



# Energy Security

## Challenges and Prospects for Bangladesh and South Asia

### Conceptual background

The term 'energy security' is used widely to refer to a number of different issues, including the pressures supply from rapidly industrialising China and India, liberalising markets to produce interdependence between countries, protecting pipelines from attack and diversifying from fossil fuels to renewable. However, these are issues not necessarily unrelated to each other. Thus, energy security can be defined as a condition in which a nation perceives a high probability that it will have adequate, sustainable, energy supplies at affordable prices and at all times. Prices are defined as affordable if they stop short of causing severe disruption of normal social and economic activity. It is imperative for leaders to perceive months, indeed years, in advance that their countries will have adequate energy supplies at affordable prices. Without such foresight, it is conceivable that economic and social activity will be truncated by market, distribution or planning constraints.<sup>1</sup>

Two major economic and political components under grid energy security: first is the 'set of all actions that affect the quantity and reliability of indigenous energy supplies'. The second includes actions 'affecting external energy supplies'.<sup>2</sup> A close relationship exists between the two components, particularly in that problems with indigenous supplies generate pressure for increasing energy imports. It is the latter component which induces the most immediate challenges to national security. Energy security is enhanced and assured by managing energy demand, raising domestic levels of energy production, and/or increasing the reliability of imported or domestic supplies. Studies on national and international security tend to concentrate on the following factors: (1) Social, cultural and political, (2) Economic, (3) Military. The complexities and challenges posed by energy security interact with all three factors. Measures taken by countries in pursuit of energy security may increase or decrease overall independence of action and security; the outcome of this interaction may in turn, feed back and influence the level of energy security. This relationship forms one part of a broader and even more complex interaction among domestic politics, foreign policy, regional and international politics. The issues of energy and security are taken to be one component of political economy, or 'the reciprocal dynamic interaction in international relations of the pursuit of wealth and the pursuit of power'.<sup>3</sup> Stress is placed on the inseparability of economics and politics with particular reference to South Asia.

This edition of BIPSS *Issue Brief* focuses on the challenges faced by South Asian countries in their efforts to contend with energy security. It will elucidate solutions that at once address regional and national concerns. Special emphasis is placed upon Bangladesh and, consequently, it will dedicate specific solutions for allaying her impending energy 'crunch' as proven gas reserves dry up.

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### Energy Security: The Global Dilemma

The International Energy Agency (IEA) summarises the issues of energy security facing the world as insufficient and secure supplies at affordable prices.<sup>4</sup>

- Environmental harm caused by consuming too much fossil-fuel energy
- The need to diversify production and consumption both by geographical location and fuel type
- The impact of rising oil and gas demand increasing the vulnerability of consumers to disruption and price shock

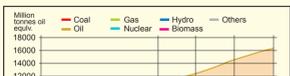


Fig. 1: World Primary Energy Demand

The IEA's principal concerns are environmental and economic. Other observers of the world energy scene have raised concomitant political risks:

- Tightened competition over depleting energy sources
- The new scramble for Africa's oil and gas
- The security of supplies from the Middle East and instability of their governments' dependency on 'petrodollars'
- The future of Iraq, with the second largest world oil reserves
- Energy-rich countries using energy supply and price as a political weapon

### South Asia: Current Challenges

This section considers the energy security challenges facing individual countries comprising South Asia. It is implied that the best, most effective means for these countries to resolve energy security challenges are through cooperative frameworks including but not limited to, power trading for instance.

Table 1: Energy Supply Indicators South Asian Countries

Countries	Fossil Fuel Proved Reserves				Fossil Fuel Production				Electricity Generation, 2007 (Million kilowatt hours per year)	Crude Oil Refining Capacity, 2007 (Thousand barrels per day)
	Crude Oil (Million barrels)	Natural Gas (10 <sup>12</sup> cubic feet)	Coal (Million short tons)	Hydro (Million short tons)	Proven Reserves (Million short tons)	Production (Million short tons)	Capacity (Million short tons)	Capacity (Million short tons)		
Bangladesh	28	5	0	6.1	0.42	0	3.6	33		
Bhutan	0	0	0	0	0	0	0.07	0.4	0	
India	547.8	38.9	101.9	857.9	0.96	403.2	126.3	2,255		
Maldives	0	0	0	0	0	0	0	0.04	0	
Nepal	0	0	0	0	0	0	0.01	0.7	0	
Pakistan	299.3	24.2	3.4	61.6	0.84	3.7	18	269		
Sri Lanka	0	0	0	0	0	0	0	2.8	50	
Total	6,165.00	62.1	105.3	926.3	2.22	407	157.8	2,607		

<sup>1</sup> Includes crude oil, natural gas, peat, lignite, other lignite, and refinery processing gas.

Source: Oil and Gas Journal, EIA-International Database, February 2006

### India

Fuel import dependency within India, as a percentage of total energy demand, has risen from 23% to 30% over the last two decades. India's dependence on imported oil has increased dramatically to 75% over the same period and is projected to grow to 85 per cent by 2012.<sup>5</sup> Unfortunately, such increases burden the balance of payments and the broader economy including inflation thereby threatening growth.

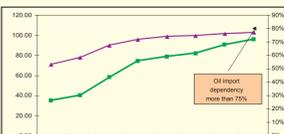


Fig. 2: Crude Oil Imports

In fact, annual inflation has risen sharply since March, when it hit 7.7%, and is well above the government's target of between 5% and 5.5%. Energy costs make up 14.2% of the inflation index and some economists are estimating that the hike will further lift the inflation rate by 50-110 basis points.<sup>6</sup> Concerns over oil supplies due to political unrest in the Middle East coupled with high energy prices in the international market pose apprehensions as to future supplies' particularly when India's demand for oil imports will continue increasing in the near future. To sustain growth strategically and to continue

alleviating poverty, additional capacity ranging 101,000 to 292,000 MW must be installed over the next two decades. Two thirds will be derived from thermal sources. This will mean a spiraling cost for imported fuels, including coal, 'since even a doubling of domestic coal production would not be sufficient to meet the demand'.<sup>8</sup> It will also mean a surge in emission of environmental pollutants.

### Pakistan

During the next 20 years, Pakistan's energy demand will increase by 350 percent, yet the percentage of its total energy needs met from indigenous sources will fall from 72 to 38 percent.<sup>9</sup>

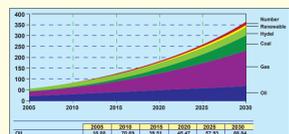


Fig. 3: Energy demand projections by fuel

These increases are exacerbated by energy intensity levels (kWh per unit of GDP) that are currently higher than both India and China. Pakistan must address its supply and demand issues urgently if it is to sustain projected growth rates of between 6-7%. In 2003-04, per capita primary commercial energy consumption in Pakistan reached 337 kilograms of oil equivalent (kgoe),<sup>10</sup> comparatively higher than India but less than the world average of over 1,500 kgoe. Approximately 28% of total commercial energy is imported, and despite a diversity of sources, 80% of that energy supply is from oil and gas.<sup>11</sup> Balance on imported fuels is expected to increase and concurrent with price hikes, will negatively impact on the country's foreign reserves-oil import bills were \$11.38 billion in 2007-08, up by more than 55 per cent since last year.<sup>12</sup> Yet, Pakistan has potentially huge indigenous reserves of energy which remains untapped.<sup>13</sup> An important concern relates to the country's high dependence on imported oil. Given that Pakistan has more resources of natural gas than oil, substitution of gas for oil is considered a viable option. Known reserves of gas are limited, and electricity demand is increasing as the grid supply is being extended to remote areas and to households in the electrified villages. Judging current estimates, the

demand for gas in Pakistan will exceed supply by 2010. Subsequently, gas will have to be imported whether that is through an Iran-Pakistan-India pipeline or the 'dolphin project', i.e. Qatar-Pakistan.



Fig. 4: Proposed Regional Gas Pipeline Routes

### Bhutan

In spite of having the highest of 'Gross National Income' in the region, only 40% of the total population and 30% of the rural population in Bhutan have access to electricity.<sup>14</sup> The country has significant energy resources with an estimated hydropower potential of 30,000 MW that can be exploited to further advance its economic development including country wide electrification.<sup>15</sup> Bhutan's energy concern revolves around its growing demand for oil products to support the transportation sector. Another concern for Bhutan will be ensuring that benefits accruing from the country's natural hydropower potential reach targeted sectors of the economy, particularly the rural areas.

### Maldives

Maldives has a population of only 340,000. Population growth, even at the present high rate of nearly 3% per year, is not likely to exert serious pressure on energy demand. Pressure on energy demand is led by the country's modernization and urbanization plans and the vibrant tourism industry. For instance, reduction of pollution by private transportation is essential in preserving the high quality of the environment-a chief attraction for foreign tourists. Exploitation of renewable energy sources (i.e. wind and solar) is therefore imperative. On the other hand, geography makes Maldives too distant to be able to play a meaningful role in promoting regional energy cooperation; within a regional energy grid for instance.

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### Nepal

Whilst having the lowest economic growth rates at around 3.6%, it is sufficiently endowed with enough hydropower potential to be able to export to Bangladesh, Pakistan and India. Around 86% of Nepal's energy needs are met through biomass whilst around 40% of the population has access to electricity. Thus the per capita consumption of commercial energy is very low at only about 41 kgoe in 2003-16. In Nepal, the major energy security concerns three fold. Firstly, reducing dependence on forest fuels: The energy economy is heavily dependent on biomass resources. Emerging signs suggest forests are already being depleted, resulting in fuel scarcity. Secondly, ensuring price stability in the energy sector: 74% of commercial energy consumption is from petroleum products, all of which are imported, and considering the state of international oil markets, volatility and high prices, it is bound to cause 'shocks' to the economy. Thirdly, the decade-long Maoist insurgency has damaged the country's infrastructure and undermined attempts to improve access to electricity. Even today, with Maoists in government, Nepal would find it a challenge to exploit its hydropower potential without regional support, simply because its topography and weather patterns present problems for the building and maintenance of infrastructure.

### Sri Lanka

Sri Lanka has a limited amount of hydropower and limited forest fuels. Like the country noted, it's most important concern is the import of oil. Currently, oil imports consume 30% of export earnings and about 6% of GDP. With increases in oil prices, its export earnings are diminishing. Sri Lanka bought 1.1 billion dollars worth of oil in the first four months of 2008, up 76.3 percent from \$92 million dollars spent in the corresponding period last year, widening the trade deficit to more than two billion dollars.<sup>17</sup> Exploration of oil and gas in the Gulf of Mannar Basin and other places have not yielded positive results. The country has no proven fossil fuel deposits, consequently, its entire energy resource development potential is limited to indigenous sources such as biomass and hydropower and the continuing oil and gas exploration. Sri Lanka is thus vulnerable to insecurities in the oil supply chain and the high prices that augment problems of dependence primarily on one energy source.

### Energy security and Bangladesh: The Challenges

Bangladesh ranks among the world's lowest per capita energy consumers.<sup>19</sup>

Table 2: Comparison of energy usage

Economy	Commercial energy use		Per 1000		Net energy imports	
	Thousand metric tons of oil equivalent	kg of oil equivalent	Per 1000	Per 1000	% of commercial energy use	% of commercial energy use
World	1,122,683	24,327	190	1997	1992	1997
Bangladesh	20,036	24,327	190	197	1.0	10
Low income	1,122,683	1,194,960	607	563	-1.2	-7
Lower middle	2,438,911	2,394,960	1,302	1,178	-1.2	-8
South Asia	438,330	586,696	394	443	1.9	16
World	8,909,416	8,411,300	1,700	1,492	0.0	-

Source: World Bank, World Development Report 2000: 'Attacking Poverty'

Comparable to other countries in South Asia, biomass forms a major source of energy-constituting 55% of the total energy demand.<sup>20</sup> Natural gas meets 24% of the country's total fuel need while hydroelectricity provides another 2%. Yet two third of the country's commercial energy consumption is met from natural gas while the remainder is from oil augmented by hydropower and coal.

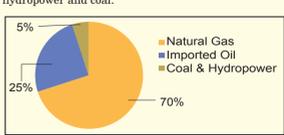


Fig. 4: Commercial energy consumption trend.

Only 32% of the total population (22% of rural population) has access to electricity. Accordingly, Bangladesh's economic development is intertwined with its management and usage of natural gas. Bangladesh's current proven reserves of around 15 Trillion Cubic Feet is to run out by 2025 if not earlier, consequently posing immediate supply-side challenges.<sup>21</sup> Therefore, two fundamental energy issues face Bangladesh: improved energy access for the general population-necessary for enhancing the development and the proper management and efficient exploitation of its natural gas resources. According to estimates by the World Bank, the economy loses \$1 billion annually due to unreliable electricity supply. Regarding its probable gas reserves, Bangladesh has the potential to become a major producer and at least in the short-term, could produce enough for export and therefore provide needed foreign exchange. However, questions abound on what the probable reserves actually are and coupled with domestic hostility towards export, export prospects seem remote.

### Mitigating the Challenges

1. **Encourage private sector development of natural gas reserves:** Through Product Sharing Contracts (PSC's), Bangladesh has entered into agreements with international companies to explore and develop its natural gas reserves. There is a need for the government to launch a vigorous campaign to attract foreign and local investment in the energy sector. Bangladesh's energy sector has every potential to attract foreign direct investment for small and medium range industries, which use natural gas as raw material.
2. **Develop nuclear power:** There is an estimated shortage of 1500-2000 MW in the national grid. With anticipated growth of the economy in the coming years, the power sector will consume two-thirds (9.6 feet) of the remaining 15 feet of proven gas reserves by 2025. Nuclear power would be able to meet the supply deficit. To be sure, alternative sources for producing electricity such as coal are necessary sources for the overall energy mix but certainly not sufficient to ensure Bangladesh's economic development is sustained long-term. Nuclear power is environment friendly, there is no gaseous pollution, liquid waste is limited, and the problem of solid waste disposal is solvable. The cost of nuclear generation is low because the high investment cost is made up by low fuel cost over a long period. Consequently, a nuclear power plant is used as a base load station. The lifetime of a nuclear power station is estimated at 40-60 years, instead of 50 years, thus improving the generation cost. If the lifetime estimate is extended to 70 years, then even the decommissioning cost can be included in calculating the generation cost.<sup>22</sup>
3. **Develop Coal:** The total reserves of coal within Bangladesh are estimated at about 1.75 billion tons but at present underground mining has been initiated only at Barapukuria (one of the major coal deposits), with a production level of one million tons per year. By expanding its coal production, Bangladesh can reduce its reliance on energy imports and diversify away from natural gas.<sup>24</sup> The financial resources of both domestic and foreign sources should be encouraged for exploiting coal reserves, possibly in the same structure as PSC's.
4. **Develop renewable energy technologies:** Although financial and resource constraints provide limited scope and potential for wind and solar, strong possibilities exist for increasing biomass-based energy through advanced technologies such as bio-gasification.<sup>25</sup> The relationship between climate and

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5. **Explore regional electricity and gas grid:** The mutual benefits for linking the Indian and Bangladeshi power grids to facilitate cross-border power exchanges are considerable. Various parts of Tripura, Mizoram, and other northeastern Indian states could be served more economically by power imports from eastern Bangladesh. In turn, western Bangladesh has only 755 MW of installed capacity, well below actual demand. Instead of adding new generation capacity locally to meet this demand, western Bangladesh could be better served by importing power from India.<sup>26</sup> Such arrangements can have supplementary benefits for the region including increased cooperation in other spheres and mutually beneficial trade.
6. **Support institutions to explore and promote regional energy security options:** It is apparent that countries in the region face related challenges and to some extent similar socio-economic development plans such as increasing the electrification of entire countries. For Bangladesh, achieving this would require objective examination of multilateral frameworks for systematic and coordinated cooperation. Progress has been made through the establishment of a SAARC Energy Center (SENTRO). Considering Bangladesh's energy security strategy which in part relies on import of hydro-based electricity from Bhutan and/or Nepal, especially in the rainy months when Bhutan and Nepal have a sizable excess capacity and the electricity demand in Bangladesh is higher. It would therefore make sense and be relatively easy to Institutionalise such cooperation.
7. **Towards regional cooperation**  
It must be understood that evoking national policies to address energy security challenges is simply not enough. Regional policies must be developed and support, if not integrated, into national strategies. More than that, leaders would be advised to collaborate with their counterparts in neighbouring countries so as to have regional policies in sync with their partners. It will become apparent that such cooperation would ensure efficient, sufficient, secure, long-term supplies that would also be sustainable in the long run when demand is expected to increase exponentially due to the growth and development of the region.

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Table 3: Energy demand forecast in South Asia (2019-2020)

Fuels	Unit	Bangladesh	India	Nepal	Pakistan	Sri Lanka
Electricity (total)	BWh	72.7	1796	0.36	251.60	23.8
Growth rate:	(%)	8.2	7.1	0.1	7.5	7.2
Oil production:	Mtoe	15.8	246.9	1.81	20.9	7.8
Growth rate:	(%)	7.3	4.8	4.8	4.5	6.2
Natural gas:	Mtoe	44.03	101.48	0.1	72.7	0
Growth rate:	(%)	11	8	0	9.2	0
Coal:	Mtoe	11.2	10.8	0.78	1.2	7
Growth rate:	(%)	3.7	6.2	10	9.4	-

Growth rates refer to the period 2003-4 to 2019-2020  
Source: Stanikar (2005)

### 1.Reducing the Impacts of High Volatility in the Oil Market

The intensity of price fluctuations in recent years has warranted particular concern from South Asian countries. Policies which should be considered in this regard are:

- **Creation of an oil price contingency fund** by levying a tax on the sale of oil and oil products to finance the additional cost burden during short price spike periods
- **Building a strategic petroleum reserve** over time that would be used during periods of high prices and replenished when prices decline.

### 2. Diversifying Sources of Fuel Supply

Most of the oil imports to South Asia emanate from the Middle East. Diversifying the sourcing of fuels will help mitigate some of the risks associated with an over dependence on crude and petroleum products from that 'turbulent' region. On the other hand, low energy consumption in the region necessitates collective action for such a diversification policy because transporting oil from Venezuela for instance, would incur huge logistical and procurement costs otherwise. In addition, oil prices could be made more reasonable if purchased collectively and in great quantities.

### 3. Diversifying Supply by Fuel Type—Balancing Single-Source Dependencies

There is a need to diversify dependency on primarily a single source of fuel, to avoid the risks associated with having 'all eggs in one basket' as it were. This may involve cooperative pipeline arrangements. For instance, the Iran-Pakistan-India pipeline will balance both countries' dependency on increasing oil imports. India's oil production is around 30 million tons per annum, whilst imports top up nearly 100 million tons and is increasing.<sup>27</sup> States can also consider increasing use of large scale renewable sources, increasing use of biomass, wind energy, and photovoltaic systems for example.

### 4. Universal Electricity Access—Reducing Poverty and Accelerating Economic Growth

The positive relationship between energy provision and economic development has encouraged most governments in the region to institute plans for countryside electrification. While these are praiseworthy goals, numerous challenges ensue. Besides the financial implications of undergoing the implementation of such electrification plans, the corollary of demand growth for fuel. Even Bhutan and Nepal, which have substantial hydroelectric resources, are constrained during the winter season when water flows are low. Nonetheless, supply-side options should also be considered. This should include examining the option of establishing small power exchanges and interconnections across national borders that could help electrify villages at a relatively lower cost compared to expanding the main electricity grid by laying expensive transmission and distribution lines to meet relatively small loads.

### 5.Transport Sector Fuel Requirements—Diversifying Single-Source Dependencies

Growing demand for transportation fuels, primarily oil has been a major factor behind recent growth in South Asian oil consumption. Between 1990 and 2000, South Asian oil consumption led by India, grew by about 75 per cent.<sup>28</sup> The volatility and high prices of oil commodities constitutes an energy security risk for all countries in the region. India, Bangladesh, and Pakistan have introduced compressed natural gas (CNG) as a transport fuel and are actively trying to enhance and expand its use.<sup>29</sup>

### 6. Regional Energy Grids—Diversifying Energy Supply

Unfortunately, in spite of the incentives for cooperation, the region lacks any regionalised distribution systems. Longstanding disputes, political exigencies, and mistrust between the countries of the region have effectively blocked even modest efforts to encourage regional energy trade. This is a sad situation given the complementary opportunities for these countries to capitalise on their energy resource endowments for mutual benefit. While the current climate of spiraling energy prices has triggered renewed interest in regional energy trade, much work remains to be done for it to become a reality. Strategic options for regional energy trade to mitigate energy security risks are highlighted below.

- **Regional Electricity Grid:** A prerequisite for power trading in the region is the establishment of a regional power grid.
- **Regional Natural Gas Grid:** Limited gas reserves

and national priorities have discouraged South Asian countries from exporting natural gas. There is an opportunity for these countries to import gas from outside the region through gas pipelines operated on a common carrier basis, jointly developed and owned by the participating nations.

### 7. Energy Sector Master Plan—Promoting Indigenous Resource Development

South Asian countries should develop a regional energy sector master plan that will not only set a realistic view of energy resources, demand profiles, and growth scenarios but emphasize joint development mechanisms aimed at maximizing investments in shared energy infrastructure and resource development. Considering the development of a Hydropower Master Sector Plan,<sup>30</sup> South Asia has an economic hydropower potential of over 211,431 MW which, when developed, would afford opportunity for energy trade within the region to bridge the demand-supply gap.<sup>30</sup> One objective of such a master plan would be to facilitate an integrated planning mechanism to identify the hydropower sources that would meet the power needs of the region at an affordable cost.<sup>31</sup> This will also help maximize the benefit from hydropower development and rationalize utilization of hydro resources.

### 8.Shared Development of Coal Technologies—Benefiting the Region

Despite coal being one of the largest fuel resources available in the region, only India has paid attention to its capabilities for energy production and is consequently the biggest consumer of coal. India has nurtured a wealth of experience and expertise in clean coal technologies and in producing power-generating equipment for coal-based thermal power stations. Cooperation in sharing technology on-grade coal/lignite use and coal based power generation equipment manufacturing thus makes tangible sense.

### 9. Sustained Cooperation on Regional Energy Issues

Existing arrangements and institutions<sup>32</sup> which have attempted making headway into regional energy cooperation have inherent problems. They lack sufficient mandate and adequate resources to cement strategic cooperative plans dealing with future energy security challenges. To supplement these efforts in a sustainable manner, there is need to establish a regional facility to support information sharing on techniques and technologies, training, renewable energy research and development, the promotion of a common strategy to address energy security concerns.

### Conclusion

This *Issue Brief* has identified some of the challenges facing Bangladesh and South Asia. It has highlighted some of the means through which to ally strategic concerns of future energy supplies. Energy security challenges should be seen as regional as opposed to simply national problems. By extension, this means allaying mutual suspicion and the 'trust deficit' inherent in inter-state relations within South Asia. All countries should appreciate that energy cooperation is based on reciprocity which in itself is a 'Confidence Building Measure' that could potentially lead to enhanced regionalism. In the end, energy security strategies are what states make of them and the degree to which energy cooperation advances is limited to national perceptions and objectives. For a region that is developing swiftly, energy problems can only worsen in the coming years. The region faces an impending energy shock. In response, institutional change needs to happen swiftly and in the form of basic energy management, better transmission infrastructure, and greater efficiency and, something as rudimentary as the drafting of countryside energy strategies must be developed as a basic minimum.

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### End Notes

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