private sector 71.2%. Planning Commission, *Tenth Five Year Plan (2002-2007),* New Delhi, p 901.

Despite the fact that power utilities in Pakistan have been trying to improve performance, much remains to be done. In Pakistan, improvements in thermal power plant maintenance and operational procedures, coupled with the adoption of higher voltage for long-distance transmission and construction of 500 kV and 220 kV lines helped reduce auxiliary consumption levels as well as transmission losses. In addition, WAPDA launched a drive against non-technical losses in the distribution network, amending laws to facilitate easier prosecution of those who pilfer electricity as well as making punishment more severe. As a result of these measures, total power losses in the WAPDA system, including station use and transmission and distribution losses declined from 37.6% in 1987 to 25.6% in 2003. WAPDA is continuing its efforts to improve operational and management efficiency to further reduce power losses and thefts (Table 2-10).

Table 2-10: Growth Rates of Power Generation, Sold and Losses (in GWh)

Units	1970-80	1980-1990	1990-2000	2000-02	1970-2002
Generation	8.91	9.99	6.00	4.01	8.02
Sent out	9.05	10.02	5.98	3.99	8.06
Sold	8.53	11.45	5.43	5.12	8.23
System losses	10.32	6.11	7.79	0.67	7.58
Total losses	9.76	6.31	7.71	1.00	7.47
System loss (% of generation)	30.71	25.00	23.05	23.67	27.46
Total loss (% of generation)	33.92	27.91	25.17	25.75	29.19

Note: Total loss includes system losses and auxiliary consumption.

Section 3 Power Trading Gains

3.1 DIRECT BENEFITS

Unlike other South Asian countries where traditional sources of energy (e.g., firewood, animal dung, crop residues, etc.) are still the only or major energy sources for the larger populace, India and Pakistan have steadily reduced their use of traditional energy. Currently, both countries derive over 60% of their energy from commercial sources (Table 3-1). On one hand, this trend suggests that an environmental conservation cushion has been created by more efficient use of energy resources; on the other, it represents significant economic and energy security challenges with respect to managing and sustaining these sources.

Table 3-1: Composition of Energy Supply (%)

Sources	India	Pakistan
Conventional	33	36
Oil and coal	39	34
Natural Gas	1	23
Hydropower	27	7
Total	100	100

Sources: Government of India, *Economic Survey, 1997-98,* Ministry of Finance, New Delhi and Government of Pakistan, *Eighth Five-Year Plan (1993-98),* Planning Commission, June 1994.

This growing emphasis on commercial energy is supplemented by two major aspects of power sector reform: (1) steady and liberal encouragement to the private sector, mainly through independent power producers, and (2) private transmission agents and open access regulations. Under India's Electricity Act 2003, buyers and sellers of electricity anywhere in the system can in theory be brought together. These open access regulations enable generation and distribution companies, electricity traders, and captive plant owners to access transmission networks across the country for the purpose of transporting and selling electricity India-wide. These provisions could be extended to exchanging electricity with neighboring countries, signaling that India-Pakistan electricity trading could become a reality in the near future.

On the commercial energy front, India's and Pakistan's dependence on imported petroleum has been steadily increasing, leading to a massive outflow of precious foreign exchange (Table 3-2).[8] In fact, the steady increase in international crude oil prices over the past year has again underscored the need for alternatives, such gas- and hydro-based power plants.

Table 3-2: Petroleum-Related Imports as Percentage of Total Imports

Country	Year	Total Imports	Petroleum as % of Total Imports
India	2002-2003	US$61.412 billion	28.72
Pakistan	2001-2002	US$10.67 billion	27.19

Sources: Government of India, Economic Survey, 2003-2004, Ministry of Finance, New Delhi, p S-82; Government of Pakistan, Economic Survey, 2002-2003, Finance Division, Islamabad, p 90.

[8] Energy is mainly used for four distinct purposes: industry and agriculture; domestic and commerce; transportation; and electricity generation. Lama, Mahendra P., "Economic Reforms and Cross Border Power Trade in South Asia," *South Asian Survey, New Delhi* (January-June 2000).

Equally critical has been the skewed distribution of available energy within India. As shown in Table 3-3, regional distribution of natural reserves in India is very uneven, and this situation is compounded by the location of supply zones and demand centers. In a number of cases, it becomes more economic, as well as more efficient and reliable, to import power from neighboring countries rather than transport it within the country.

Table 3-3: India – Distribution of Energy Resources

Region	Coal (mt)	Lignite (mt)	Crude Oil (mt)	Natural Gas (mm^3)	Hydropower (TWH)
Northern	1.06	2.51	0.03	0.00	225.00
Western	56.90	1.87	519.47	516.42	31.40
Southern	15.46	30.38	45.84	80.94	61.80
Eastern	146.67	0	2.19	0.29	42.50
Northeastern	0.89	0	166.17	152.00	239.30
Total	220.98	34.76	733.70	749.65	600.00

Source: Tenth Five-Year Plan, Planning Commission, New Delhi, 2003.

3.1.1 Educational Impact

Social development in India and Pakistan has lagged behind other developing countries. On the Human Development Index, Pakistan and India stand at 142 and 127, respectively. While India has made it into the mid-level category of developing countries, Pakistan has slipped down to the lowest level, below Bangladesh, Nepal, Sudan, and Cameroon.[9] By all key indicators, India and Pakistan have relatively poor records, from infant mortality rates to educational enrollment and provision of health services. There could be a number of reasons for this, including confused priorities, development policy flaws, and poor implementation. However, resource constraints are the most obvious reason since, with more resources and better governance (including greater accountability and responsiveness to the needs of citizens), the situation could be improved. As well, within each country, there are numerous disparities in social development – regional, urban, rural, industrial, and agricultural, etc. The most remote and peripheral areas generally receive the least attention (Table 3-4).

Table 3-4: South Asia Educational Profiles

Country	Adult Literacy Rate 2001	Primary Enrollment Rate (Net) 1995-2001	Combined Enrollment Rate 2001	Public Expenditure on Education as % of GDP / Government Expenditure			
				GDP		Total Government Expenditure	
				1990	1998-2000	1990	1998-2000
Bangladesh	41	79	54	1.5	2.5	10.3	15.7
Bhutan	47	53	33	NA	5.2	N/A	12.9
India	58	89	56	3.9	4.1	12.2	12.7
Maldives	97	99	79	4.0	3.9	10.0	11.2
Nepal	43	66	64	2.0	3.7	8.5	14.1
Pakistan	44	46	36	2.6	1.8	7.4	7.8
Sri Lanka	92	97	63	2.6	3.1	8.1	N/A

Source: Social Development in Pakistan: Annual Review 2002-03, The State of Education, SPDC, Karachi, p 3.

Tables 3-5 and 3-6 summarize Pakistan's public spending on all sectors of education. Compared with the rest of South Asia, Pakistan spends only 1.7% of GDP on education, while India spends 4.1%. As a result, Pakistan has one of the lowest literacy rates in the

9 UNDP, *Human Development Report, 2004*, Oxford, New York, 2004.

region, the lowest school enrollment ratio, and one of the lowest rates for educational fund utilization. Over one-fourth of Pakistani children do not have access to schools. Enrollment of girls has increased – but 36% still have no school access. By world as well as South Asian standards, it is a dismal picture. Lack of resources is the real problem, particularly as the outflows on debt servicing and defense expenditure constitute the two largest items in the national budget each year. As a result, Pakistan has no spare funds to allocate to education.

Table 3-5: Primary Education in Pakistan – Planned Allocation vs. Expenditure, 1955-2003

Plan	Allocation for Primary Education (Rs Million)	Actual Expenditure on Primary Education (Rs Million)	Expenditure (As % of Allocation)
1955-60	51.4	21.2	41.0
1960-65	78.0	19.0	24.0
1965-70	68.5	25.0	36.5
1970-78	473.9	444.0	94.0
1978-83	3049.7	1413.1	46.3
1983-88	7000.0	3533.0	50.5
1988-93	10128.0	6399.2	63.0
1993-98	32669.0	23340.4	71.4
1998-03	69860.0	-	-

Source: Khawaja, Sarfraz & Khawaja Sabir Hussain (2003), "Critical Analysis of Universalization of Primary Education in Pakistan," *Academy of Educational Planning & Management*, Ministry of Education, Islamabad.

Table 3-6: Pakistan – Federal Investment in Education Sector, 2001-04 (Rs Million)

Subsector	2002	2003	2004
Elementary	3452	1051	1359
Secondary	211	589	319
College	95	116	268
Technical	485	130	457
Scholarships and miscellaneous	155	269	182
Literacy Program	350	294	363
Higher education (including local and foreign scholarships)	722	4286	4500
Madrassas reforms	N/A	225	200
Total	5470	6960	7648

Source: Government of Pakistan (2004). Federal PSDP (2003-04). Islamabad: The Planning Commission.

If Pakistan and India begin trading in electricity, what is the likely impact of this trade on education in Pakistan? There are three potential outcomes:

- Extension of educational services to more villages and rural areas;
- Improved quality of instruction; and
- Positive change in the learning environment.

3.1.1.1 Extension of Educational Services

To assess the full scope of potential benefits, consider the following scenario. If Pakistan were to sell 3,000 MW of power to India, it could not only earn an annual net profit of US$ 160 million (after deducting fixed and transmission costs as per the calculations given in Appendix B), but it would also gain an additional US$ 300 million through a parallel 10% decrease in defense expenditure. Even if it spends only half of this US$ 460 million on

education, Pakistan could radically transform its educational sector. By spending these new funds on primary education, an estimated 27,600 new schools could be built (at an average cost of US$ 8,330.) With 200 students in each school, 5.52 million more children could be enrolled.

The foregoing calculations assume that each school would cost US$ 6,000 to run. With more schools, employment opportunities would also increase significantly. Assigning five teachers to each school, 138,000 new teachers would be employed. Based on current costs in Pakistan, these estimates are very conservative. Construction of new buildings will employ thousands of skilled and unskilled workers from economically depressed rural communities. Investing in education, a sector that has long been neglected due to lack of funds, will have a positive impact on general literacy, social mobility, family planning, worker skills, and dissemination of new knowledge and technologies.

3.1.1.2 Improved Quality of Instruction

In the normal development sequence, and as demanded by Pakistan's own rural population, roads and electricity are key priorities. As the pattern of development in Pakistan and other South Asian countries demonstrates, power transmission and distribution lines and roads have generally followed each other. Installing this basic infrastructure would improve teacher attendance in rural schools and colleges, and end the local "ghost school" phenomenon. Aside from poor administrative controls and discipline, it is the long distances and lack of roads and transport services that deter teachers from going to schools and colleges. Having this infrastructure in place will encourage the local population to approach the bureaucracy administering the educational system to file complaints against absentee teachers. As a result, it is anticipated that the current school dropout rate of about 40% will decline significantly. It will help hundreds of thousands of students stay in schools and complete their education.

3.1.1.3 Positive Change in the Learning Environment

In 2003-04, the Higher Education Commission (formerly the University Grants Commission) was allocated US$ 220 million to operate 47 public sector universities and eight degree-awarding institutes. This amount included scholarships for students, instructor and employee salaries, maintenance, and new facility construction (university and institute income from other sources, such as donations, and student fees, was excluded). If half of the previously mentioned US$ 230 million were allocated to higher education, Pakistan could double its current spending in this sub-sector. That additional funding would give it the flexibility to expand instruction in certain fields, attract more qualified teachers by offering better working conditions, provide better teaching facilities, and improve the quality and standard of education.

3.1.2 Health-Related Benefits

Health is another social sector area that has not received much attention from policymakers. In Pakistan, most rural areas where peasants and farmers are engaged in agriculture do not have access to proper health services. Even though agriculture contributes 25% to the national GDP, basic rural health care is either unavailable or inadequate. The basic health units established in the 1980s generally lack qualified doctors. Poor farmers, peasants, and other village inhabitants resort to quack-healers who do more harm than good. The health budget as a percentage of GDP has remained static at about 7 to 8% for the past decade. Both the per capita and actual numbers of medical doctors, nurses, and available hospital beds have improved but are largely offset by the growth in population (Tables 3-7 and 3-8).

Table 3-7: Pakistan – Health Sector Profile

Year	Total Health Budget (Rs Million)	% of GDP	Population/Health Provider Ratios		
			People per Doctor	People per Nurse	People per Hospital Bed
1996	16,355	0.8	1689	5060	1417
1997	18,342	0.8	1636	4480	1428
1998	19,664	0.8	1590	3992	1450
1999	20,808	0.7	1578	3822	1492
2000	22,077	0.7	1529	3732	1495
2001	24,281	0.7	1516	3639	1490
2002	25,405	0.7	1466	3347	1517
2003	28,814	0.7	1404	3296	1536
2004	32,000	0.8	N/A	N/A	N/A

Source: Government of Pakistan (2004), *Economic Survey 2003-04*, Finance Division, Economic Advisors' Wing, Islamabad.

Table 3-8: Pakistan – Major Health Care Indicators

Year	Hospitals	Dispensaries	Basic Health Units (Health Subcenters)	Maternity and Child Health Centers	RHC	TB Centers	Total Beds	People per Bed	Registered Doctors	Nurses
1990	756	3795	4213	1050	459	220	72997	1480	52794	16948
1991	776	3993	4414	1057	465	219	75805	1461	56478	18150
1992	778	4095	4526	1055	470	228	76938	1476	60949	19389
1993	799	4206	4663	849	485	233	80047	1455	63908	20245
1994	822	4280	4902	853	496	242	84883	1406	67099	21419
1995	827	4253	4986	859	496	260	85805	1426	70602	22299
1996	858	4513	5143	853	505	262	88454	1417	75132	24776
1997	865	4523	5121	853	513	262	89929	1428	79368	28661
1998	872	4551	5155	852	514	263	90659	1450	83592	32938
1999	879	4583	5185	855	530	264	92174	1492	88014	35979
2000	876	4635	5171	856	531	274	93907	1495	92734	37623
2001	907	4625	5230	879	541	272	97945	1490	97156	40019
2002	906	4590	5308	862	550	285	98264	1517	102541	44520
2003	906	4554	5290	907	552	289	98654	1536	108062	46331

Source: Government of Pakistan (2004), *Economic Survey 2003-04,* Finance Division, Economic Advisors' Wing, Islamabad.

What are the reasons for this neglect? There are three reasons – poor administration, inadequate funds, and poor infrastructure services, including lack of electricity and roads.

As an alternative option, assuming that US$ 230 million (half of the US$ 460 million in power sale profits and defense savings) were allocated to the health sector, it would cover the entire cost of the health ministry's immunization and development budgets. Pakistan currently spends US$ 32 million on immunizations (covering about 70% of the child population) and US$ 142 million on development. An addition of only US$ 14 million would provide 100% child immunization. After covering immunization at US$ 32 million, the remaining US$ 198 million could be used to expand health care services, improve delivery of services, and add more beds and hospitals. The total federal health budget for 2003-04 was US$ 533 million. One can appreciate that the amount of US$ 230 million referred to above constitutes 43% of the total health budget.

3.1.3 Accessibility

In India, a significant portion of the society still does not have access to modern sources of energy – it is both physically inaccessible and unaffordable. At the same time "while generation has risen in recent years, end consumers of electricity continue to experience serious problems in terms of reliable access to electricity."[10] In Pakistan, the number of consumers has increased to 13 million (12.6 million general and 400,000 industrial and agricultural).[11] In India, the number of consumers has grown from 82 million in 1990 to more than 100 million (as of March 1998).[12]

In India, out of the estimated 80,000 villages yet to be electrified, the Tenth Plan proposes to electrify 62,000 villages through grid supply[13]. In addition to Jharkhand, Madhya Pradesh, Rajasthan, Uttar Pradesh, and Uttaranchal, most of these villages are concentrated in areas such as West Bengal, Arunachal Pradesh, and Meghalaya or the surrounding regions. Electrification of these areas would bring about significant changes in poverty and related social profiles. Removal of regional disparity through electrification helps reduce social stress and energizes the entire socioeconomic processes. Rural electrification helps create markets for products manufactured by small-scale industries, and it introduces better communications and transport services to cater to these markets, increasing interaction between villagers and urban dwellers. New relationships develop indirectly within rural-urban and ethnic groups, contributing to the process of social integration.

There are over120,000 villages in Pakistan; only about 73,807 of these were electrified by 2003. The government does plan to connect all villages to the national grid eventually. The country's economic slowdown in the late 1990s slowed the pace of village electrification. However, now that the government is planning to spend larger amounts on infrastructure development and maintenance throughout the country, the village electrification program might also get a boost, which will increase the total demand for electricity (Table 3-9).

Table 3-9: Pakistan – Number of Electrified Villages

Year	Cumulative Total*
1998	65951
1999	67183
2000	68292
2001	69887
2002	71561
2003	73807

*Including WAPDA and Federally Administered Tribal Areas and Provincially Administered Tribal Areas.
Source: *Power System Statistics* (26th, 27th, & 28th issue), Planning Department Power Wing (2001, 2003, & 2004).

10 Government of India, *Economic Survey 2003-2004,* Ministry of Finance, New Delhi, 2004 p 173.

11 The number of villages electrified stands at 73,063 as of March 2003. Government of Pakistan, *Economic Survey 2002-03,* Finance Division, Economic Advisor's Wing, Islamabad, 2003.

12 *Public Electricity Supply*, *All India Statistics 1997-98 General Review*, Central Electricity Authority.

13 The balance of 18,000 remote villages are proposed to be electrified by 2011-12 through the use of decentralized non-conventional sources of energy. The existing definition of an electrified village is: "a village will be deemed to be electrified if electricity is used in the inhabited locality within the revenue boundary of the village for any purpose whatsoever." The Tenth Plan document summarily mentions that "there is need to change this definition so as to declare a village as electrified only if a minimum number of households in that village are provided with electricity connections." According to the 1991 census, there are 587,000 villages of which 500,000 (86%) are declared to be electrified on the basis of the existing definition. However, available data shows that only 31% of rural households are electrified and, out of a total estimated 19.5 million electric irrigation pumpsets, only 12 million have actually been energized. Government of India, *Tenth Five Year Plan 2002-2007,* Planning Commission, New Delhi, p 914.

3.1.4 Alternative Market – Potential Gains from Elimination of Cross-Subsidies

In India, one of the major controversies that have emerged following the opening of the power sector to private investment is the losses to state exchequers created by state subsidies to various activities and groups. The issue of cross-subsidies funded by higher tariffs for industrial and commercial customers (who pay Rs 2.34 per kWh) to agricultural and domestic customers (who pay Rs 0.21 and Rs 0.91 per kWh, respectively) often comes up for discussion, particularly as the higher industrial and commercial tariffs generate 42% of the subsidy to agricultural and domestic users.[14]

Excluding subsidies, the losses incurred by the SEBs in India have increased rapidly throughout the 1990s. According to an estimate by the Planning Commission, in 2001-02 alone, the commercial loss (excluding subsidies) was approximately Rs 24,063 crore [US$ 5.34 billion]. This has severely impacted electric utility operations and impeded efforts to supply electricity to consumers on a reliable basis. State utilities have defaulted on payments to central public sector units, such as National Thermal Power Corporation (NTPC), Power Grid Corporation, National Hydroelectric Corporation (NHPC), Coal India Ltd., and Indian Railways, and have accumulated substantial arrears. The hidden agricultural and domestic gross subsidy increased from Rs 74.49 billion [US$ 1.65 billion] in 1991-92 to Rs 345.87 billion [US$ 7.68 billion] in 2001-02.

The basic problem faced by the power sector is the gap between user charges and the cost of supply. Despite reform efforts, the gap between the supply and the average tariff has actually worsened in recent years, rising from Rs 0.23 in 1992-93 to about Rs 1.10 in 2001-02. Revenues dropped from 82.2% of costs in 1992-93 to 68.6% in 2001-02 (Table 3-10).

Table 3-10: India – Recovery of Costs through Tariffs (Paisa)

Year	Average Cost/Unit	Average Tariff/Unit	% Recovery of Cost
1992-93	128.2	105.4	82.2
1993-94	149.1	116.7	78.3
1994-95	163.4	128.0	78.3
1995-96	179.6	139.0	77.4
1996-97	215.6	165.3	76.7
1997-98	239.7	180.3	75.2
1998-99	263.1	186.8	71.0
1999-2000	305.1	207.0	67.8
2000-01	327.3	226.3	69.1
2001-02	349.9	239.9	68.6

Source: Government of India, *Economic Survey 2002-2003,* Ministry of Finance, New Delhi, 2003, p 183.

In 2001-02, the percentage of unit cost of supply recovered through consumer tariffs was estimated to be 64.66% and the subsidy to sales revenue ratio was 43.3%. Most of the SEBs in India incur huge losses every year. The total deficit of all SEBs in 2001-02 was Rs 2,483.70 billion [US$ 55.19 billion] (with subsidy) and Rs 3,317.70 billion [US$ 73.72 million] (without subsidy). This suggests that, as of yet, SEB reforms have not yielded the desired results highlighting the need to focus on how the SEBs should function in the context of the reform process.[15]

The Indian Electricity Act 2003 clearly states that consumer tariffs should progressively eliminate cross-subsidies and move toward actual cost of supply. However, the National

[14] Kirit S Parikh (ed) India Development Report 1999-2000, Oxford, Delhi, p 115.

[15] Government of India, Economic Survey 2002-2003, Ministry of Finance, New Delhi, 2003, p 183.

Electricity Policy announced in February 2005 says otherwise. These contradictions must be resolved if the power sector is to become financially self-sustaining.

In Pakistan, tariffs are also at a comparatively low level, seriously distorting the efficient commercial management of the power sector (Table 3-11). While private sector participation broke the power generation monopoly of WAPDA and KESC, these organizations continued to monopolize control of the transmission and distribution network. Although the IPP's minimum purchase agreements protected their revenues, WAPDA and KESC were beset by mismanagement, operational losses, and power thefts, leading to a liquidity crisis that forced them to renegotiate their IPP contracts. At the same time, the IPPs demanded higher tariffs, due to costly thermal power generation. The ensuing power tariff disagreements between WAPDA and KESC and the IPPs were a serious setback for the privatization program.

Table 3-11: Pakistan – Schedule of Electricity Tariffs

Tariff Category/Particulars	Energy Charges (Rs/kWh)*
General Supply A-1	
Up to 50 units	0.61
For first 100 units	0.41
For next 200 units	0.58
For next 700 units	1.51
Above 1000 units	1.88
General Supply A-2	
For first 100 units	2.92
For next 200 units	3.16
For peak load requirement above 20 kV	1.09
Industrial Supply	
Up to 50 kW	1.30
41-500 kW	1.98
Bulk Supply	
400 volts up to 20kW	1.24
400 volts above 20kW up to 500 kW	1.09
All loads	1.04
Agricultural Tube Well	
SCARP	1.26
Punjab and Sindh	0.90
NWFP and Baluchistan	0.75

*Effective 21-11-2002. Source: Government of Pakistan, *Economic Survey 2002-03,* Finance Division, Economic Advisor's Wing, Islamabad, 2003.

The tussle between the government and IPPs intensified, resulting in cancellation of six IPP contracts on charges of technical inefficiency and corruption. Although these issues were finally resolved after lengthy negotiation, electricity pricing is clearly a crucial issue for both internal and external trading.

There are industrial and other services sector units along the India-Pakistan border that need a reliable supply of quality power and are willing to pay a higher price for this reliable power. If generating units could realize a better price in the cross-border market, part of the extra revenue could be used to subsidize poor consumers. This would change the pricing paradigm since generators will be selling at a higher price than the cost of generation, unlike the current situation. In view of the fact that there are social and political limits to increasing power costs in the domestic sector, cross-border power trading could provide a better option as far as electricity pricing is concerned.

In Pakistan, domestic and agricultural electricity subsidies and their impact on the management of public utilities has also been a major issue. Across the board, Pakistani tariff rates are found to be much lower than in many neighboring states in India. Table 3-12 indicates that tariff rates are 23% to 80% higher in Delhi than in Pakistan (even higher when the latest rates are taken into account). Pakistani utilities will, therefore, receive substantial markups ranging from 30% to 80% if they export power to the nearby city of Delhi. This higher tariff revenue could be used by Pakistan to fund many of its social sector reallocations.

Table 3-12: India and Pakistan – Tariff Differences and Advantages

Consumers	India* (Delhi) [a] (Paise/kWh)	Pakistan** [b] (Paise/kWh)	Price Difference (US$) [a]–[b] ($/kWh)	Difference in % [b] / [a]*100
Domestic				
0-120	150 (0.033)	61 (0.01)	0.023	70
101-200	210 (0.046)	58 (0.009)	0.037	80
201-400	300 (0.066)	151 (0.024)	0.042	63
Industrial				
	410 (0.091)	130 (0.021)	0.07	23
	600 (0.13)	198 (0.032)	0.098	24

Notes: US$ 1 = Rs 45 (India) and US$ 1 = Rs 61 (Pakistan). Data within parentheses are prices in terms of US$ /kWh. *Domestic lighting/fan and power (single delivery point). *Small industrial units: tariff for non-continuous Industry and continuous industry respectively. **General Supply A-1. **Industries: tariff Up to 50 kW and 51-500 kW, respectively. Sources: Tariff in Delhi from Delhi Electricity Regulatory Commission, which came into force June 1, 2001; tariff in Pakistan from Government of Pakistan, *Economic Survey 2002-03,* Finance Division, Economic Advisor's Wing, Islamabad, 2003 (in effect on 21-11- 2002).

3.1.5 From Informal to Formal Trade

Trade between India and Pakistan has more or less followed the same pattern as their political relationship. In times of conflict or border tensions, trade dips; when relations improve, the trading volume goes up. The official or documented trade volume is Rs 476 million [US$ 10.57 million], which is well below 1% of Pakistan's total international trade. The largest volume of trade is informal or through third countries (Table 3-13). Estimates of the volume of this type of trade vary broadly, from US$ 100 million to US$ 1-1.5 billion, and no authentic sources for verification exist. A relatively conservative guess would be that smuggling volumes are in the neighborhood of US $250-350 million, but it is still a guess. Informal trade creates a number of ill effects on the national economies of the two countries, particularly loss of customs revenue. Lower customs revenues mean less money available for social development or infrastructure investment. In the end, the poorest members of society suffer the most, as their needs are generally neglected due to competitive allocation of already scarce resources.

Table 3-13: Pakistan-India Trade Statistics (Rs Million)

Major Items	2001-02		2002-03		2003-04	
	Exports	Imports	Exports	Imports	Exports	Imports
Fruits and vegetables	33.356	5.097	21.343	0.830	19.547	0.563
Sugar raw and refined	...	18.153	...	...	...	...
Animal fodder	...	7.634	...	1.068	...	28.008
Raw cotton	...	...	...	0.043	...	56.043
Ores and concentrates of iron and steel	...	13.587	...	18.267	0.110	31.051
Crude vegetable materials	4.245	6.660	3.864	6.190	1.856	6.398
Petroleum and related products	...	0.036	...	...	38.984	...
Chemical elements and compounds	...	63.177	0.100	59.529	0.221	144.954
Chemical materials and products	0.169	17.435	0.147	16.444	0.149	26.359
Special transactions and unclassified	0.025	0.894	32.817	9.177	12.561	13.920
Total (including other items)	49.227	186.521	70.664	166.509	93.680	382.367

Source: Government of Pakistan, Ministry of Commerce.

Illegal or informal trade creates and strengthens criminalization of the economy, adversely affecting governance, political order, and institutional integrity. Furthermore, it introduces economic distortions that injure the interests of legitimate businesses. As a powerful sector profiting from illegal trade emerges, it uses various channels to exert political pressure on the government to erect more trade barriers.

If statistics on legal and illegal India-Pakistan trade are combined, though still far below the potential and optimal level, they indicate many complementary areas. The three segments of Pakistani and Indian society that have relied on misperceptions for many years are the:

- Political establishment, which has a vested interest in preventing any closeness or economic integration because their strategy of political and military confrontation will be at risk (It will lose political support that will in turn undermine the rationale for high defense spending.);
- Smugglers engaged in illegal cross-border trade, and the border security (and other) officials protecting them in exchange for payment, who might lose this lucrative revenue source if trade flows through official channels; and
- Business and industrial companies, including multinationals, that have used this adverse bilateral relationship to sustain their inefficient and uncompetitive production and market control.

For instance South Asia's contribution to tea exports to Pakistan, which has become the largest tea importer in the world (150 million kg), has been appallingly low, at only 13% in 1998 (India 1.5%, Bangladesh 4.4%, and Sri Lanka 7.24%). The Pakistani government put tea at the top of its freely importable list of 600-plus items with India back in 1988. Ironically, South Asia has been both the largest and geographically the nearest possible tea producer for Pakistan. Kenya has gradually emerged as the most vital source of Pakistan's imports, securing over 60% in 1998 versus a meager 11% in 1975. Pakistan imports tea from Kenya at a much higher price than would be necessary from within the region. The three-year estimate for 1992-94 highlights the increasing cost of non-cooperation (and the benefits that could have resulted from cooperation). If Pakistan had imported all its tea from tea-producing

countries within South Asia, it could have easily forestalled the transfer of some US$ 110 million outside the region in these three years.[16]

A major factor in Pakistan's importation of tea from outside South Asia is the presence in Pakistan of multinational tea trading companies with substantial stakes in the tea gardens of Kenya.[17] These companies control more than 70% of the tea market in Pakistan. This situation has been termed the "domination effect," where a large transnational enterprise exerts its influence on the economy through market operations, or by more direct means, to serve its own purposes.[18] However, the adverse political relations between India and Pakistan have always been used as the reason for not importing tea from India. This shows that business interests, including those of the multinationals, could also act as negative stakeholders thriving on adverse relationships.

A widely circulated misperception in Pakistan is that, if trade with India is liberalized, Pakistani industries will suffer a great loss, as they would lose market share due to low product competitiveness. Only a few studies have attempted to explode this myth. Two Pakistani economists, Ijaz Nabi at the World Bank and Anjum Nasim of the Lahore University of Management Sciences, in their paper "Trading with the Enemy: A Case for Liberalizing Pakistan-India Trade" argue that substantial economic benefits will accrue to Pakistan in almost every major sector of the economy – a realistic conclusion.[19] In a commodity like tea alone, Pakistan could save US$ 40-50 million a year.

Tables 3-13 and 3-14 present an interesting contrast. The direct formal trade between India and Pakistan, though increasing in recent years, is less than half a billon Pakistani rupees, while the items originating from either country but being traded through Dubai is Rs 2,125.42 million [US$ 47.23 million], four-and-a-half times more than direct trade. For this reason, the consumer cost is higher for Indian goods imported through third countries. The transaction cost of goods moving through a third country goes up with transportation charges, the profits of third-party middlemen, and time variables. Consumers at both ends have to pay more. Liberalizing trade will increase trade volumes if bilateral trading policies are consistent. Even if the custom duty regime changes in coming years, the government would derive substantial income due to enhanced trade, which Nabi and Nasim estimate at Rs 2 billion [US$ 0.04 billion].[20] That is a significant amount, which may give the government more fiscal latitude to invest in the social sector. They also suggest that Pakistani producers will make gains in terms of increasing competitiveness, and accessing international markets as well as a very large Indian market.

16 See Mahendra P. Lama, monograph on *Regional Economic Cooperation in South Asia: A Commodity Approach* published by the Society for Peace, Security and Development Studies, Department of Defense and Strategic Studies, University of Allahabad, 1997. Also read "Integrating the Tea Sector in South Asia: New Opportunities in the Global Market," *South Asian Survey,* Delhi, January-June 2001.

17 The Lever Brothers business unit markets the leading brands of tea in Pakistan including Yellow Label, Rich Bru, and Taaza. Brookbond was for years the country's major packed tea business house. (Naween A. Mangi, *Pakistan & Gulf Economist,* Karachi, Sep 21 - 27, 1996 and Khurram Baig, *Pakistan & Gulf Economist,* Oct 06 - 12, 1997).

18 Alfred Maizels, *Commodity Instability And Developing: The Debate, World Institute for Development Economics Research (WIDER)* of the United Nations University, Tokyo, January 1988, pp - 23-24.

19 Ijaz Nabi and Anjum Nsim, "Trading with enemy: A Case for Liberalizing Pakistan-India Trade," in Ed., Sajal Lahiri, *Regionalism and Globalization: Theory and Practice* (London: Routledge, 2001).

20 Ibid.

Table 3-14: Pakistan-Dubai Trade Statistics (Rs Million)

Major Items	2001-02		2002-03		2003-04	
	Exports	Imports	Exports	Imports	Exports	Imports
Fruits, vegetables, and prepared items	16.523	5.551	16.451	2.250	19.681	6.430
Sugar raw and refined	...	2.806	0.538	1.276	...	1.725
Raw cotton	0.018	11.881	1.039	12.042	0.063	22.383
Petroleum and petroleum products	78.054	300.948	104.211	463.925	99.981	99.836
Chemical materials and products	2.006	25.771	7.865	45.722	6.969	66.336
Manufactured textile articles	63.272	...	174.772	...	128.311	0.154
Machinery and parts	5.137	75.255	17.016	128.572	13.119	184.498
Special transactions and unclassified	3.616	3.728	32.472	11.068	44.693	7.222
Total (Including other items)	631.037	710.533	1006.547	1027.222	893.933	1231.489

Source: Government of Pakistan, Ministry of Commerce.

3.1.6 Patterns of Consumption – Emerging Opportunities

A look at electricity consumption patterns for the past several decades (Tables 3-15 and 3-16) shows a remarkable increase in the demand for power in both India and Pakistan, because of burgeoning domestic demand due to changing consumer needs and rural electrification projects. However, power demand in the domestic and agricultural sectors is higher than in the industrial sector. Higher industrial power demand is an indicator of faster industrialization and increased economic prosperity. It is expected that, by liberalizing their economic regimes, India and Pakistan would reverse this power demand trend. The consumption patterns by sector for India and Pakistan are illustrated in Tables 3-15 and 3-16.

Table 3-15: India – Electricity Consumption by Economic Groups (%)

Year	Domestic	Commercial	Industry	Traction Motors	Agriculture	Others
1950-51	12.6	7.5	62.6	7.4	3.9	4.0
1960-61	10.7	6.1	69.4	3.3	6.0	4.5
1970-71	8.8	5.9	67.6	3.2	10.2	4.3
1980-81	11.2	5.7	58.4	2.7	17.6	4.4
1990-91	16.0	5.9	44.2	2.2	26.4	4.5
2000-01	23.9	6.1	34.0	2.6	26.8	5.6

Source: Government of India, *Economic Survey 2002-2003,* Ministry of Finance, New Delhi, 2003, p S-27.

Table 3-16: Pakistan – Electricity Consumption by Economic Groups (%)

Year	Domestic	Commercial	Industry	Agriculture	Bulk Supply & Public Lighting	Traction Motors
1992-93	35.9	4.2	34.9	17.9	7.1	0.1
1997-98	41.5	4.5	26	17.5	10.5	0.04
2002-03	44	5.3	28.8	12.7	9.2	0.02

Consumption patterns may change depending on the development goals of the country. A higher load factor of the system indicates the efficiency of the power system.

In India, electricity consumption in the agriculture sector has shown the highest growth rate, raising its share from 3% in 1950-51 to over 26% in 2000-01. Diminishing agricultural yields mean that more inputs are required to produce more from the same cultivable land. This translates into rising agricultural energy consumption and declining industrial and transportation consumption. Domestic sector consumption has steadily climbed due to the acquisition of appliances and the growth in rural household electrification.

In Pakistan, domestic users account for almost 44% of total electricity consumption. Industrial and agricultural consumption have been declining. The overall consumption of energy over the past six years has increased at an average rate of 2.4%, with marked differences in the different sectors. The highest growth rates were recorded in the domestic and commercial sectors. In fact, unlike India, Pakistan's agricultural sector has had a negative energy consumption growth rate and its industrial sector has had a very insignificant growth rate (Table 3-17).

Table 3-17: Pakistan – Energy Consumption by Sector (Unit toe)

Sector	1996-97	1997-98	1998-99	1999-2000	2000-01	2001-02	Annual Compound Growth Rate (%)
Domestic	4830291	5356095	5343706	5709084	5825500	5895458	4.1
Commercial	663660	684454	756618	779689	777825	809113	4.0
Industrial	8025312	8000864	8290687	8663489	8608411	8701352	1.6
Agriculture	857193	820135	717323	675026	666475	691758	-4.2
Transport	7538503	7742402	8302477	8785472	8685806	8612474	2.7
Other government	731706	741457	701381	672306	691785	786285	1.4
Total :	22646665	23345408	24112191	25285067	25255801	25496441	2.4

Source: *Pakistan Energy Yearbook,* 2002.

3.1.7 Improvement in Quality of Life

Electricity can transform the quality of life and work substantially. It improves health standards, helps promote literacy, and motivates people. In rural areas, it helps to slow rural-urban migration, and enhances opportunities for income and employment generation.[21] However, the question of accessibility and affordability is very critical in rural areas. There are large numbers of vulnerable domestic customers whose service is disconnected due to their inability to pay the minimum monthly electricity bill.

At the same time, there is evidence that enhanced income levels lead to increased electricity consumption despite higher tariffs. For example, in Pakistan, the per capita income during the period 1980 to 1988 increased from Rs 3,204 [US$ 71.20] to Rs 6,732 [US$ 149](an average of rate of 9.7%). During the same period, the actual domestic consumption of electricity increased at an average rate of 19.0%.

This growth was achieved in spite of an increase of 3.7% in the average domestic tariff. Data also demonstrates that a sharp hike in tariffs will reduce consumption. However, the across-

[21] Electricity in rural areas can help increase evening working hours, facilitating adult and other classes. Television and radio sets can help in dissemination of useful information to the rural community. Electrically powered refrigerators can store vaccines that can improve community health conditions. Mohan P.C. Munasinghe, "Sustainable Energy Development : Issues and Policy" in Kleindorfor, Paul R, Howard C Kunreuther & David S Hong (Eds) , *Energy, Environment and the Economy : Asian Perspectives,* Edward Elgar, Brookfield, US, 1996, pp 6-7. Many issues related to energy consumption in both rural and urban South Asia are dealt with in a comprehensive manner by Gerald Leach, *Household Energy in South Asia,* Elsevier Applied Science, London, 1987. This study is based on field surveys done in Bangladesh, India, Pakistan, and Sri Lanka.

the-board increase in tariffs in 1988 had a very salutary effect on domestic consumption, and annual per household consumption actually decreased by 2.6%, from 1,390 kWh to 1,367 kWh per year. However, only consumers belonging to a relatively higher consumption bracket were affected and the consumption rate of consumers using a bare minimum amount of electricity remained intact.

Indicators show that higher and better macroeconomic performance generally leads to higher electricity consumption. In the 1990s, most Southeast Asian countries experienced a sharp increase from already high levels of consumption in comparison to the relative poorer level of consumption in South Asian counties. Higher levels of electricity consumption in India also matched its improved economic performance. Only after a particularly high level of consumption is reached, such as occurred in Japan, does the marginal propensity to consume start declining. In this context, most of the South Asian countries are far below the primary level of consumption (Table 3-18).

Table 3-18: Per Capita Demand (kWh/Capita/Year)

Country	1990	1998	Average Growth 1990-98 (%)
Bangladesh	60	77	3.17
India	215	349	6.0
Indonesia	155	330	9.9
Japan	6,000	7,395	2.6
Korea	2,230	4,167	8.1
Malaysia	1,050	2,398	10.9
Pakistan	270	343	3.0
Singapore	4,800	8,242	7.0
Sri Lanka	215	247	1.7
Thailand	570	1,300	10.9

3.1.8 Power-Intensive Industries

The northern and western regions of India (mostly the states bordering on Pakistan) have exhibited a steady decline in electricity consumption related to irrigation, while domestic and industrial consumption has increased. In addition to electrification of households that previously had no access to electricity, the rise in consumption indicates that more and more people are using household appliances that require electricity. This trend suggests that the current consumer-buying culture could expand enormously in the very near future. At the same time, it indicates that the pace of industrial activity in the northern region of India has also increased with liberalization efforts (Tables 3-19 and 3-20), as indicated by the annual increase in demand for industrial sectors in the northern region (Table 3-21). The same trends can be observed in the western region as well.

Higher availability and consumption of electricity by the industrial sector helps to expedite the pace of economic development and prosperity. Ensuring higher availability of supply through the cross-border power exchange mechanism will help consumers in both countries meet their electricity needs and also create an atmosphere of interdependence, helping to create a friendly and congenial social and political environment. In essence, it will help to resolve the key issue of “lack of confidence” between the people of the two countries.

Table 3-19: India – Northern Region Pattern of Utilization of Electrical Energy

Categories	1993-94	1997-98	1998-99	2004-05
Domestic	21.72	24.28	24.22	26.85
Commercial	8.58	9.39	9.32	9.22
Irrigation	34.42	30.90	29.19	26.58
Industry	29.61	28.66	30.53	30.80
Others	5.67	6.77	6.74	6.55
Total	100.00	100.00	100.00	100.00

Table 3-20: India – Western Region Pattern of Utilization of Electrical Energy

Categories	1993-94	1997-98	1998-99	2004-05
Domestic	15.21	16.33	16.55	18.45
Commercial	5.56	5.09	5.13	5.28
Irrigation	29.59	34.90	34.71	30.94
Industry	42.26	36.81	36.95	39.41
Others	7.39	6.87	6.66	5.92
Total	100.01	100.00	100.00	100.00

Table 3-21: India – Northern Region Forecast Summary by Category (Public Utilities in Million kWh)

Category	1993-94	1997-98	1998-99	2001-02	2003-04	2004-05
Domestic	14699.91	19664.08	21563.58	28975.11	34597.48	37692.01
Commercial & Miscellaneous	5808.76	7605.21	8300.36	10472.73	12072.93	12933.60
Public Lighting	558.14	842.19	1025.41	1311.81	1542.05	1670.88
Public Water Works	1673.44	2436.35	2652.53	3459.75	4063.38	4400.00
Irrigation	22593.73	23648.40	24513	29621.56	33219.87	35150.28
Lift Irrigation	704.89	1377.31	1476.88	1811.01	2043.66	2174.51
Low Tension (LT) Industries	6694.67	7131.79	8107.67	11259.19	13213.87	14299.04
High Tension (HT) Industries less than 1MW	2596.62	3513.41	4176.67	4979.1	5714.87	6131.14
HT Industries 1MW & above	10747.34	12562.00	14898.01	18534.16	21266.54	22818.61
Railway Traction	1007.59	1269.62	1343.09	1535.35	1741.30	1880.82
Non-Industrial	598.69	930.46	973.67	1066.91	1184.58	1249.03
Total Consumption-mkWh	67683.78	80980.82	89030.84	113026.68	130660.45	140400.77
T & D Losses (%)	25.75	29.45	29.07	28.22	27.53	27.20
T & D Losses - mkWh	23473.22	33798.18	36492.16	44439.32	49642.55	52446.23
Energy Requirement-mkWh	91157.00	114779.00	125523.00	157466	180303.00	192847.00
Load Factor (%)	81.34	79.66	75.41	71.00	70.99	70.98
Peak Load (MW)	12793.00	16447.00	19001.00	25307	28993.00	31017.00

Source: Government of India, Sixteenth Electric Power Survey of India, Central Electricity Authority, Ministry of Power, New Delhi, September 2000, page-26.

3.1.9 GDP Impact through Agricultural Production

Availability of electricity is a very critical input for the intensive agricultural production system in many parts of northern and western India, particularly the border areas and

adjoining states like Punjab, Rajasthan, Gujarat, Uttar Pradesh, and Haryana. As shown in Table 3-22, these states are the leading agricultural producing centers for many crucial commodities. For instance, Punjab and Uttar Pradesh together produce over 23% of India's rice (over 72 million tons); Punjab, Haryana, and Uttar Pradesh produce over 72% of the country's wheat (65 million tons); and Gujarat alone produces over 20% of India's cotton (8.7 million bales).

Table 3-22: Northern and Western Indian States Agricultural Production

Commodity	Uttar Pradesh & Punjab	Punjab, Haryana & UP	Gujarat	Rajasthan, UP & Haryana	Uttar Pradesh	Gujarat	Uttar Pradesh	Gujarat
Rice	23 (72.7)							
Wheat		72 (65.1)						
Groundnut			25 (4.4)					
Rape seed & Mustard				71 (3.9)				
Sugarcane					41 (281)			
Cotton						20 (8.7)		
Potato							44 (23.2)	
Onion								17

Notes: Figures within parentheses are the total production of respective commodity in the year 2002-03. Except Cotton, which is in terms of million bales (1 bale=170 kg) all other units for all other commodities are in million tons. 8.7 million bales = 1479 million kg
Source: Computed on the basis of data provided in Government of India, Economic Survey, 2003-2004, Ministry of Finance, New Delhi, pp s-16- s-19.

Most of these commodities need electricity for processing or crop irrigation. If adequate electricity were available, the states as well as the nation would benefit. However, most of the states face rather serious power shortages and it is likely that their performance could have been better had the electricity supply been adequate. Cross-border power trading could bring them the electricity they require at the right time and price. If cross-border power imports generate a 1% increase in the production of the items produced by these states, it could have a positive impact on both state and national GDP. Even at below current market prices, a 1% increase in certain agricultural items could generate over Rs 17,904.46 million [US$ 397.87 million](about 0.01% of the national GDP). If this produce is exported at only a 30% markup over the domestic price, it would equal almost 8% of the agricultural exports of 2002-03 (Table 3-23). This would have a significant impact on rural employment. With higher incomes, and access to electricity, the rural population would have greater purchasing power, increasing the demand for other manufactured products.

Over the next few years, electricity consumption in these states could increase considerably, due to farmers switching to mechanized equipment and more efficient production systems in order to compete in national and international markets. Power availability for various agricultural operations has risen to 1.231 kW per hectare (kW/ha) in 2001-02 from only 0.295 kW/ha in 1971-72. This increase resulted from greater use of tractors, power tillers, combine harvesters, irrigation pumps, and power-operated machinery. The share of mechanical power increased from 39.63% in 1971-72 to 83.62% in 2001-02. Efforts are under way to encourage farmers to adopt technologically advanced agricultural equipment to make farm operations more efficient and streamline the agricultural production process.[22]

[22] Government of India, *Economic Survey, 2003-2004,* Ministry of Finance, New Delhi, p 166.

Table 3-23: GDP Gains Due to 1% Increase in Agricultural Production in Western and Northern Indian Border States

Commodity	1% Increase in Existing Production	Unit Price	Income Gains (Rs Million)
Rice	0.72	Rs 8000 / ton*	5760
Wheat	0.65	Rs 8000 / ton	5200
Groundnut	0.044	Rs 40000 / ton	1760
Rape seed & Mustard	0.03	Rs 35000 / ton	1050
Sugarcane	0.41	Rs 6000 / ton	2460
Cotton	14.79	Rs 74 / kg**	1094.46
Potato	0.232	Rs 2500 / ton	580
Total Income			17904.46
Total GDP			19952290 ***
GDP Impact (%)			*0.089 %*
Agricultural Exports Impact (%)			*23275.79!* *(7.68 %)* *Rs 303030 #*

Notes:
* This price mentioned is a price higher then the minimum support price but much lower than the market price.
** Export price Rs 74 / kg (2000-2001).
*** Net National Product at Factor cost at current price for 2002-03.
! If exported with the price jack up of 30%.
Total agriculture exports during 2002-03 of US$ 6734 million converted into Rs @ Rs 45 per dollar.
Source: Computed on the basis of data provided in Government of India, Economic Survey, 2003-2004, Ministry of Finance, New Delhi.

In Pakistan, the government is projecting an annual GDP growth rate in the range of 6-8% for the next a few years. This growth rate is largely predicated on impressive industrial expansion (both large and small) as well as steady and significant growth in the agriculture sector. Demand for electricity in these sectors will therefore increase by at least the same percentage in this period. The nation has to plan for this expansion.

In 2004, Pakistan faced the prospect of less than average rainfall during the monsoon season. Accordingly, WAPDA alerted the government to the fact that hydroelectric generation might below normal, which might necessitate load shedding during the winter. Thus, the government must not only plan for anticipated growth in demand, it must also ensure that installed sources of electricity generation are able to meet demand regardless of climatic conditions. This might mean having enough excess thermal capacity in the system to top up the shortfall, or installing grid connections with neighboring countries. As long as there are seasonal variations in demand and supply throughout the region, power trading will be beneficial even where excess capacity exists only in off-peak seasons.

3.1.10 Investment Climate

Both India and Pakistan have steadily introduced substantial reforms in their FDI policies making them rather liberal and attractive (Table 3-24). FDI inflows to individual South Asian countries that members of the South Asian Association for Regional Cooperation (SAARC) reveal that most of the countries receiving FDI have shown increasing but erratic trends, particularly in the case of Pakistan (Table 3-25). At the same time, India has been consistently attracting an overwhelming percentage of FDI inflows, steadily increasing from 34% in 1980-85 to 66% in 1998. Conversely, Pakistan's share has declined drastically (Table 3-26), despite the fact that it has one of the most liberal FDI polices in South Asia.

Table 3-24: India and Pakistan – Foreign Direct Investment Policy Regimes

Policy Areas	India	Pakistan
FDI Institutions	▪ Foreign Investment Promotion Board and Council	▪ Board of Investment
Protection and Guarantees	▪ Settlement of disputes is governed by the Indian Arbitration Act, 1940. ▪ UN Convention on the Recognition and Enforcement of foreign arbitral Awards. ▪ MIGA.	▪ Guaranteed 'no nationalization;' ▪ Settlement of disputes through ICSID.
Foreign Equity Participation	▪ Up to 51% in most industries; ▪ Up to 24 in industries reserved for the small scale sector; ▪ 100% in export oriented like power, electronic and software technology parks.	▪ 100 % without any permission of the government; ▪ No Objection Certificate (NOC) not required from the provincial governments.
Fiscal Incentives	▪ 100 % export oriented units exempted from payment of corporate income tax for a block of five years during the first eight years of operation; ▪ Finance for export from banks at special concessional rates of interest; ▪ Tax relief under avoidance of double taxation agreements. Income Tax holiday for 100% export oriented units and units in export processing zones for ten years.	▪ No custom duty on import of plant, machinery & equipment for the A & B categories industries like value-added or export industry and hi-tech industry; ▪ First Year Allowance @ 75 % and rein-vestment allowance @ 50 % for C & D category industries (engineering/capital goods, petro-chemicals, chemicals, and agro-based industry, production of quality of hybrid seeds, milk processing etc); ▪ Zero import tariff on plant and machinery (not manufactured locally) used for agriculture.
Repatriation and Expatriates	▪ Repatriation of foreign capital invested, profits and dividend earned after payment of taxes. ▪ Units operating in a limited list of Consumer Goods industries are subjected to dividend balancing with matching export earnings for a period of seven years.	▪ Full repatriation of capital, capital gains, dividends, and profits allowed.
Infrastructural Incentives	▪ Export processing zones; ▪ Foreign company can acquire or hold immovable property in India for carrying on its activity; ▪ The foreign citizen of Indian origin may also acquire any immovable property in India, except for agricultural land, farm house and plantation.	▪ Export processing zones; ▪ No upper ceiling of land for registered agricultural companies involved in production, processing and marketing of agricultural products on commercial lines.

Sources: Foreign Investment Policy of the Government of India, May 1997, India Investment Centre, New Delhi, 1998 & Pakistan: Investment Policies, 1998, Board of Investment, Islamabad, Government of Pakistan.
Also see Mahendra P Lama, "Investment in South Asia: Trends and Issues", South Asian Economic Journal, Colombo, March 2000.

Table 3-25: Foreign Direct Investment Inflows in SAARC Countries 1986-2001 (in US$ Million)

Year	SAARC Countries	Bangladesh	India	Maldives	Nepal	Pakistan	Sri Lanka
1980-85	178.8	-0.1	62	-0.3	0.2	75	42
1990-95	1184.8	6	703	7	6	389	110
1986	255	2	118	-1	1	105	30
1987	405	3	212	na	1	129	60
1988	326	2	91	na	1	186	46
1989	481	na	252	-1	na	210	20
1990	458	3	162	na	6	244	43
1991	463	1	155	na	2	257	48
1992	717	18	233	7	1	335	123
1993	1137	10	574	7	4	347	195
1994	1581	8	973	9	6	419	166
1995	2753	2	1964	7	5	719	56
1996	3618	14	2525	9	19	918	133
1997	4998	139	3679	11	23	713	433
1998	3560	190	2633	12	12	507	206
1999	3093	178	2168	12	4	530	201
2000	3095	280	2319	13	na	305	178
2001	4069	78	3403	12	19	385	172

Source: UNCTAD, *World Investment Report*, Various Issues.

Table 3-26: Percentage Share of SAARC Member Countries in the Total Foreign Direct Investment Inflows to South Asia, 1986-2001

Year	SAARC Countries	Bangladesh	India	Maldives	Nepal	Pakistan	Sri Lanka
1980-85	178.8	-0.06	34.68	-0.17	0.11	41.95	23.49
1990-95	1184.8	0.51	59.33	0.59	0.51	32.83	9.28
1986	255	0.78	46.27	-0.39	0.39	41.18	11.76
1987	405	0.74	52.35	0.00	0.25	31.85	14.81
1988	326	0.61	27.91	0.00	0.31	57.06	14.11
1989	481	0.00	52.39	-0.21	0.00	43.66	4.16
1990	458	0.66	35.37	0.00	1.31	53.28	9.39
1991	463	0.22	33.48	0.00	0.43	55.51	10.37
1992	717	2.51	32.50	0.98	0.14	46.72	17.15
1993	1137	0.88	50.48	0.62	0.35	30.52	17.15
1994	1581	0.51	61.54	0.57	0.38	26.50	10.50
1995	2753	0.07	71.34	0.25	0.18	26.12	2.03
1996	3618	0.39	69.79	0.25	0.53	25.37	3.68
1997	4998	2.78	73.61	0.22	0.46	14.27	8.66
1998	3560	5.34	73.96	0.34	0.34	14.24	5.79
1999	3093	5.75	70.09	0.39	0.13	17.14	6.50
2000	3095	9.05	74.93	0.42	0.00	9.85	5.75
2001	4069	1.92	83.63	0.29	0.47	9.46	4.23

Source: UNCTAD, *World Investment Report*, Various Issues.

There are many factors that accelerate or slow down both foreign and domestic investment. Faisal Bari and Ali Cheema argue that, although South Asian countries liberalized their economies and their FDI has grown, it is still far below the level of East Asian countries.[23] In

[23] Faisal Bari and Ali Cheema, "Toward a Common Investment Strategy in South Asia" a report submitted to South Asian Centre for Policy Studies., (SACEP), Dhaka, 2003.

addition to factors such as availability of domestic credit, lending rates, and governance, the nature of bilateral ties between India and Pakistan may also be considered as an important factor in attracting or deterring flow of foreign investment. This highlights the fact that the investment climate should improve dramatically if sustainable economic exchanges like power trading between India and Pakistan were to be implemented. This could create new and solid stakeholders including power producers, distributors, traders, transmission and grid operators, creditors, donors, and technology exporters, as well as end-users, such as industries, households, and agriculture.

The ongoing lack of cross-border investment between India and Pakistan is a major concern, considering the potential scope and opportunities. These investments could occur in many crucial sectors including power. It should be noted that neither country's investment policies bar investments from the other country. The issues related to regional FDI are critical particularly as regionalization of economic benefits takes on more importance. These issues need to be examined extensively, keeping in mind natural resource management, technology, domestic participation, labor markets, and internal resources.

The trade and investment linkages between India and Pakistan are critical to address factors, such as a limited industrial base, narrow export base, and structural weaknesses. As trade increases, balance of trade deficits between a more industrialized and a less industrialized partner (like India and Pakistan, respectively) could be a major issue. Accordingly, trade and investment need to be consciously linked by incorporating appropriate provisions in trade treaties and the respective FDI policies.

Even the impact of initiatives, such as the South Asian Preferential Trade Association (SAFTA), varies widely depending on the level of industrialization of the member states. This has been the case in many regional groupings. Countries with advanced industrial structures have gained more from trade preferences while the share of intra-community and intra-regional trade of the less industrially developed countries has not changed significantly. This has led to discontent in the latter countries. The resulting tendency has been for these countries to impose quantitative restrictions on their imports of industrial products from other member countries.[24] That is why cross-border investment is crucial; there is huge scope for cross-border mergers and acquisitions by companies in both India and Pakistan.

Cross-border energy sector investment and trading by India and Pakistan will send a very positive signal to multinational corporations and other investors. Pakistan is likely to gain more than India in FDI percentages if their bilateral relations improve. There are two reasons for optimism. First, the current rate of foreign investment in Pakistan is very small and remains far below its potential due to domestic political and regional security factors that have discouraged investment. In the 1990s, Pakistan received US$ 2-3 billion a year. Once it is internally stable and has better relations with India, this investment flow will increase substantially. Second, Pakistan's oil and gas sector has already received relatively large investment and is likely to attract even more investors.

Per capita commercial energy consumption in India and Pakistan continues to be quite low and indicates the potential for increased consumption (Table 3-27). The persistent shortage of energy has been a major factor in the subcontinent's low rate of growth. Conversely, poor-quality energy infrastructure has been a major obstacle to its economic development.[25]

[24] Lama, Mahendra P, "Investment in South Asia: Trends and Issues", *South Asian Economic Journal*, Colombo, March 2000.
[25] World Bank, *Asia Energy Profil : Energy Sector Performance*, Department Paper Series No 9, Washington, DC, November, 1994.

Table 3-27: South Asia – Per Capita Commercial Energy Consumption

Country	Kilogram of Oil Equivalent (kgoe)		Average Annual % Growth
	1990	1997	1990-1997
Bangladesh	190	197	1.0
India	424	479	1.9
Nepal	311	321	0.6
Pakistan	400	442	1.7
Sri Lanka	322	386	2.4
South Asia	394	443	1.9
World	1705	1692	0.0
South Asia as % of World	23.1	26.2	

Source: World Bank, World Development Report 2000/2001, pp 292-293.

India and Pakistan's inability to cater to growing industrial and other commercial needs has adversely affected their productivity, social development, and investment climate. This situation is exacerbated by structural, institutional, and financial problems. Khatib and Munasighe (1992) estimated the cost of power shortages to India and Pakistan's industrial sectors to be 1.5% and 1.8% of GDP, respectively.[26] It is estimated that every unit of electricity that is lost, for any reason, results in an economic loss of five to ten times the cost of the electrical energy generated, due to wastage in labor, material, and equipment as well as the loss of production time.[27]

In India's case, it is found that elasticity for almost all the fuels, except solid fuels, is greater than unity. This means that investment growth in the energy sector must be greater than the anticipated investment growth in other sectors of the economy so as not to derail the economic expansion process. This is a major challenge to India's energy security as well as a major prerequisite for achieving the double-digit growth rate that India has been striving for. Thus, both India and Pakistan could develop strategic power sector investment policies to cater to regional needs.

3.1.11 Cross-Border Gas Trading

The confidence built by even small and limited electricity exchanges could gradually be extended to larger ventures like gas pipelines, which both countries have discussed. In addition to electricity, there are three areas in South Asia's oil and gas sector that lend themselves to regional cooperation, including trans-boundary natural gas trade; refined petroleum product trade; and oil and gas exploration.

A sizable gas shortfall is expected in both India and Pakistan unless major exploration and drilling operations are undertaken. India's Tenth Plan has projected natural gas demand of 130 mmscm/d in the year 2006-07, which could rise to 175 mmscm/d in 2011-12. Indian policy in recent years has sought to promote imports of natural gas, in view of the fact that demand is projected to outstrip production by 62 mmscm/d in 2006-07 using the Tenth Plan's intermediate demand forecast. It could be higher if latent demand for natural gas is taken into account.

[26] H. Khatib and M. Munasinghe, "Electricity, the Environment and Sustainable World Development", World Energy Council, 15th Congress, Madrid, September 1992.

[27] K.K.Y.W. Perera, "Energy Issues and Alternatives", *Economic Review,* People's Bank, Colombo, August 1996, p 7.

Smaller countries like Bhutan, Maldives, and Nepal are also likely to see a quantum jump in gas consumption in the next decade or so. The optimal techno-economic solution is for India, Pakistan, and other South Asian countries to consolidate their demands to potential suppliers in North, West, and Central Asia so that economies of scale result in substantial reductions in unit cost of supply to all countries.

India and Pakistan have been envisaging both onshore and offshore pipelines. However, nothing concrete has emerged to date, due to the enormous financial implications; geopolitical apprehensions; uncertainty over natural gas reserves; supplied gas pricing; third-country transit approvals; and environmental impacts. This has also been the case with the intra-regional gas pipeline between Bangladesh and India.

Economies of scale achieved through joint gas purchases will substantially reduce per-unit import costs. According to an economic analysis conducted for a United Nations Development Program (UNDP) sponsored project on South Asian energy-environmental cooperation, the tariff cost of the pipeline project could be reduced by about 26% by building a joint pipeline for India and Pakistan instead of separate pipelines (based on prevailing prices in March 1998).

Therefore, to promote regional energy cooperation through natural gas trading via trans-boundary gas pipelines, the South Asian countries will need to work in a spirit of mutual trust in four major areas:

- Undertaking full-fledged preparatory techno-economic work;
- Securing intergovernmental agreements;
- Informing the public; and
- Promoting international commercial and financial interest in the proposed projects.

A prime reason for including gas as another equally important source of energy trade is that building power grids would lead to building pipelines, and vice versa. Cooperation in either of the two energy sectors will help eliminate psychological barriers, create trust, and open the gates to trade in agriculture and manufactured goods. Given the stubborn legacy of India Pakistan relations, it would be pragmatic to begin trading in electricity because of the shorter distances and time period needed to develop this trade as compared with natural gas. This kind of trade creates a “win-win” situation. India would gain in terms of power grid stability in the adjoining states of Gujarat, Rajasthan, and the Punjab; expanded rural electrification network; and, more importantly, new centers of industry. Pakistan will receive foreign currency cash flows, be able to meet its balance of payments deficit, and earn revenues to recover its power project investment costs. With more resources available Pakistan can invest more in development and improve its distributive effects on the poor. If the power grids are connected, Pakistan can also benefit from grid stability during seasonal periods of low hydropower generation. Cross-border energy exchanges could open the lines of commerce, trade, and communications, and create a new climate of trust, political goodwill, and visible economic gains for all.

Section 4 Other Benefits

4.1 THE CASE FOR POSITIVE STAKEHOLDING

Despite the end of the cold war, breakup of the former Soviet Union, reorientation of the nonaligned movement, global economic reforms, global communications expansion, new political rapprochements, and changing alignments, contemporary South Asia continues to hold on to a conventional paradigm of security based largely on geopolitical threats. There is no meaningful "peace and cooperation" constituency in the region as a whole. Any dialogue on peace and cooperation is related to the same security and conflict issues that have long dominated the region. This political situation contrasts sharply with regional efforts on behalf of human rights, child labor, hydroelectric dams, intellectual property rights, non-governmental organizations, and democracy.[28]

Non-political advocates – stakeholders outside the government and state conglomerate – are emerging to play an increasingly vital and decisive role. In this context, older confidence-building measures need to be reassessed and revamped. Historically, South Asia has relied on military and political confidence building measures, despite the fact that few of these have been effective or survived for any length of time.

In the case of the India-Pakistan conflict, it becomes important to consider the vital question of how to design new confidence building measures. Economic confidence building measures require that business and other types of economic cooperation (Track II diplomacy- meaning initiatives through informal and back channels) be considered as measures for encouraging the peace-building process in South Asia. Just as there have been stakeholders who perpetuate conflicts, there are now stakeholders who want to create peace.

In addition, those confidence building measures created by economic stakeholders in South Asia have generally endured, and India's relations with smaller neighbors, such as Nepal, Bhutan, Bangladesh, and Sri Lanka, offer several examples. While serious political crises have arisen between these countries and India, they have been remarkably short-lived – mainly due to large economic stake holdings on both sides of the border.

Strikingly, there have been no such stake holdings between the business sectors of India and Pakistan. Whatever stake holding has occurred has unfortunately been on the side of keeping the conflict alive. In other words, the more chance of conflict between India and Pakistan, the greater the opportunity for these negative stakeholders to maximize their gains.[29] Thus, a chain of economic confidence building measures must be developed and implemented. There will be conscious and continuous efforts to thwart and abort any move towards creating positive stake holdings, as occurred in the case of Pakistan's trade policies involving sugar deals and proposed cross-border power trade. However, global economic reforms are likely to be the most critical factor for positive stakeholders in India-Pakistan relations. Even if incremental-ism persists in the process of improving relationships, actors behind the scenes have become more diverse and dynamic. They include International Monetary Fund (IMF)/World Bank-led players and various transnational corporations. For the later, the strategic interest is corporate gains and, to attain these, the transnational corporations are

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28 Lama, Mahendra P., "Designing Economic Confidence Building Measures: Role of India in South Asia," in *India's Pivotal Role in South Asia, CASAC ,* New Delhi, September, 2000.

29 Lama, Mahendra P., "Changing Facets of Conflict and CBMs in South Asia," paper presented in the Faculty Workshop on *Peace and Conflict Studies: South Asian and Western Perspectives,* organized by JNU and Kroc Institute, University of Notre Dame, USA, New Delhi, March, 2000.

likely to put steady pressure on "pull factors" in a particular country to achieve a substantive transformation in that country's dealings with neighbors – as they have done in many other theatres of bilateral conflict. On an optimistic note, it is reasonable to conclude that the changing nature of economic actors and their increasing support base in society will inspire policy designers on both sides of the border to create mechanisms for substantial and lasting interaction.[30]

The positive players and stake holdings are yet to emerge. Economic exchanges through energy trading could become a major platform for developing economic stake holdings that will help create sustainable confidence building measures in the region. In developing and implementing these economic stake holdings, India's role is pivotal, both in terms of being a driving force as well as a consolidating agent.

4.2 FOSTERING INTERDEPENDENCE

Interdependence between nations is the best guarantor of regional peace and stability. It helps create multi-dimensional relationships and deepens the sense of mutual empathy and understanding. However, India and Pakistan have oriented themselves toward distant regions and markets and have selected partners accordingly. Therefore, the overriding issue is to replace the primacy of politics with the primacy of economics. Initiating economic transactions in politically neutral areas, such as electricity trading, could be an effective way to foster interdependence. While electricity trading has certain inherent constraints compared with other areas of trade, it nevertheless offers greater potential for creating a long-term basis for interdependence.

Once agreements are signed, the infrastructure is put in place, and trading operations begin, the cost of withdrawing from an arrangement will be immense for both parties. For example, the post-partition disagreement over dividing the Indus basin waters was amicably settled by the Indus Waters Treaty in September 1960, which occurred with the active mediation of the World Bank. For the past 44 years, both countries have honored the treaty, an impressive record by any standard. A permanent Indus Basin Commission comprised of one member from each country was created to resolve ongoing issues and, if that fails, questions can be referred to an arbitrator.[31]

Interdependence is predicated on the fact that the costs of disengagement are so high that the parties tend to separate political issues from economic cooperation, seeking peaceful solutions to resolve conflicts. Once mutual vulnerabilities are well established through power trading between India and Pakistan, the inherent logic of interdependence would prevail, bringing about positive changes in bilateral relations and significantly reducing the risk of confrontation.

The other significant point in understanding the effects that electricity trade would have on interdependence is that, in addition to creating stakeholders and promoting constituencies of interest in both countries, it will also influence government policies toward more trade and openness.[32] At this point, the stakeholders are few and the constituencies of common interest are weak. Industrialists, business people, workers, and electricity consumers in India would

30 Michael, Sakbani, "Pivotal Countries in a Two-Track World: Regionalization and Globalization," *Cooperation South,* Number 0ne, 1998, UNDP, New York.

31 We have taken information on this section from S. M. Burke and Lawrence Ziring, *Pakistan's Foreign Policy: An Historical Analysis* 2nd edition (Karachi: Oxford University Press, 1990). pp.10-11, 230-234. Also see Mahendra P. Lama and Rasul Bakhsh Rais, *Pipelines and Powergrids for Peace, 2001.*

32 Mahendra P. Lama and Rasul Bakhsh Rais, *Pipelines and Powergrids for Peace* (Kings College, London and International Centre for Peace Initiatives, Mumbai: 2001, p. 12.

have a natural interest in peaceful relations with Pakistan. Similarly in Pakistan, the state (which will earn substantial revenues from electricity trade), IPPs, and others directly and indirectly connected with this trade will have to weigh the costs and benefits of confrontation with India.

The key assumptions of this analysis are economic rationality as well as the rationality of those who run the Indian and Pakistani states. Economic rationality dictates that withdrawal of cooperation or severing of relations hurts interests in their totality and, therefore, it becomes an obsolete option. Disputes can take place over how rewards or benefits are to be distributed as trade and commercial relations multiply, or may occur quite frequently as states change their economic policies. But these types of dispute require altogether different policy tools, such as negotiation, bargaining, and establishment of institutions to help resolve issues in a peaceful manner. It is rational to expect that kind of change to take place when India and Pakistan begin to trade electricity, which serves as a catalyst for promoting trade in other areas and increasing the commercial and economic ties between the two nations.

4.3 COMPREHENSIVE SECURITY BENEFITS

Will energy trade help improve relations between India and Pakistan? The answer is unequivocally yes. Four reasons for this emphatically positive answer – creating conditions for peace, deepening relationships, changing perceptions, and building confidence – are discussed in the following paragraphs with evidence from the experience of other countries and regions.

4.3.1 Creating Conditions for Peace

The theory of open trade between communities and nation states postulates that substantial increases in the transactions of good and services across national boundaries would result in creating better conditions for peace. This improvement results from the creation of constituencies within business communities, industrial sectors, and service sectors, and by providing incentives to groups to support peaceful and stable relations to protect their interests. Trade in one area of economic activity spills over into other areas, expanding the volume and categories of goods that can be traded, as gains accumulate and their value for national economy becomes well established. The economic integration process leading to the European Union (EU) started with an agreement in the 1950s to trade in two commodities, coal and steel. The list kept expanding as trade barriers continued to be reduced. Today, the countries of the European Union are among the world's most integrated economies. However, economic integration is neither independent of politics nor does it remain confined to economic spheres. The first step, the decision to trade must have political will behind it and enough support within the state apparatus. Once on the rails, the movement is smooth, quickly creating more beneficiaries and enlarging the support base for new initiatives.

Trade and economic transactions create their own political momentum, known as spillover effects in other relationship categories. Those who studied the European Coal and Steel Community developed a coherent integration theory predicting a political union of the member states. For some, a "United States of Europe" may be a distant goal, but already supranational institutions have emerged such as the European parliament, court of justice, and many other institutions that deal with common issues relating to defense, foreign policy, human rights, and the environment. Europe now has a common currency and is working toward common defense and foreign policies. The same is true of the members of the Association of South East Asian Countries that have followed the EU model. India and Pakistan can learn from the experience of other countries if they show political will in separating contentious issues from economic cooperation. They have not displayed this spirit

in the past. However, in the very near future, the political will to cooperate will be driven primarily by strategic sectors, like energy, that are needed to support the next stage of economic development and sustain the present level of growth.

4.3.2 Deepening Relationships

Evidence from the interdependence concept suggests that trade and other exchanges deepen relationships, increase mutual vulnerabilities, discourage abrupt changes in economic policies and severing of relations for political reasons, and help disassociate conflicts from the matrix of economic issues. It is not merely the kind of transaction but the overall transaction scale and volume – its density – that produces interdependencies. Such interdependencies existed at the subcontinent level before the creation of India and Pakistan. Geographical proximity, the old infrastructural network (though rusted and in disrepair), and more modern communications technologies can be put to use for increasing the density of economic transactions. Looking at the dismal volume and very limited trading basket between India and Pakistan, energy could be a major tradable item, which would increase interdependence and reduce vulnerabilities. The positive economic gains will make policymakers in India and Pakistan sensitive to each other's needs, help improve the political situation, and encourage the protection of mutual interests.

4.3.3 Changing Perceptions

The issue of perception is extremely important for shaping relations between any two countries. For various reasons, India and Pakistan have promoted highly negative images of each other for almost half a century. The media and other groups in both countries have supported this officially-sanctioned demon-like characterization of each other. Trade, free movement of peoples between the two countries, interaction between different social segments, and a conscious decision to adopt mutually positive attitudes at the government level would help to eliminate many misperceptions in India and Pakistan.

4.3.4 Building Confidence

Cross-border energy trade will build confidence and break the old mindset that India and Pakistan are born to be enemies. Confidence is built in blocs and continues to accumulate. One of the most important outcomes of confidence building is a psychological one, as peoples wedded to old views become realistic about their traditional adversaries. In other regions, notably Europe, old enemy states like France and Germany has become partners, allies, and friends. War between them is unthinkable now. This change was the result of interlocking economic and trade ties that, over time, transformed the political landscape of Europe. Emotional issues of the past have given way to pragmatic issues of economic well-being. People in India and Pakistan are no less rational than in other countries. The growth of economic exchanges triggered by energy trading will bring about an attitudinal change in people, making them more realistic and pragmatic. As in Europe, this change will have a cascading effect on the process of regional economic consolidation.

In comparison to the social sectors of the economy, defense spending in India and Pakistan is quite large. India spends approximately 2.7% of its GDP on defense. In monetary terms this translates into US$ 16.2 billion annually. Pakistan's defense burden is around 3.9 % of GDP, which is roughly 60% more than that of India.[33] In comparison, the defense burden of the North Atlantic Treaty Organization (NATO) and non-NATO countries of Europe is 2.6% and 1.6%, respectively. The positive aspects of military spending, including the commercialization of technological innovations by civilian industries, are far offset by its

[33] *The Military Balance* Vol. 103, Issue, 2002-2004. The figure for Indian defense expenditure is for year 2003, and for Pakistan 2002.

debilitating impact on general human welfare. "Military expenditure cannot only crowd out more productive and employment creating investments, it can also preempt the best scientific brains, divert R&D resources from civilian sectors to military objectives, lead to a culture of militarism and repression of the people, and create many opportunities for corruption in arms procurement deals."[34]

Both countries justify their higher defense spending on account of national security. The conventional paradigm of national security rests on the notion that in an anarchic world system, states have to build up national military capabilities to defend borders and protect legitimate national security interests. There are many problems with this thesis but two critiques may be considered: First, the military, like other bureaucratic organizations, keeps expanding and has an inherent interest in perpetual modernization and new technology acquisitions. Consequently, the costs of national security keep escalating. Modernization and expansion in one country generates insecurity and a fear of falling behind in the other, stimulating a corresponding escalation in defense expenditures. This has been the pattern of the India-Pakistan arms race. The argument that we can afford present defense outlays, and that there is nothing more sacrosanct and important than national defense, has lost many of its adherents after the disintegration of the former Soviet Union. Second, the national security issues of developing countries such as India and Pakistan are more complex than the security of the borders. It involves addressing regional disparities, food security, political integration and national solidarity among different ethnic groups. Internal threats like ethnic and sectarian conflict and religious extremism are no less bothersome to national security than external threats, and domestic threats often are more stubborn and grow more menacing over time.

Energy trading between the two countries will create the necessary trust for rethinking defense spending. However, this is a long-term expectation, but quite realistic and supported by historical evidence from the experience of other countries. If relations between India and Pakistan can improve using electricity trade to break the old barriers, then defense spending is likely to decline. Pakistan's defense budget for the financial year, 2003-04 was US$ 3 billion. Consider a rough estimate of 10% reduction in defense spending. It will make US$ 300 million available to Pakistan and much more to India.[35] Over a period of time, significant reduction in defense expenditure should result in considerable savings, which could be utilized to meet the pressing financial needs of the social sectors in both countries. The following sections will discuss how Pakistan's profits from the sale of power to India and savings in defense spending could be invested in education and health sectors that will largely benefit the poor.

[34] Mahbub ul Haq, *Human Development in South Asia 1997*, Oxford, Karachi, 1997, p 86.

[35] Government of Pakistan, Finance Division, Finance Advisors' Wing, *Economic Survey 2003-04*. Islamabad, p 46.

Section 5 Trading Mechanisms

5.1 INTERNAL POWER EXCHANGES

5.1.1 Power Exchanges in India

There are one-way power transfers and two-way power exchanges taking place in India – both interstate and interregional. In parallel with a major shift in transmission system planning, there has been a conscious attempt to integrate regional grids for bulk interregional power transfers. This has helped in catering to the increased variations in planned and actual load growth in different parts of the country. High-capacity "transmission highways" are also to be built across the country to facilitate anticipated future large-scale power trading.

Scheduled interstate exchanges within the same region take place in limited quantity. The unscheduled interstate exchanges take place due to diverse demand and overdraw by the states. These are adjusted *post facto* in the regional energy accounts from the sales of central sector stations to various states. Bilateral exchanges, mostly seasonal, also take place between the states in the same region and in different regions from time to time based on mutually agreed rates. Some of the examples of these exchanges are Himachal Pradesh to Delhi during summer (100 to 200 MW), Punjab to Rajasthan, Tamil Nadu, and Andhra Pradesh during winter (100-150 MW), Maharashtra to Karnataka during winter (100-150 MW), and Orissa to Andhra Pradesh throughout the year (150 MW).

Interregional exchanges take place mainly from the surplus eastern region to the northern, western, southern, and northeastern regions. Current interregional transfers are fixed at about 1,000-1,200 MW from the eastern region to neighboring regions (Table 5-1).

Table 5-1: Interregional Power Exchanges (Million Units)

From/To	Northern	Western	Southern	Eastern	North-Eastern	*Total*
Northern		975.4		22		997.4
Western	299.1		798.9			1098
Southern		621				621
Eastern	1768	2380	4742		665	9555
North-Eastern						0
Total	2067.1	3976.4	5540.9	22	665	12271

Source: Central Electricity Authority, *Executive Summary*, January 2003

The total power transfer capacity of the interregional transmission system is about 5,500 MW at 220 kV and above in high voltage direct current (HVDC) back-to-back systems, which equal about 5.5% of the country's generation capacity. Interregional transmission systems currently under construction will have a power transfer capacity of 3,500 MW, and include the Talcher-Bangalore HVDC system for evacuation of power from Talcher Shakti Nagar Thermal Power Station stage-II (2000 MW) dedicated to the southern region. However, interregional power transfers are not planned for bulk power transfers and are based on limited exchanges of operational surpluses.

There are a number of new interregional interconnections that are being commissioned, including the Sasaram (eastern region) HVDC back-to-back system (500 MW), Biharsharif-Sasaram (eastern region)-Allahabad (northern region) 400 kV D/C, and Rourkela-Raipur 400 kV D/C. This will facilitate bulk interregional power transfers. Installation of shunt capacitors

at load centers in the state systems is an additional initiative to improve voltage levels, enhance system security, and reduce transmission losses.

As per plans of the government, over 41,000 ckm of extra-high voltage lines at 400 kV and above including HVDC are expected to be added in the next five years. The inter-regional power transfer capability is expected to increase to 14,000 MW by FY 2007 and to 30,000 MW by 2012-13. This should facilitate power trading for transfer of power from surplus to deficit areas across the country.

India's regional power systems are to be operated in two clusters by 2007-08, one comprising the northern, eastern, and northeastern regions, and the other the western and southern region, each cluster operating in a synchronous mode. Synchronous operation of both clusters is expected by 2012-13. Currently, the eastern region accounts for 78% of the total power exchanges taking place between the regions.

5.1.2 Power Exchanges in Pakistan

In Pakistan, the internal power exchange is between KESC and WAPDA. The volume of power trade between KESC and WAPDA is shown in Table 5-2.

Table 5-2: Internal Power Exchange in Pakistan (in GWh)

Year	Export to KESC	Imports from KESC
1985	0.97	674.00
1990	171.16	264.46
1995	884.04	207.58
2000	1840.33	13.59
2003	1801.00	65.00

Source: Energy Yearbook of Pakistan (various issues), Hydrocarbon Development Institute of Pakistan.

Currently, WAPDA's share of total electricity generation is around 83% and its sales share is 87%, indicating that KESC supplies a smaller share of electricity to Karachi and neighboring areas. WAPDA meets KESC's power supply shortfall if excess supply is available, and has been doing so at an annual growth rate of 18.1% between1990 and 2003. In some areas, WAPDA buys electricity from KESC, but these purchases have declined from 264.46 GWh in 1990 to 65 GWh in 2003 (annual rate of decline was -10.79%).

5.2 POWER TRADING – OPTIONS AND MODELS

South Asia can choose from a range of options for energy exchanges. Prior to 1947, most of the region had an integrated energy market and system. The choice of a regional electricity/energy trading or exchange model is a crucial issue. There are successful examples of international gas and power trading mechanisms in several regions of the world, and competitive energy trading legislation is one of their primary enabling features.

The possibility of energy trading has opened up new vistas of cooperation. Cross-border energy trading could lead to effective utilization of natural resources; increased power supply reliability; economies in operation and mutual support during contingencies; large-scale transformation of sectors contributing to economic growth; more effective confidence building through participation of multiple stakeholders; and enhanced market integration in energy related goods and services. The changing nature of economic actors and institutions

and their increasing support base in civil society are likely to force South Asian policy designers to develop mechanisms for substantive and lasting interaction.[36]

Interconnecting and coordinating the operations of regional power systems would provide immense technical and economic benefits. These interconnections allow each electric utility to save on power plant investment and operating costs as a result of improved utilization of the interconnected system. They also enhance the quality and reliability of electricity supplied to customers and reduces environmental damage. Reducing power system losses is often more cost-effective than constructing new generation capacity, and reducing transmission and distribution losses continues to be a high priority in South Asia. The Four Borders Transmission Interconnection pre-feasibility study[37] conducted by Nexant, Inc under the South Asia Regional Initiative on Energy cooperation (SARI/Energy) carried out in 2001, envisaged a 90 MW transmission loss reduction by interconnecting the power grids of India, Nepal, Bhutan, and Bangladesh. These interconnections would reduce the need for installing new capacity, saving investments costs of Rs 3,600 million (US$ 79.12 million at the exchange rate of US$ 1=Rs. 45.50).

An extensive network of interconnections already exists between South Asian countries. India's Power Grid Corporation (PGCIL) has already identified the additional interconnections that would be required in the South Asian Growth Quadrangle (Bangladesh, Bhutan, northeast India, and Nepal), and calculated the feasibility and cost-benefits to the participating countries. These South Asian interconnections would parallel India's efforts to integrate all of its internal regions to form a national grid by the end of the Eleventh Five-Year Plan in 2012.

Options for power trading in the broader context of South Asian regional cooperation in include mechanisms such as:

- Bilateral power trading;
- Pool-based trading/exchange; and
- Wheeling facilities.

5.3 STATUS OF INDIA'S PROPOSED POWER IMPORTS FROM PAKISTAN

In 1997-98, due to its "take or pay" PPAs with IPPs – which obligated WAPDA to make capacity payments to IPPs even if it did not need the power – Pakistan ended up with unused surplus power, creating significant economic loss. Power availability was to be further increased due to then ongoing projects like the Ghazi Brotha and Chashma hydro projects. The only option was to either sell this surplus power to Pakistani industrialists at cheap, below-cost rates, or export it to India.

In 1998, Pakistan made an informal offer to India to sell its surplus IPP-produced power. This offer was based on two very compelling domestic realities: (1) the need to dispose of excess power that could not be sold internally and could not be absorbed by an industrial base that had failed to grow as projected; and (2) the need to comply with loans and guarantees extended by international financial institutions to Pakistani power sector investors who were

[36] Lama, Mahendra P., Q.K. Ahmad, and Mohan Man Sainju, "Reforms in Power Sector and Cross Border Power Trade in South Asia" in a forthcoming volume edited by Mohsin Khan, IMF, Washington, 2004.

[37] The Report "Four Borders Project: Reliability Improvement and Power Transfer in South Asia" was produced by Nexant Inc. November 2001 with an objective to provide guidance to regional power sector stakeholders and governmental policy makers as to the possibilities for interconnecting transmission systems of Bangladesh, Bhutan, India and Nepal in what is referred to in the report as the Four-Borders Region.

required to make uninterrupted debt repayments, which could only be accomplished through power sales to a stable market like that of India.

The potential markets in India were the northern and the western regions, which are the country's largest electricity-consuming industrial areas. Pakistan's Punjab province, which is adjacent to India's Punjab state, has been Pakistan's biggest power consumer, consuming over 60% of the nation's electricity. Besides being a major source of agricultural production, Punjab province is home to many commercial and industrial units. It has experienced a growth rate of almost 4%**.** This indicates that Punjab province of Pakistan could be a major destination of any power exchange from India and other South Asian countries (Table 5-3).

Table 5-3: Pakistan – Electricity Consumption by Province (Public Utilities Only)

Province		1996-97	1997-98	1998-99	1999-2000	2000-01	2001-02	Annual Compound Growth Rate (%)
Punjab	*GWh*	25121	25639	25244	27033	28797	30565	4.0
	*toe**	2045894	2088012	2055902	2201	2345189	2489222	
Sindh	*GWh*	9488	10436	10122	10204	10807	10505	2.1
	toe	772701	849892	824321	831016	880126	855566	
NWFP	*GWh*	6638	6794	6243	6528	6843	7000	1.1
	toe	540607	553268	508453	531611	557315	570040	
Baluchistan	*GWh*	1666	1704	1687	1822	2138	2552	8.9
	toe	135698	138753	137362	148413	174093	207832	
Total	*GWh*	42914	44572	43296	45587	48585	50622	3.4
	toe	3494900	3629926	3526038	3712584	3956724	4122661	

Source: WAPDA, KESC as reproduced in Pakistan Energy Yearbook, 2002. * tons of oil equivalent.

Several key issues must be settled before cross-border trading occurs. They include transmission line costs; transmission line sharing mechanisms; power tariffs; payment mechanisms; and, most importantly, power supply sustainability and politically guaranteed energy security.

Organizations like PGCIL and various IPPs in Pakistan began discussing exports of electricity to the states of Rajasthan, Punjab, and Gujarat in 1998 and 1999. Tariffs proved to be a major stumbling block in the negotiation process when WAPDA asked for US 7.2 cents/kWh while India offered 2.25 cents.[38] Accordingly, negotiations broke off.

Following the negotiations, former Water and Power Minister Raja Nadir Pervaiz said that the "GOP is considering a proposal to allow the IPP[s] to export 200 MW of surplus power to India. Pakistan has [conducted a study] and found it viable that surplus power could be exported to India through multinationals [MNCs]. MNCs would be asked to lay transmission lines and export electricity to India." As the IPPs, including Japan Power, Fauji Kabairwala Power, and Liberty Power, had built their plants, they would be in a position to sell power to India through MNCs.

Obviously, India cannot be expected to pay for Pakistan's high IPP tariff rates and Pakistan cannot sell power below the rates it must pay the IPPs – a huge gap that remains to be bridged. However, a limited number of industries may still be willing to buy power from

[38] Masood, Malik, "A Note on Pakistan Power Sector/WAPDA Restructuring and Privatisation and other Issues of Interest for South Asian Energy Forum,*"South Asia Regional Energy Forum Proceedings,* USAID, Kathmandu, 1999.

Pakistan even at high rates. The World Bank, the guarantor of Pakistan's IPP loans; the countries where some of the major IPPs (like Hubco) are registered; and the IPPs themselves should attempt to play an advocacy role in identifying these industries. However, the existing gap is too wide to bridge through bargaining, a situation compounded by Pakistan's current lack of surplus power.

5.4 TRANSMISSION ARRANGEMENTS

The National Grid Company (NGC) of the U.K., the world's largest privately owned independent transmission company, is already operating in Pakistan on a large scale. It could play a major role in implementing India-Pakistan transmission interconnections.

To transmit the power that is expected to be available on the national grid, a massive program is now being undertaken to extend the transmission systems. Pakistan has a 500 kV primary transmission system extending from Jamshoro in the south to Tarbela and Peshawar in the north.[39] All these lines run near to the Indian border and may not require complex transmission extensions to cross over to India, as shown on the power transmission map of India's Punjab state (Figure 5-1). According to Pakistan's power minister, "there is a complete network on the Pakistani side and of course on the Indian side as well [length of the transmission lines on the Pakistan side is shown in Table 5-4]. What are needed are the connections, which would take only a couple of weeks."[40]

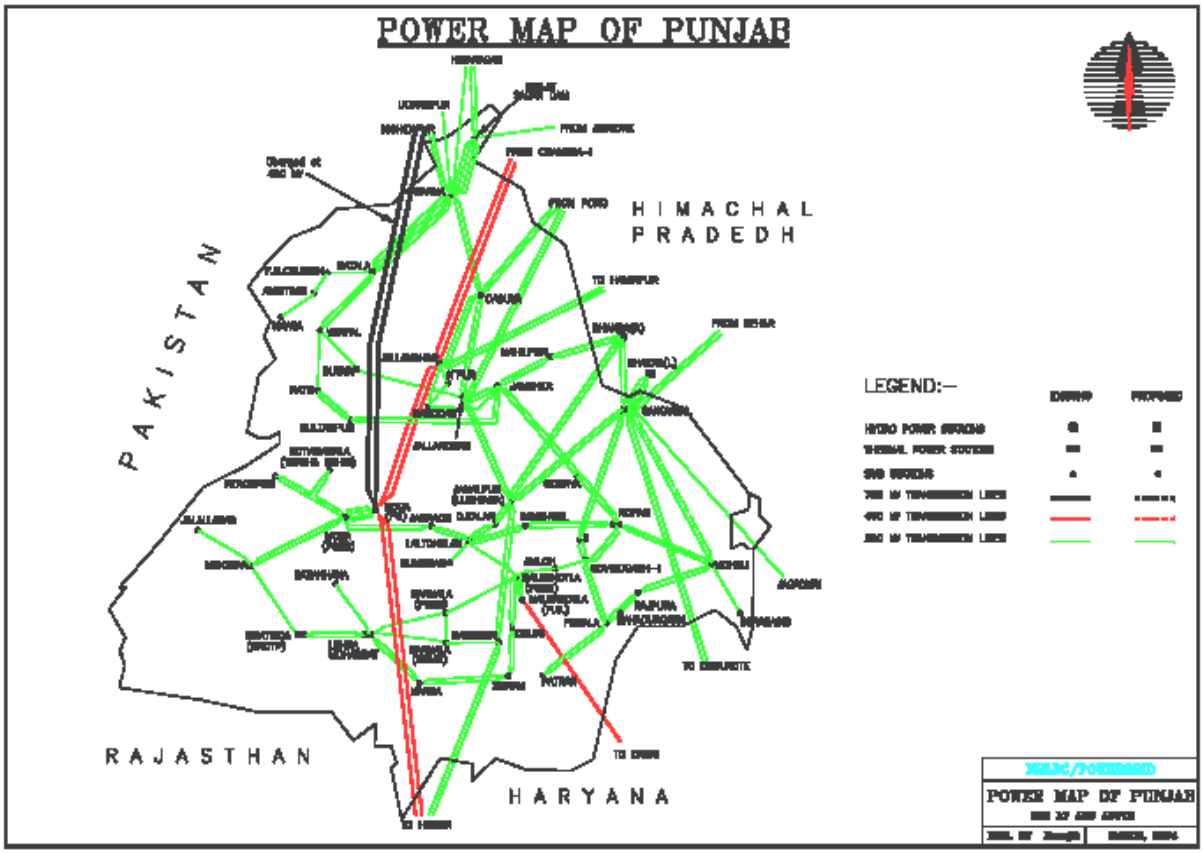

Figure 5-1 Power Map of the Indian State of Punjab

[39] The 500-kV transmission lines currently under construction in the public sector in Pakistan are estimated to be 1726 km long. An additional 1,727 km of 500-kV transmissions lines are planned to be constructed by the private sector.

[40] Statement by the Power Minister of Pakistan Gohar Ayub Khan, *Hindustan Times,* January 16, 1999. Also see Lama, Mahendra P., "Economic Reforms and Cross Border Power Trade in South Asia," *South Asian Survey,* New Delhi, September – December 2000.

Table 5-4: Length of WAPDA Transmission Lines and Number of Grid Stations in Service (500, 220, 132, and 66 kV)

Year	Total Transmission Line Lengths (km)	Total Number of Grid Stations
1998	42037	601
1999	42688	606
2000	43191	620
2001	43542	630
2002	43729	642
2003	45157	657

Source: Power System Statistics (26th, 27th, & 28th issue), Planning Department Power Wing (2001, 2003, & 2004).

WAPDA and KESC have a substantial number of grid stations and transmission line networks across the country. With 45,157 km of lines across Pakistan and 657 grid stations, most of the country is covered. The only exception is the border area of Balochistan where the electricity is provided by grid stations in Iran. The grid map for Pakistan is provided in Figure 5-2. It clearly identifies the grid stations where the Pakistani and Indian grids could be interconnected at minimal cost – the grid stations in Lahore and/or the grid station in Jamshoro. An additional grid is planned for Thar, which could bring the Pakistani grid even closer to the Indian grid. A large coal project is currently being implemented in Thar, with technical help from the Chinese, and could be a significant source of power export to India.

If the exchange of power between Pakistan and India were to take place, each country could construct and maintain a double-circuit, twin-bundled 220-kV transmission system from designated substations – Dinanath in Pakistan and Patti in India. PGCIL could play an active role in handling India's transmission of power purchased from Pakistan. As previously mentioned, there is a complete network of transmission lines and grids on the Pakistani side along the northwestern border of Indian Punjab.[41] In Pakistan, the K. Noor, Solar Electric Power Company (SEPCO), and Japan Power plants and the adjacent grids in Pakistan's Punjab province near the border of Indian Punjab are the potential locations, and can be used for onward transmission to the Indian distribution systems. The nearest grid on the Indian side of Punjab is Patti, located very near to Lahore Ring. Various possibilities exist for transmission through the Pakistani grids between New Kot Lakhpat and Raiwand to Patti in India. A 50-km high-voltage double circuit (HVDC) transmission line has been proposed for evacuating power from the Dinanath substation near Lahore to the Patti substation in Indian Punjab. If this is installed, it will likely bring about a major transformation in the political economy of regional cooperation in South Asia. As Figures 5-1 and 5-2 indicate, exchanging power between the Indian state of Punjab and the Pakistani province of Punjab would be easy and convenient.

[41] On the southwestern border, there are relatively few lines on the Pakistani side of Punjab. A weak transmission possibility (relatively low kV) appears to be from the Fort Abbas and Faqir Wali grids in Pakistani Punjab to the Indian lines near Anupgarh.

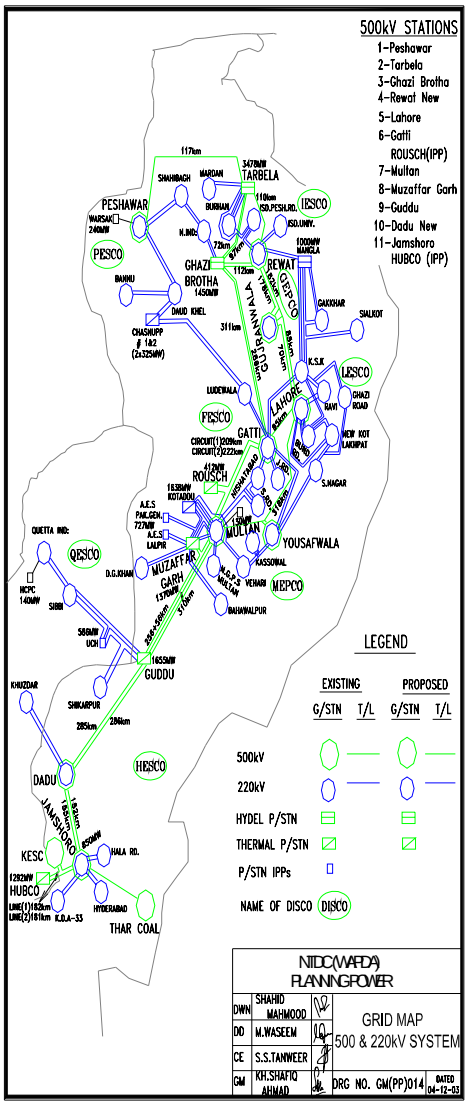

Figure 5-2 Power Map of Pakistan

Section 6 Power Market

6.1 NATURE AND IMPLICATIONS

Analyzing the demand-supply gap in the Indian and Pakistani power sectors is an essential first step in determining the potential for cross-border power trade. Both countries are large energy importers and have faced protracted power shortfalls due to excess industrial and residential demand that exceed their power-generating capacities. The demand for power is growing at a much faster rate than the supply, which has experienced some growth on an erratic basis. This has led to increased power cuts and rationing. A major portion of the demand comes from rural areas in both countries, as burgeoning rural populations gradually demand more and more power.

6.1.1 Seasonality in Power Generation

The seasonality factor in both generation and demand is noticeable. In India, there exists clear seasonality in power generation, particularly in hydropower. The peak months for hydropower generation are August to September, while the lean months are January to June. Thermal plant generation is primarily designed to match and balance the trough months created by hydro plants in winter and the pre-monsoon season, as has also been the case in Pakistan.

The maximum demand for electricity in Pakistan between 1998 and 2003 is shown in Tables 6-1 and 6-2. This data also illustrates the increase in demand, the extent of seasonal variations, and the load factor on generation capacity. The total change in peak demand has been about 22%, an annual growth rate of about 4.5%, which is likely to continue increasing.

It should also be noted that in Pakistan, there is substantial seasonality in peak demand. For 2002-03, the lowest demand was in February 2003 at 8,842 MW; peak demand was 11,044 MW in June 2003. In general, hot weather creates more demand for electricity than cold weather.

The difference identifies the potential for trade, even if there was no excess capacity in the system. As long as the demand for electricity in India is not perfectly and positively correlated with the demand pattern in Pakistan, trade will benefit both sides. It will not only create a conduit for excess electricity, it can also help in stabilizing the grid. On the other hand, in Bhutan and Nepal, the peak demand is usually during December and January, when generation from hydropower plants is low. Although February to April is the driest period, the demand in these months is relatively lower. In Nepal, maximum power demand occurs in December (391 MW) and minimum demand occurs in August (344 MW). Maximum supply capacity occurs in the wet months and the minimum occurs in the dry months of February-March (322/324 MW). There is capacity surplus during wet months (57 MW maximum during January) and capacity deficit during dry months. The situation in Bhutan is somewhat similar. The surplus power from these countries can be traded within the region as well if transmission interconnections are built to link their power grids, and linking the grids would be a practical demonstration of regional cooperation.

Table 6-1: Pakistan – Maximum Demand (MW)

Years	WAPDA	KESC	Total (Undiversified)	Total (Diversified)
1998	8825	1729	10554	10347
1999	9192	1730	10922	10708
2000	9289	1855	11144	10925
2001	9718	1860	11578	11351
2002	10108	1885	11993	11758
2003	11044	1885	12929	12675

Source: Power System Statistics (26th, 27th, & 28th issue), Planning Department Power Wing (2001, 2003, & 2004).

Table 6-2: Pakistan – Maximum Demand and Load Factor

Fiscal Year Ending June 30	Maximum Demand (MW)		Energy Generation (GWh)	Load Factor (%)
	WAPDA	Incl. Export to KESC		
1998	8825	9165	53259	66.34
1999	9192	9242	53683	66.31
2000	9289	9609	55873	66.38
2001	9718	10128	58455	65.89
2002	10109	10459	60860	66.43
2003	10835	11044	64040	66.19
Jul-02	10447	10622	N/A	N/A
Aug-02	10815	10880	N/A	N/A
Sep-02	10241	10246	N/A	N/A
Oct-02	9725	9760	N/A	N/A
Nov-02	9020	9104	N/A	N/A
Dec-02	8801	8992	N/A	N/A
Jan-03	8539	9296	N/A	N/A
Feb-03	8716	8842	N/A	N/A
Mar-03	9257	9318	N/A	N/A
Apr-03	9977	10055	N/A	N/A
May-03	10513	10548	N/A	N/A
Jun-03	10835	11044	N/A	N/A

N/A = data not available. Source: Power System Statistics 28th Issue (2004).

6.1.2 Demand-Supply Gap Projections

Both India and Pakistan have load forecasts in place for the next 15 to 20 years. Load forecasts, which cover only projected electricity demand, indicate yearly projections of likely demand over periods of 5, 10, or even 25 years. They help to ascertain the capacity and energy requirements of a particular country.[42] In most cases, the forecast basis involves a detailed review of the past level of electrical consumption, supplemented by overall development policies.

6.1.2.1 India's Demand-Supply Gap

In India, the demand for electric power has been increasing rapidly (consistently over 8% per annum). The country's annual energy requirement is on the order of 480 billion units, while

[42] Load forecasts also help to determine the direction and extent of investments required in the power sector. They are prepared in full consideration of the nation's economic growth rate, per capita GDP, population projections, consumer affordability (income and price elasticities), industrial growth rate, and historical trends. Load forecasts are also essential in formulating financial policies, tariff rates, and future fuel requirements.

availability is 450 billion units, resulting in an energy shortage of about 30 billion units (6.2 %). Consequently, the country is faced with chronic energy and power shortages. Within the power demand structure in India's five distinct regions, the western region ranks highest with over 33% of total power demand in the country, followed by the northern region with 28%; 27% in the southern region; and a combined 12% in the eastern and northeastern regions.

In India there are a range of projections based on different set of assumptions in each model. An FICCI study pointed out that the public sector is expected to generate 40,000 MW during 1997-2007 leaving a gap of 37,000 MW during the Ninth Plan (1997-02) and 41,000 MW in the Tenth Plan (2002-07). Unless the private sector steadily and extensively moves in, the peak demand shortage is projected to be almost 50-60%.[43]

The Ministry of Power Central Electricity Authority (CEA) in consultation with the Planning Commission has programmed a capacity addition of 41,110 MW (excluding non-conventional energy sources) during the Tenth Plan (2002-07). Of the total capacity addition of 41,110 MW--14,393 MW are allocated to hydro, 25,417 MW to thermal, and 1,300 MW to nuclear.

The demand projections per the government's 16th Electric Power Survey are shown in Table 6-3. This demand projection can be affected by a number of factors, including: the impact of reform on improving the power sector's operational and managerial efficiency (and associated cost reductions); changes in development policies and the effects of economic liberalization on investment trends; anti-theft legislation and reductions in transmission and distribution losses; tariff rationalization and its impact on demand through price elasticity; and the likely penetration of demand-side management options, power cuts, and frequency/voltage fluctuations.

Table 6-3: India – Projected Demand

Region	Energy Requirement (Million kWh)			Peak Load (MW)		
	2006-07	2011-12	2016-17	2006-07	2011-12	2016-17
Northern	220820	308528	429480	35540	49674	69178
Western	224927	299075	395859	35223	46825	61966
Southern	194102	262718	354599	31017	42061	56883
Eastern	69467	90396	117248	11990	15664	20416
Northeastern	9501	14061	20756	1875	2789	4134
All India	719097	975222	1318644	115705	157107	212725

Source: 16th Electric Power Survey, Central Electricity Authority, New Delhi, 2000.

The Ministry of Power's own estimates peg peak demand power shortfall at an alarming 20-21%. The situation in 2000-01 graphically illustrates the gaps in demand and supply (Table 6-4). In Delhi alone, the total estimated availability is likely to be barely 2,600 MW in 2002, versus an estimated demand of 3,500 MW.[44]

[43] *Outlook,* Delhi, October 19, 1998 and P Abraham, former Power Secretary, Government of India as quoted in *Times of India,* Delhi January 27, 1999.

[44] "Strategy Paper, (White Paper) on Reforms required in the Power Sector," Government of Delhi, 1999, as quoted in *Times of India,* Delhi, January, 1999.

Table 6-4: India – Regional Power Supply Positions in 2001-02

Region		Requirement		Availability		*Shortage (%)*	
	IC (MW)	Peak (MW)	Energy (MU)	Peak (MW)	Energy (MU)	Peak	Energy
Northern	28087	23200	150383	21346	142410	8	5.3
Western	31395	26510	175016	22024	156793	17	10.4
Southern	26954	22757	140516	19201	128095	15.6	8.8
Eastern	16190	7940	50687	7648	50197	3.7	1.0
North Eastern	2241	1148	5935	1043	5855	9.1	1.4
All India	104917	81555	522537	71262	483350	12.6	7.5

At the beginning of the Ninth Plan (1997-02), the energy shortage was 11.5% and the peak deficit was 18%. The actual power supply position in March 2002 on the eve of the beginning of the Tenth Plan indicates an energy deficit of 7.5% and peak deficit of 12.6%. The current shortage is due mainly to a growth in power demand that has outstripped the growth in generation and generating capacity additions. Table 6-5 shows that the eastern and the northeastern regions are expected to have surplus electricity by the year 2006-07. Given the fact that significant interregional transfers of electricity already take place in the country, this power is likely to be evacuated to other regions facing deficits (primarily the southern and western regions).

Table 6-5: India – Projected Power Supply Position in 2006-07

Region	Peak Demand (MW)	Peak Availability (MW)	Surplus/ Deficit (MW)	Surplus Deficit (%)	Energy Requirement (MU)	Energy Availability (MU)	Surplus/ Deficit (MU)	Surplus/ Deficit (%)
Northern	35540	29667	-5873	-16.5	220820	181468	-39352	-17.82
Western	36223	30210	-6013	-16.6	224927	191947	-32980	-14.66
Southern	31017	25348	-5669	-18.3	194102	158687	-35415	-18.25
Eastern	11990	14221	2231	18.6	69467	83273	13806	19.87
Northeastern	1876	2035	159	8.5	9501	11057	1556	16.38
A&N	49	40	-9	-18.4	238	183	-55	-23.11
Lakshadweep	11	6	-5	-45.5	44	28	-16	-36.36
All India	116706	101527	-15179	-13.0	719099	626643	-92456	-12.86

Source: 16th Electric Power Survey, Central Electricity Authority, New Delhi, 2000.

All the regional grids face perennial energy shortage except the eastern region, which has surplus power varying from 1,000 MW to 3,000 MW throughout the year. In other regions, seasonal surpluses occur mostly during off-peak hours, such as nighttime and during lean demand periods due to weather conditions and agricultural pumping loads.

The growth in regional demand-supply gaps is shown in Table 6-6. The increase in power deficits varies from region to region, from an all-India figure of 7.25% to 6.53% in the south. The highest increase for both power demand and supply is in the northeast.

Table 6-6: India – Growth in Regional Demand-Supply Gaps, 1988-01 (%)

Region	Demand	Supply	Deficit
North	8.06	8.22	7.6
West	7.53	7.54	7.49
South	7.14	7.29	6.53
East	7.49	7.67	6.87
Northeast	9.33	9.79	7.9
India	7.62	7.72	7.25

A regional projection of power demand and supply for the year 2012 indicates a serious shortfall in all major regions – northern, southern, and western (Table 6-7). Since the projected surplus power in the east and northeast regions will be insufficient to meet the gap in demand, importing power from neighboring countries will be the only least-cost viable option available.

Table 6-7: India – Supply/Demand Scenario Through 2012

Region	Present Demand 2001 (MW)	Projected Demand 2012 (MW)	Planned Central Govt. Capacity Additions by 2012 (MW)	Surplus or Shortfall (MW)
Northern	21,000	49,000	14,000	(-)14,000
Southern	20,400	42,000	10,000	(-)12,000
Western	24,900	46,000	16,000	(-) 5,100
Eastern/Northeastern	8,750	19,000	23,000	(+)12,750
Total	75,050	156,000	63,000	(-) 17950

Source: The Four Borders Project: Reliability Improvement and Power Transfer in South Asia: A Prefeasibility Study, prepared for USAID-SARI/ Energy Program by Nexant , November 2001, p 2-11.

Meeting projected power and energy demands through capacity additions would require additions on the order of 10,000 to 15,000 MW every year during the next 10 years. Such additions would be possible only if IPPs and mega-power developers participate in power sector development both in India and in neighboring countries. At the same time, optimum utilization of existing generating and transmission capacity is essential and can be achieved through consciously planning and promoting interstate energy exchanges from surplus to deficit systems. CEA has projected total power demand by region through 2016-17. Out of the total projected peak demand of 212,725 MW in 2016-17, more than 32% is likely to come from the northern region, followed by 29% from the southern, 26% from the western, and 9% from the eastern regions.[45] Clearly, the concentration of power demand will be in the northern and western regions, which opens the door to power imports from neighboring countries.

6.1.2.2 Pakistan's Demand-Supply Gap

If power consumption across all social and economic sectors were constant, projected power demand would be proportional to the aggregate sum of the sectors. However, power consumption differs from sector to sector. Changes in the composition of generation output and changes in power use efficiency in different sectors can result in a disproportionate growth in demand for power with respect to GDP.

[45] Central Electricity Authority, *Sixteenth Electric Power Survey of India*, Ministry of Power, New Delhi, September 2000; Parikh, Kirit S, (ed) *India Development Report 1999-2000,* Oxford, Delhi, p 114.

Power use efficiency may be defined as the ratio of growth rate of power sold to the growth rate of output. In Pakistan, the power use coefficient seems to vary with the growth of output. The efficiency coefficient was stable in the 1970s and 1980s but declined to 1.18 in the 1990s due to a slowdown in economic activity, resulting in lower demand. During this same period, there were also improvements in end-use efficiency as well as a sharp decline in system losses. An electricity tariff increase also lowered demand for electricity. Growing dependence on small, privately owned electricity-generating units has also contributed to the low coefficient (Table 6-8).

Table 6-8: Pakistan – Power Use Coefficient, 1971-2002

Year	Power Use Coefficient (E1)	Growth Rate of Output (GDP)
1971-1980	1.74	4.80
1980-1990	1.76	6.50
1990-2000	1.18	4.60
2000-2002	1.62	3.17

Note: The power use coefficient is defined as the ratio of growth rate of power consumption to growth rate of output.

Three projections made by different organizations are available. The Planning Commission's Working Group for the Energy Sector developed two power-demand scenarios based on GDP growth projections. The first is a normal consumption growth scenario and the second is high-demand scenario. WAPDA produced a load forecast based on 5%, 6%, and 7% GDP. WAPDA also prepared a forecast for energy generation for a higher growth scenario between 1997 and 2018. The Energy Wing of the Planning and Development Division prepared two power demand scenarios in its Ten-Year Perspective Development Plans 2001-2011 and "Physical Targets up to 2025," as shown in Tables 6-9 and 6-10, respectively.

Table 6-9: Pakistan – Demand for Power (MW)

Fiscal Year			Demand Projections	
			Normal Case	High-Demand Scenario
Seventh Plan	Actual	1987-88	5,821	
	Actual	1988-89	6,311	
	Actual	1989-90	6,699	
	Actual	1990-91	7,108	
	Actual	1991-92	7,641	
	Actual	1992-93	8,613	
Growth Rate for Power Demand			*8.15%*	
Eighth Plan	Actual	1993-94	9,135	
	Actual	1994-95	9,036	
	Actual	1995-96	9,317	
	Actual	1996-97	10,183	
	Projected	1997-98	10,927	10,927
Growth Rate for Power Demand			*4.87%*	
Ninth Plan		1998-99	11,821	11,927
		1999-2000	12,762	12,991
		2000-01	13,572	13,941
		2001-02	14,342	14,863
		2002-03	15,166	15,863
Growth Rate for Power Demand			*6.78%*	*7.74%*
Tenth Plan		2003-04	16,343	17,251
		2004-05	17,704	18,861
		2005-06	19,240	20,684
		2006-07	20,912	22,687
		2007-08	22,733	24,888
Growth Rate for Power Demand			*8.43%*	*9.43%*
Eleventh Plan		2008-09	25,117	27,751
		2009-10	27,789	30,985
		2010-11	30,747	34,600
		2011-12	33,488	38,030
		2012-13	36,474	41,803
Growth Rate for Power Demand			9.92%	10.93%
Twelfth Plan		2013-14	39,730	45,953
		2014-15	43,279	50,518
		2015-16	47,147	55,540
		2016-17	51,363	61,046
		2017-18	55,959	67,141
Growth Rate for Power Demand			*8.94%*	*9.94%*

Table 6-10 shows that maximum demand would grow to 12,578 MW by the year 2002-03 and to 20,924 MW by the year 2010-11. Projections for installed capacity, energy generation,

energy sales, system losses, number of consumers, and rural electrification targets are also provided in Tables 6-10 and 6-11.

A comparison of the projections developed by these sources shows that actual demand growth has been more subdued than even the most pessimistic scenarios prepared by the Working Group and WAPDA. Demand projections prepared by the Energy Wing represent a closer position relative to actual demand figures. Based on these projections, Pakistan would require roughly 6,000 MW in capacity additions by the year 2010 and another 20,000 MW by the year 2020. The actual demand will depend on how well (or badly) Pakistan performs in terms of overall economic growth in the interim period, and how much of the gross national investment is directed towards the power sector.

Pakistani power generation declined from 10% per annum in 1980-90 to 4% per annum in 2000-02. However, with a normal demand growth rate, WAPDA will face a 500 MW shortage in the year 2005-06, increasing to 5,529 MW by the year 2010.[46] To fill this gap, the Government of Pakistan has announced a power policy designed to encourage private investment in the power sector with the goal of increasing installed capacity from 13,188 MW (2002) to 48,284 MW (2025). However, a growing gap between installed capacity and peak demand will emerge – from 1,194 MW in 2002 to 10,174 MW in 2025. Given technological constraints this may indicate rising excess capacity. Figure 1 shows that peak demand is expected to fluctuate around 80 percent of installed capacity.

Table 6-10: Pakistan – Power Sector Ten-Year Perspective Development Plan Physical Targets, 2001-11

Item	Unit	Benchmark 2000-01	2001-02	2002-03	2003-04	2004-05	2010-11
Installed Capacity	MW	17710	18145	18592	19052	19964	26750
Growth Rate		5.7	2.46	2.46	2.47	4.79	5.99
Maximum Demand	MW	11205	11872	12578	13326	14206	20924
Growth Rate	(%)	2.1	5.95	5.95	5.92	6.60	7.00
Annual Energy	GWh	67539	70637	73877	77266	82026	118156
Gen. Growth Rate	(%)	3.7	4.59	4.59	4.59	6.16	6.83
Annual Energy	GWh	47808	50676	53717	56945	60954	92291
Sale Growth Rate	(%)	2.9	6.00	6.00	6.01	7.04	7.70
System Losses	(%)	29.21	28.08	26.95	26.3	25.66	21.89
Consumers	Mil.	13.75	14.35	15.35	15.75	16.43	20.55
Cumulative							
Rural	No.		1722	2000	2500	3000	3000
Electrification	No.	70544	72266	74266	76766	79766	102766
Cumulative							

[46] Government of Pakistan, *Pakistan Economic Survey 2002/03*, Islamabad, 2003.

Table 6-11: Pakistan – Power Sector Long-Term Physical Targets

Item	Unit	Benchmark	Targets				
		2000-01	2003-04	2010	2015	2020	2025
Maximum Demand	MW	11,205	13,326	19,555	27,282	38,811	54,434
System Demand Growth	%	2.1	5.95	6.60	6.89	7.30	7.00
Rate Addition in Demand	MW	452	2,121	6,229	7,727	11,529	15,623
Installed Capacity	MW	17,710	19,052	25,236	32,870	46,204	64,040
Growth Rate	%	5.7	2.46	4.80	5.43	7.05	6.75
Addition in Capacity	MW	1,866	1,342	6,184	7,634	13,334	17,836
Annual Energy	MWh	67,539	77,266	110,590	153,817	214,028	303,425
Generation	%	3.7	4.59	6.16	6.82	6.83	7.23
Growth Rate	MWh	4,789	9,727	43,324	43,227	60,211	89,398
Addition in Generation							
Annual Energy Sale	MWh	47,808	56,945	85,698	124,148	179,783	257,912
Growth Rate	%	2.9	6.0	7.05	7.69	7.69	7.48
Addition In Sales	MWh	2,695	9,137	28,753	38,450	55,635	78,128
System Losses	%	29.2	26.3	22.51	17.00	16.00	15.00
Cumulative Consumers	Mil.	13.75	15.75	19.95	23.95	28.95	34.45
Addition	Mil.	0.55	2.00	4.20	4.00	5.00	5.50
Villages/Abadies	No.	70,544	76,766	95,766	113,266	133,266	158,266
Electrified Cumulative	No.	2,252	6,222	19,000	27,500	20,000	25,000
Addition							

Source: Energy Wing, Planning & Development Division, Government of Pakistan.

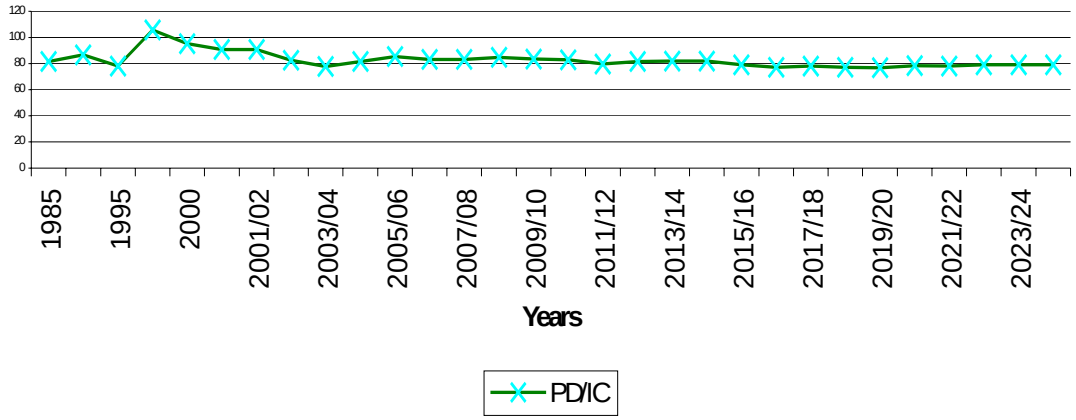

Figure 6-1 Ratio of Peak Demand to Installed Capacity

The forecasts in this section are based on a regression model. The growth rate of electricity sales would be affected significantly by the growth rates of output, electricity prices, and consumers, and the lagged dependent variable. For all variables, a three-year moving average is computed. The estimated results are:

GS = –2.355 + 1.277 GDP – 0.09 Price + 0.392 Consumers + 0.29 GS (t–1)
(1.73) (3.50) (2.208) (2.79) (1.489)

where:

GS = Growth rate of electricity sales
Price = Per unit price of electricity, including all surcharges
Consumers = Number of consumers
GS (t-1) = Lagged dependent variable

The estimated coefficients of all the variables have expected signs and all the coefficients, except the coefficient of GS (t – 1), are statistically significant. Assuming no change in the growth rate of electricity and in the growth of consumers, electricity demand growth rate was estimated for different levels of GDP growth rate. For GDP growth rates of 5%, 7%, and 9%, initially the electricity demand growth rate is expected to be equal to 6.9%, 9.5%, and 12.0%, respectively. Based on these initial growth estimates and the regression coefficients, reported above, electricity demand has been projected up to year 2025 (Table 6-12). Not surprisingly, estimates are extremely sensitive to GDP growth rate as increasing the growth rate of GDP by 4 percentage points (i.e., from 5% to 9%, is expected to increase the demand from 240,661 GWh to 977,652 GWh by 2025 (i.e., a fourfold increase in electricity demand).

Table 6-12: Pakistan – Sale of Electricity (GWh)

Actual 2002	51,906 GWh		
GDP Growth Rates	5%	7%	9%
2003	55499.09	56823.73	58148.37
2004	59466.81	62756.84	66134.08
2005	63757.32	69485.42	75543.88
2006	68369.55	76991.92	86400.99
2007	73319.22	85327.5	98854.45
2009	78628.39	94571.37	113114.8
2010	84322.38	104818.5	129436.3
2011	90428.82	116176.6	148114.2
2012	96977.51	128765.7	169487.7
2013	104000.5	142719	193945.7
2014	111532	158184.3	221933.1
2015	119609	175325.5	253959.3
2016	128270.8	194324.1	290607.1
2017	137560	215381.4	332543.4
2018	147521.9	238720.6	380531.3
2019	158205.2	264588.8	435444.1
2020	169662.1	293260.2	498281.1
2021	181948.8	325038.5	570185.9
2022	195125.2	360260.3	652467
2023	209255.8	399298.8	746621.6
2024	224409.8	442567.6	854363.4
2025	240661.2	490525.1	977652.8

Source: Figures calculated on the growth estimates and the coefficient of regression stated above.

Similarly, a variety of factors are believed to be responsible for the fall in industrial and agricultural consumption; the most notable are an economic slowdown and mounting tariffs and, in the industrial sector, the low cost of self-generation and unreliability of power suppliers like WAPDA and KESC. The growth rate in commercial consumption and in the industrial sector was 4% and 3% in 1990s. This has been mainly attributed to a much higher tariff regime, higher unauthorized connections and thefts in the sector, a climate of perceived insecurity of capital investment due to the nationalization policies of the 1970s, and, more recently, to the geopolitical situation in the area.

A key feature of demand management in the power sector is cross-subsidization, which involves lower tariffs for both domestic consumers and agricultural producers, and higher tariffs for commercial and industrial consumers. Nevertheless, over the past five years or so

there has been a consistent increase in tariffs on all types of power consumption, necessitated by a number of factors – including the rising share of relatively costly thermal power; relatively high-cost electricity purchases from IPPs, and excess IPP generation capacity (for which mandatory contractual payments were made). Ironically, prices tended to rise despite rapid generation expansion in the power sector. Against this backdrop, tariff restructuring has been a key component of the power sector reform program. Recently, power prices have been reduced, with a sharp reduction in the industrial electricity tariff. If the trend continues, it would eliminate tariff structure distortions.

Current rural electrification efforts in both Pakistan and India are going to stimulate a substantial increase in electricity demand. For instance in Pakistan, until 1995-96, rural electrification grew at rates ranging from 9% to 11% but slowed down to less than 2% in the subsequent period. Currently, 73,063 villages are electrified in Pakistan. Despite high costs of supplying power to rural areas owing to low load factors, rural electrification remains a major objective of power sector reform in Pakistan. There is also an increased emphasis on reducing transmission losses, which are particularly acute in rural areas.

6.1.3 Supply: Composition and Determinants

In India, the suppliers of bulk power are central generating stations, IPPs or mega-power projects, vertically integrated utilities and state transmission utilities in surplus areas, and Power Trading Corporation (PTC). The capacity of central sector stations has been fully allocated to states. All IPPs have long-term contracts assuming recovery of full fixed cost and return on equity at 68.5% Plant Load Factor (PLF). Some IPPs have even guaranteed power off-takes. However, given few suppliers of bulk power – mainly NTPC and the SEBs – and a lack of merchant generators, the supply side remains uncompetitive.

Currently, the total installed hydro capacity in Pakistan (all under WAPDA) is 5,039 MW, of which 3,478 MW is installed at Tarbela, the largest hydropower generator in Pakistan. On the other hand, the share of thermal power (generated by WAPDA is 4,735 MW, KESC is 1,756 MW and IPPs is 5,794 MW) is 69.03% (12,285 MW) in the generation capacity totaling 17,793 MW. Nuclear power generation capacity stands at 462 MW, of which 325 MW were added in 1999.

In the last decade or so, the need for rapid development in the power sector, especially under the privatization drive, has led to the emergence of thermal power projects. Consequently, the share of hydropower generation has declined significantly between 1988 and 2002, from 50.4% to 31.3% of total generation. The reliance on thermal power not only contributed to increased dependence on imported fuel but also led to higher tariffs, placing a significant financial burden on the largely state-owned power utilities.

These problems prompted a redirection of efforts toward optimizing the use of Pakistan's vast hydroelectric potential, while taking into account seasonal variations in the availability of water. However, due to long lead times associated with commissioning hydropower projects and interim load and peaking requirements, additional thermal plants have also been planned. In addition to its involvement in thermal power plants, the private sector would also help develop small and mini-hydro projects.

The three generation companies formed from Pakistan's WAPDA system thermal power plants are the Jamshoro Power Company, comprised of the 850 MW Jamshoro (Sindh) thermal power station and 174 MW Kotri (Sindh) gas turbine power station; Central Power Generating Company, comprised of the 1,655 MW Guddu thermal power station (Sindh); and

Northern Power Generation Company, comprised of the 1,350 MW Muzaffargarh thermal power station, 130 MW Multan natural gas power station, 244 MW Faisalabad gas turbine power station, and132 MW Faisalabad steam power station. Though the supply-demand gap remained positive in the past six years, within next couple of years, load shedding is expected to hit the country with a vengeance. It would require load management and new generation at regular intervals, necessitating annual investment outlays of a magnitude beyond the country's annual development outlays. It is, therefore, anticipated that future power development would be through BOO or BOOT mechanisms.

6.2 HYDROPOWER POTENTIAL

6.2.1 Installed Capacities

There are quite revealing variations in the installed capacities of power utilities in India and Pakistan. These variations also reflect potentialities as based on natural resources. As shown in Table 6-13, thermal power has gradually dominated the installed capacities in India (72%, mainly steam-based) and Pakistan (71%). Although South Asia has some of the richest sources of hydropower in the world, the share of hydro sources in both India and Pakistan has steadily declined.[47] The estimated hydropower potential of the countries in the region is shown in Table 6-14. However, only a very small proportion – barely 15% – of this great regional potential has been exploited so far.

Table 6-13: India and Pakistan – Installed Generating Capacities

Sector	India(MW)	Pakistan(MW)
Thermal	75931 (72.3% share)	13786 (71.58% share
Nuclear	2700 (2.57% share)	462 (2.39% share)
Hydro	26329 (25.1% share)	5010 (26.01% share)
Total	104960*	19258

*In addition to this figure, the installed capacity in non-utilities is over 16000 MW. *Sources:* Government of India, *Economic Survey 2002-2003,* Ministry of Finance; Hilal Raza et al, Pakistan Country Report 2003, CPD, Dhaka.

Table 6-14: South Asia – Installed Hydropower Capacity and Potential

Country	Hydroelectric Potential (MW)*	% Installed Capacity (MW)**	Harnessed as % of the Total
Bangladesh*	555	230	65.71
Bhutan**	30000	444	1.48
India	75400	25407	33.70
Nepal	83290	368	0.44
Pakistan	40000	5010	12.52
Sri Lanka	2000	1129	56.45
Total	231245	32588	14.09

**Power System Master Plan (PSMP), 1995.* ***Wangchuk, LK, Bhutan's Minister of Trade and Industry in an interview with *EnergySouth Asia,* New Delhi, January/February 2002, p 14.

In India, almost 45% of the total installed hydropower capacity is located in southern India. Northern India accounts for 34%, western India 11.5%, and eastern and northeastern India 9.4% of the total installed hydro capacity. Most revealingly is the situation in the northeastern

[47] For example in India, hydro sources constituted as much as 43% of the total installed capacity in 1970-71, which steadily declined to the current level of 25%. This is despite the fact that the installed capacity of hydropower underwent a 44-fold increase from a mere 575 MW in 1951 to almost 25,407 MW today. In Pakistan the share of hydropower in the total installed capacity has declined from 44% in 1980-81 to 30% in 1999. In Pakistan, the 1997 installed capacity of 15,996 MW was split between WAPDA (72% including Kot Addu), private producers (17%), KESC (9.5%), and Karachi Nuclear Power Plant (0.85%). Government of Pakistan, *Economic Survey 1997-98*, p 113 and *Statistical Abstract India, 1997*, Central Statistical Organization, Department of Statistics, Ministry of Planning and Programme Implementation, New Delhi, p 176.

region, which despite proven hydropower potential of over 48,000 MW, continues to lag behind on hydro development. Even hill states with large hydropower potential, such as Jammu and Kashmir and Himachal Pradesh, also lag in hydro development. Together, they currently constitute a meager 2.4% of total installed hydro capacity.

Considering the environmental advantages and the immense hydro potential in India, the government is renewing its emphasis on hydro development. Several multilateral agencies, including Japan Bank for International Cooperation (JBIC), are now lending to hydro projects. Power Finance Corporation (PFC) is also funding hydro projects.

Per WAPDA estimates, Pakistan has a total hydropower potential of about 41,721 MW, of which only 9,137 MW has been tapped thus far. This leaves Pakistan with an untapped potential of about 32,584 MW (Table 6-15). Large hydro projects take a long time to build and can have significant environmental impacts as well. But interestingly, Pakistan has a significant potential for hydro generation through small projects, which could also be tapped by the private sector. Larger projects, like Kalabagh Dam and Bhasha Dam, are also on the drawing boards, and the government has announced that one of these dams could be started by 2005. Hydro potential indicating location or name of project, capacity in MW, annual energy expected, and estimated capital required are summarized in Table 6-16. Most of the projects proposed for implementation, as presented in *Vision 2025,* are selected from this list.

Table 6-15: Pakistan – Total Hydel Potential (MW)

Province/(Area)	Projects in Operation	Projects Under Implementation in Public Sector		Projects in Private Sector	Projects where No Feasibility Study Established		Projects where Feasibility Study Established		Hydel Potential Un-tapped	Total Hydel Potential
		By Province	ECNEC Approved Projects, Construction not yet Started		Above 50 MW	Less than 50 MW	Above 50 MW	Less than 50 MW		
NWFP	3767.2	81	554	84	13584	426	58	143.9	14212	18698.1
Punjab	1698	N.A	96	N.A	N.A	349.65	3720	32.2	4102	5895.82
AJK	1036.1	4.8	969	828.7	1152	177	420	48.2	1797	4635.8
Northern Areas	93.732	18	N.A	N.A	10905	814	505	71.5	12296	12313.5
Sindh	N.A	N.A	N.A	N.A	80	48.55	N.A	49.5	178.1	178.05
Baluchistan	N.A	N.A	N.A	N.A	N.A	N.A	N.A	0.5	0.5	0.5
Total	6595.032	103.8	1619	912.7	25721	18152.2	4703	345.77	32584.97	41721.77

Source: Pakistan Hydel Power Potential (2004)

Table 6-16: Hydropower Potential of Pakistan

Projects	Capacity (MW)	Annual Energy (Mill kWh)	Cost Million US$
Golan Gol	106	464	100
Jinnah	144	868	387
Duber Khwar	160	701	147
Allai Khwar	125	548	93
Rohri	16	70	46
Lower UCC RD 283100	6	26	43
Main Line UCC RD 133296	8	26	43
B.S. Link (Head)	10	44	72
B.S. Link (Tail)	9	39	65
New Bong Escape, Mirpur	45	197	54
Madar Batduru, Muzaffarabad	10	45	10
Riali Saidpur	2	7	2
Jari Pirpur	1	4	1
Malakand-III	75	329	112
Renolia	12	52	11
Matiltan, Distt. Swat	84	368	94
Batai Khwar, Distt. Swat	8	35	14
Tarbela Extension	960	1900	509
Munda Dam	600	1845	930
Kuram Tungi	40	300	
Guddu	33	198	
C-J Link Tail	22	95	54
Sharmai Darora	115	504	152
Hari Gal	54	237	68
Kotli 2	97	425	71
Hariyota	12	33	33
Kalam (A1)	105	460	113
Kedam (B1)	428	1875	401
Madyan (C1)	150	657	212
Naran	219	959	720
Suki Kinari	652	2856	610
Chakothi Hattian	139	609	341
Kandia System	1025	4490	1155
Chor Nalah/Spat Gah	850	3723	1064
Kalabagh	3600	12460	5490
Shishi River	2	11	4
Summer Gah	28	123	21
Normal	3	13	7
Doarian Hydel Project	24	105	30
Luat hydel Project	10	44	13
Nagdar Hydel Project	16	70	20
Darai Khwar	28	123	31
Khan Khwar	70	307	87
Gulpur Hydel Project	60	263	108
Neelum-Jhelum	969	4244	1500
Kohala	500	2190	800
Taunsa	120	695	296
DG Khan Link-III	7	37	
Jagran	31		65
Basha Dam	3360	14129	4234
Tangar (Manur replaced)	13	55	
Nakar	9	47	10
Jabori	8	42	10
Karora New	7	37	8

Projects	Capacity (MW)	Annual Energy (Mill kWh)	Cost Million US$
Ushri Khwar	6	33	
Pairind	133	545	
Kotli	104	597	
Khazana	110	487	
Rajdhani	85	507	82
Rajdhani-2	97	398	121
Barali	66	398	
Sehra	65	16781	98
Dasu	2712	18109	3107
High Thakot	2415	8205	5170
Bunji	1500	4532	1500
Yulbo	710	4357	2852
Rakhiot	670	390	
Upper swat	105	1783	
Gabrul-Kalam	429	653	
Kalam-Kedam	147	4956	
Kalam-Madyam	625	3534	
Tungas	625	3661	3472
Spatgah-Churnala(I&II Combined)	877	2680	
Mahal	511	2487	958
Azad Puttan	462	2567	693
Karot	460	4362	828
Kaghn Valley Cascade	830	2586	
Munda Mirkhani	492	331	
Besham	63	1939	
Doyiam (NA)	425	386	346
Phandar (NA)	86	219	76
Hardo (NA)	41	221	33
Tormic (NA)	41	920	32
Swat A1	144	129	
Talu (NA)	25	1248	22
Altit (NA)	250	35	454
Bimbal	8	18	8
Gande Gah	4	232	6
Koto	53	1095	89
Astor Valley	250	1989	250
Karang	454	76	422
Gomal Zam	17.4	749	19
Chakoti	171		256
GRAND TOTAL:	31452	154195	41355

Source: WAPDA, *Hydropower Development Plan Vision 2025*, Lahore, 2002.

Appendix A Peace Dividend

Together, India and Pakistan account for over 90% of South Asia's total military expenditure. Both countries are now nuclear states. Mutual rivalry and mistrust shape the nature and size of military expenditures in both countries. Given the size of its economy, the burden of defense expenditure has been relatively heavier on Pakistan. With India's per capita defense expenditure of US$ 10 and Pakistan's US$ 26, the social and human cost has been enormous.

Broad estimates of the tradeoff between the purchase of the military hardware and the social services infrastructure that could have been created by equal spending are shown in Table A-1. The table shows how social services and infrastructure could have gained if defense spending had been reallocated in both India and Pakistan – particularly as both still have social services and infrastructure that are far below even average standards.

Table A-1: Estimated Human Costs of Arms Purchases

Military Hardware	Cost	Possible Social Service/ Infrastructure Benefits
Battle tank	US$ 4 million	Immunizations for 4 million children*
Mirage 2000-5	US$ 90 million	Primary school education for 3 million children**
Submarine	US$ 300 million	Safe drinking water for 60 million people***

Notes: * Immunizing a child against deadly diseases costs only US $ 1. ** It costs US$ 30 a year to maintain a child in primary school. *** It costs US$ 5 to supply safe drinking water to one person for one year. Source: Mahbub ul Haq, *Human Development in South Asia 1997*, Oxford, Karachi, 1997, p 85.

Both countries purchase military hardware against supplier credits, thereby steadily accumulating debt. Though there is no authoritative data available, this debt is estimated to run into billions of dollars. More seriously, in both countries, the current generation will likely incur the wrath of the next generation for having taken on massive debt to acquire unnecessary military hardware.

Several studies have estimated the peace dividends that could accrue from better relations between India and Pakistan. If sufficient confidence is built between these two countries triggered by a deeper and wider economic exchange, people-to-people contacts, and other institutional linkages, there is an increasing possibility that defense spending in real terms may finally decline. *Human Development in South Asia 1997* discusses three different scenarios for either freezing or reducing defense spending in India and Pakistan. Tables A-2 and A-3 show that the cumulative peace dividends of the three scenarios – a freeze in real terms, a 2% annual cut, and a 5% annual cut – would generate savings of US$ 80 billion, US$ 100 billion, and US$ 125 billion, respectively, between 1997 and 2010. Released as peace dividends, these funds could finance a wide range of social and development projects.

The state of human deprivation in both India and Pakistan is in sharp contrast to their massive spending on defense services to safeguard national security. However, the very concept of

national security is changing and increasingly being linked to human security. "The essence of real security lies in safeguarding people, not just in safeguarding borders."[48] There are examples like the USSR, Iraq, Somalia, and Nicaragua, all of which had very high military to social spending ratios. While those countries made military-based national security objectives their prime concern, they failed to provide the food, shelter, jobs and political stability that are the basic elements of human security.

Table A-2: India and Pakistan – Potential Peace Dividend (Freeze Scenario)

Year	Potential Military Expenditure (Annual Increase in Real Terms)		Recommended Level (Freeze at 1996 Level in Real Terms)	
	5 % Rise Pakistan (Rs billion)	6 % Rise India (Rs billion)	Pakistan (Rs billion)	India (Rs billion)
1996	115	255	115	255
1997	121	270	115	255
1998	127	287	115	255
1999	134	304	115	255
2000	140	322	115	255
2001	147	341	115	255
2002	155	362	115	255
2003	162	283	115	255
2004	170	406	115	255
2005	179	431	115	255
2006	188	457	115	255
2007	197	484	115	255
2008	207	513	115	255
2009	217	544	115	255
2010	228	577	115	255
Total Military Spending (1997-2010)	2372	5681	1610	3570
Peace Dividend	-	-	762	2111

Source : Mahbub ul Haq, *Human Development in South Asia 1997*, Oxford, Karachi, 1997, p 86.

Table A-3: India and Pakistan – Potential Peace Dividend (2% and 5% Scenarios)

Year	Annual Reduction of 2 % (In Real Terms)		Annual Reduction of 5 % (In Real Terms)	
	Pakistan (Rs billion)	India (Rs billion)	Pakistan (Rs billion)	India (Rs billion)
1996	115	255	115	255
1997	113	250	110	242
1998	111	245	104	230
1999	109	240	99	219
2000	106	235	94	208
2001	104	231	89	197
2002	102	226	85	188
2003	100	221	81	178
2004	98	217	77	169
2005	96	213	73	161
2006	94	208	69	153
2007	92	204	66	145
2008	91	200	62	138
2009	89	196	59	131
2010	87	192	56	124
Peace Dividend	980	2603	1248	3198

Source: Mahbub ul Haq, *Human Development in South Asia 1997*, Oxford, Karachi, 1997, p 86.

[48] Mahbub ul Haq, *Human Development in South Asia 1997*, Oxford, Karachi, 1997, p 84.

Table A-4 is a snapshot of the scale and nature of social deprivation in the two countries. For instance, there were 45 million children who were out of school in India in 1995, which is likely to increase to 78 million by 2010. In Pakistan, over 71 million people did not have access to safe drinking water in 1995, which is likely to rise to 137 million by 2010. In other words, if the two governments do not reallocate funds from new development sources or divert funds from military spending to these basic areas of human development, the situation could become much worse in the next decade or so. South Asia abounds in local and regional examples of how deprivation can lead to conflicts and instability, fueling the need to spend ever-greater amounts on both internal and external security.

Table A-4: India and Pakistan – Backlog of Major Human Deprivations, 1995-2010 (in Millions)

Parameter	India	Pakistan
Education		
Out of school children (1995)	45	17
Increase in primary school-age group (1995-2010)	33	10
Total children to be provided schooling	78	27
Health		
No access to basic health care (1995)	140	63
Additional population to be provided basic health care (1995-2010)	286	66
Total no of people to be provided health care during 1995-2010	426	129
Safe Water		
No access to safe drinking water (1995)	234	71
Additional population to be provided safe water (1995-2010)	286	66
Total number of people to be provided safe water (1995-2010)	520	137
Nutrition		
Number of malnourished children (1995)	63	9

Source: Mahbub ul Haq, *Human Development in South Asia 1997*, Oxford, Karachi, 1997, p 106.

Human Development in South Asia 1997 estimates the cost involved in eliminating at least some of the major symptoms of deprivation in both India and Pakistan. The additional cost for providing basic health care to the entire population in the two countries by the year 2010 is estimated to be US$ 25 billion or roughly US$ 1.6 billion a year (Table A-5). If all five basic human development priorities – primary education, safe drinking water, basic health care, malnutrition care, and family planning services – are provided, the cost is likely to be US$ 108.6 billion between 1995 and 2010 (US$ 7.24 billion a year). This is equivalent to about 1.53% of the cumulative GDP of US$ 7,089.2 billion of both countries, assuming an annual growth rate of 5%. If both these countries earmark 20% of their budgets for the five priority areas and bilateral and multilateral donors earmark 20% of their assistance for the same priorities (versus the prevailing 9%), India and Pakistan could easily meet their target by reallocating funds generated by defense spending cuts (i.e., the peace dividend).

Table A-5: India and Pakistan – Additional Cost of Essential Human Investment, 1995-2010 (US$ Billion)

Objectives	India	Pakistan
Universal primary education to all children	23.0	7.9
Safe drinking water to the entire population	24.4	6.6
Basic health care for the entire population	19.0	6.1
Child malnutrition eradication	0.63	0.09
Family planning services (80% coverage)	17.3	3.6
Total	84.3	24.3
Cumulative GDP (1995-2010)	5878.9	1210.3
As % of cumulative GDP	1.4	2.0

Source: Mahbub ul Haq, *Human Development in South Asia 1997*, Oxford, Karachi, 1997, p 107.

Appendix B Calculation of Profit to Pakistan from Export of 3000 MW Power to India

Cost Calculations/kWh

S.No	Particulars	Amount
1	Tariff for 24-hour supply at the Indian Border/kWh	2.48
2	Pakistan's Margin	0.38
3	NREB transmission charges	0.15
4	NREB transmission Losses	0.09
5	Interconnection Charges	0.12
6	Trader's margin	0.03
7	Total landed cost to the customer at Indian bus-bar	3.25

Quantity of Power Exported Annually

Assuming that 3,000 MW power is exported 24 hours a day for 365 days at a plant load factor of 70%, the quantity of power sold per annum would be:

3,000 MW x 0.70 (PLF) x 24 (hours) x 365 (days) = 18,396 million kWh
(say, 18,400 million kWh)

Annual Profit

Profit for sale of 18,400 million kWh @ Rs 0.38 = Rs 6,992 million
Taking a conversion rate of US$ 1 = Rs 43.50, the above profit = US$ 6,992/43.50 = US $ 160.73 million/year (say, US$ 160 million)

- **like Afghanistan and India to trade power.**

U. S Agency for International Development
1300 Pennsylvania Avenue, NW
Washington, DC 20523
Tel: (202) 712-0000
Fax: (202) 216-3524
www.usaid.gov