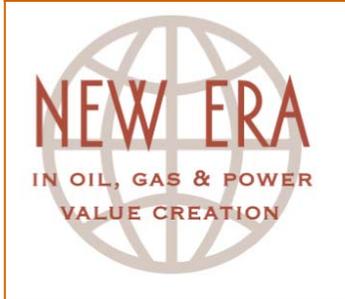


## Case Study From



## Gas Monetization in Bangladesh<sup>1</sup>

*In Bangladesh, about 70% of total commercial energy consumption is met by natural gas and the remainder is met by oil, coal and hydropower. Bangladesh has substantial high quality natural gas reserves at the eastern part of the country. Only two out of the twelve fields are operated by private companies, the rest are operated by different subsidiaries of Petrobangla. The average daily production is about 1 bcf/d. According to the production capacity and development program, the national production will increase to about 1.3 bcf/d by 2005. But the domestic demand is not expected to increase. The*

*international oil companies, development partners, US Chamber of Commerce along with some other vested quarters, are raising the issue of exporting gas to India, which is not supported in Bangladesh.*

- *Should Bangladesh export its gas to India? What are the alternatives? How viable are the alternatives?*
- *What does the current situation imply for investors (existing and potential)?*
- *What lessons does the Bangladesh experience offer to countries with similar supply-demand discrepancy?*

### Background

Bangladesh covers a land area of 55,800 square miles and hosts a population of 131 million, which has grown at 2% a year between 1980 and 1999 and is expected to grow at 1.6% a year until 2015. The country remains dependent on agriculture and poverty is a serious issue. In 2001, the GDP consisted of 30% in agriculture, 18% in industry and 52% in services. Since independence in 1971, Bangladesh has made strong progress. Key social indicators such as birth rate, life expectancy, school enrollment, and child immunization have improved remarkably, and poverty has been declining. Its NGOs are very active and provide microcredit and social mobilization to some 8 million poor, mostly women. But with a per capita income of only \$350, faster implementation of reforms is essential to unshackle the economy's potential for growth and to make a greater dent in poverty.

Following a period of stagnating poverty reduction in the 1980s, the share of the very poor fell from 43% of the population in 1991-92 to 36% in 1995-96. Reducing the poverty of the very poor living in rural areas (still at 40% of the rural population) remains a massive challenge. While higher growth rates have contributed to the decline in poverty, rising inequality has reduced the overall rate of poverty reduction. Nevertheless, the declining trend of poverty incidence has continued into the second half of the 1990s.

The people have benefited from the general improvement in the country's policy environment in the 1990s, with growth averaging nearly 5% a year between 1990 and 1998, compared to 4% between 1984 and 1990. Economic growth in 2000 was 5.3%, thanks again to bumper agricultural harvests yielding a GDP of \$203 billion. Although

<sup>1</sup> This case study was prepared using publicly available information.

people also enjoy relatively low inflation (5.8% in 2000 and 9% in 1999), unemployment remains high at more than 35%.

Macroeconomic management has historically been a strong point in Bangladesh. However, recently fiscal policy has been on an expansionary path. Overall budget deficit and its domestic financing have been increasing. Bangladesh's external debt was \$17 billion in 2000. Also, the momentum of policy reforms that began in the early 1990s has not been maintained. As a consequence of confrontational politics and weak government commitment to reforms in banking, power, and state-owned enterprises, progress has not been made in improving the performance of the public sector.

Bangladesh's manufacturing sector has recently lost some of its dynamism after growing impressively at 7.7% a year between 1990 and 1998, growing only at 3.2% in 1999 and 2000. The slowdown in manufacturing is linked to a higher cost of doing business and loss of competitiveness in domestic and foreign markets due to increased political instability, intensified power supply bottlenecks, continued weaknesses in financial intermediation, real exchange rate appreciation, slower trade reforms, and increased policy uncertainty. The slowdown in reforms also threatens to dampen foreign direct investment (FDI), which has shown a steady increase, from a mere trickle in the 1980s, to \$308 million in 1998-99, before falling by 50% in 2000 to \$150 million. The fall-off in large investment expenditures by international oil companies in 1999 accounts for much of this decline.

#### *Energy Profile*

Oil reserves are estimated at 56.9 million barrels and the country's proved gas reserves are estimated at 10.6 trillion cubic feet (tcf) although a 2000 study by the USGS places them at 32.1 tcf. In 2000, oil production was estimated at 4,581 barrels a day (b/d) and oil consumption was estimated at 65,000 b/d. As a result, the country imported 60,419 b/d. The state oil and gas company Bangladesh Oil, Gas and Minerals Corp. (Petrobangla) is dominant. Currently, Calm, Halliburton, Mobil, Rexwood-Oakland, Shell, Texaco, and Unocal are foreign companies involved in Bangladesh. There is no coal in Bangladesh; so the country imports all of its coal (200,000 tons in 2000). Bangladesh owns significant gas reserves but does not consume much itself.

#### **Fossil Fuel Reserves, Production and Consumption in Bangladesh (2000)**

	<b>Proved Reserves</b>	<b>Production</b>	<b>Consumption</b>
Oil	7.8 million t. (57 million b.)	2.3 MT/yr (4,581 b/d)	3.3 MT/yr (65,000 b/d)
Natural Gas	0.30 tcm (10.6 tcf)	10 bcm/yr (1 bcf/d)	10 bcm/yr (1 bcf/d)
Coal	None	None	200,000 tons

Sources: Energy Information Administration (EIA), BP World Energy

Electricity generation capacity in 2000 was 3.8 gigawatts. Electricity production in 1999 stood at 12.1 billion kilowatthours (87% natural gas, 6% oil, 6.3% hydro). The percent with access to electricity is 15% and per capita electricity consumption in 1999 was 89 kWh.

Annual per capita energy consumption at 3.5 MMBtus is far below the world average which is 64 MMBtus. About 73% of the total energy supply comes from biomass fuels mainly from wood (65%), agriculture residues (27.1%), animal dung (7.8%). In the rural areas, people use traditional inefficient stove wasting about 90% of the energy with traditional fuels. For lighting purpose, they mostly depend on traditional kerosene lamp.

#### **Consumption of Energy by Sector (1,000 tons of oil equivalents)**

<b>Sector</b>	<b>1995-96</b>	<b>1996-97</b>	<b>1997-98</b>	<b>1998-99</b>
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Domestic/Residential	1021	1060	1076	1052
Industrial	933	965	999	987
Commerce/ Service	137	138	150	149
Transport	1039	1062	1088	1097
Agriculture & Others	371	396	429	432
Non-Energy use	1948	1997	2111	2192

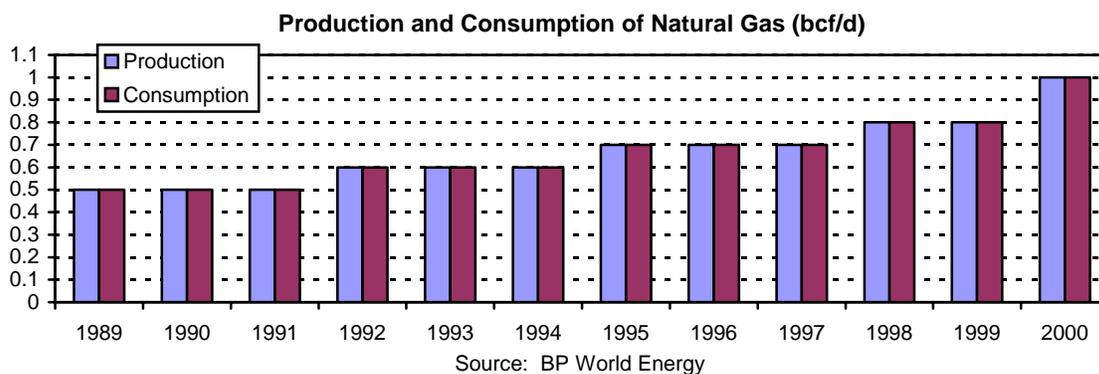
Source: Bangladesh Bureau of Statistics

## Natural Gas Industry

Natural gas is Bangladesh's only significant domestic source of commercial energy. Bangladeshi gas production began in 1960 from the Chattak Field. According to a recently released study by the US Geological Survey (USGS), Bangladesh currently has estimated proved natural gas reserves of around 32.1 tcf in approximately 20 fields (mainly onshore). USGS also believes that Bangladesh could contain even more gas. Bangladesh could use its gas resources to power vehicles. The government already has announced plans to convert government vehicles to compressed natural gas to help alleviate pollution problems in Dhaka, and also in response to high oil prices, to produce electricity, petrochemicals, and fertilizers, which it also could use both within the country as well as for export.

The success rate of finding a gas field in Bangladesh is 3:1, which is above the world average. At present, 12 gas fields are supplying gas to the national grid from 42 production wells. The average daily production level is around 1 bcf/d. Apart from natural gas, some other petroleum products come out from the gas wells. These are condensate, motor spirit, high-speed diesel and kerosene. Petrobangla sells condensate and high-speed diesel to Bangladesh Petroleum Corporation. Until the beginning of the 1990s, Petrobangla was the sole organization in the oil and gas sector, which has been characterized, in recent years by a low level of investments and a lack of sufficient financing.

Besides the foreign energy companies, natural gas in Bangladesh is being produced by two subsidiaries of state energy company Petrobangla -- Sylhet Gas Fields Ltd. and Bangladesh Gas Fields Co. Ltd. These two companies produce gas for domestic consumption. More than 80% of gas is consumed for power and fertilizer production, and the remainder by industry and households.



Petrobangla has 22 gas fields nationwide. The international oil companies discovered 12 gas fields having a total Gas Initially in Place (GIIP) of 22.2 tcf against the Petrobangla's discovery of 10 fields having a total GIIP of 2.1 tcf. The main fields include: Bibiyana (discovered by Unocal in Sylhet on Block 12, with 3.2 GIIP tcf5-6 tcf), Titas (with 4.1 GIIP tcf), Habiganj (3.7 GIIP tcf), Kailashtilla (3.7 GIIP tcf), Rashidpur (2.2 GIIP tcf), Jalalabad

(1.2 GIIP tcf), Sangu (1.0 tcf), nearly all of which are located in the eastern part of the country, plus the Sangu offshore gas field (being developed by Cairn Energy, Shell, and Halliburton) in Block 16 of the Bay of Bengal, 30 miles southwest of Chittagong.

Production from Sangu, Bangladesh's first offshore field (with estimated reserves of around 850 bcf), began in June 1998. Sangu is one of Bangladesh's most important gas discoveries to date, and the first foreign-run gas field. In January 2000, Shell Bangladesh Exploration and Development (SBED) along with partners Cairn Energy and HBR Energy reportedly discovered a new gas field near Sangu (South Sangu-1). In August 2000, SBED announced that it had invested \$40-\$50 million in new offshore gas exploration projects in Bangladesh, including the Sandwip East 1 well in Block 15 (Bay of Bengal). Other possible gas fields include Shaldanadi (estimated reserves of 500-1,000 bcf), Fenchuganj, Feni, Kumta, and Shahbajpur.

A \$1-billion Western Region Integrated Project (WRIP) involves the development of the Shahbajpur gas field in Bhola, the installation of a 93-mile pipeline to Khulna, and the construction of several gas-fired power plants (at Gopalganj, Bhola, Barisal, and Khulna) to serve western Bangladesh. Shahbajpur, discovered by Petrobangla subsidiary Bapex (Bangladesh Petroleum Exploration Company) in 1995, is estimated to contain 330-400 bcf of recoverable gas. In September 1998, Unocal and Petrobangla initialed a production sharing contract (PSC) for development of Shahbajpur. Unocal has proposed an integrated, \$250-million energy project centered around Shahbajpur, and including a gas pipeline system to serve western Bangladesh, gas-fired power to be built in Bhola, Barisal, and Khulna, and possibly fertilizer and cement plants. Currently, the gas transmission system experiences bottlenecks and requires expansion to accommodate future supply increases.

In May 1999, Unocal, which operates through its wholly owned subsidiary, Unocal Bangladesh Ltd. took over the assets and operations of Occidental, which had experienced a major explosion and fire at one of its wells in the Sylhet area in 1997. As of June 2000, it appeared that Irish oil and gas exploration and production company Tullow Oil PLC, along with Chevron, had been awarded rights to drill in Block 9 in the northeast Sylhet region.

Since then, negotiations have started for PSCs with only two companies; however, among companies placing bids since the country's second oil and gas licensing round began in 1997 are Cairn and Royal-Dutch Shell on Block 5, and Unocal on Block 7. As an outcome of the second round bidding, one PSC has been signed for block 7 with Unocal, PSCs were initialed for blocks 5 and 10 with Shell/Cairn, with Pangea (US) for block 8, with Maersk Oil (Denmark) for offshore blocks 19 and 20, and with Tullow (UK)/ChevronTexaco (US) for block 9.

In July 1998, Cairn Energy reportedly made a large gas discovery in the Halda valley. Meanwhile, Unocal, along with Petrobangla, is developing the 1.6-tcf Jalalabad gas field. Output at Jalalabad (Block 13) began on March 22, 1999 at a rate of 100 mmcf/d. In early 1997, Unocal acquired 50% interest in Occidental blocks 12, 13, and 14. Unocal also is involved in two PSCs with Petrobangla covering Blocks 12, 13, and 14. In 1998, Occidental-Unocal discovered an estimated 4-5 tcf of gas-in-place on Block 12. In late September 1998, Shell and Cairn said they had agreed to an alliance over gas development in Bangladesh (including the Sangu and Semutang fields), plus northeastern India.

### Production & Consumption by Sector (bcf)

	1994-95	1995-96	1996-97	1997-98	1998-99
<b>Production</b>	247	266	261	281	275
<b>Consumption</b>	234	253	245	265	291
Electricity	107	111	111	123	141
Fertilizer	80	91	78	80	83
Industrial	24	27	30	33	37
Commercial	4	3	3	3	4
Domestic	18	21	23	25	27

Source: Petrobangla

The present total gas consumption in Bangladesh stands at around 1 bcf/d. It is expected that gas production would rise up to around 1.3 bcf/d in 2005 at the present rate of consumption. Although Bangladesh has a vast natural gas deposit, per capita consumption of energy is still one of the lowest in the world. Bangladesh's gas demand is expected by some independent analysts to grow by around 6% annually over the next two decades. Potential uses for natural gas in Bangladesh include: petrochemicals, compressed gas for vehicles, power generation, fertilizer, and possibly liquefied natural gas (for export). Bangladesh also contains around 55 million barrels of natural gas liquids (NGLs), which could be used for petrochemicals production or as a cooking fuel to help reduce deforestation and pollution.

#### *Export of Gas*

Another option to monetize the country's gas reserves would be to export gas to India. Gas exports, however, are controversial within Bangladesh, with many people feeling that Bangladeshi gas resources first should be used for domestic purposes and also that the size of the country's gas reserves remains highly uncertain, particularly in relation to future domestic demand projections. Both major political parties are officially committed to considering gas exports only if Bangladesh has proven reserves sufficient to cover 50 years of domestic demand.

The government of Bangladesh has been under pressure from both multi-national and bilateral donors to take a decision in favor of exporting natural gas. The government, however, has been encouraging gas export in the form of value added products like electricity and fertilizer. While a number of economic projections showed that pipeline gas export would be most profitable, Bangladesh is moving very cautiously in this regard. The government emphasizes power and fertilizer production to expand domestic gas market base, which could be exported.

According to the World Bank - "Bangladesh would gain more by exporting natural gas to India than by selling its neighbor fertilizer or electricity produced by the gas. The Bank's assessment is that the country could easily earmark two tcf for exports. The target of two tcf was moderate and would still leave the reserves base equivalent to more than 30 years. Gas exports via pipeline to India, which would require the laying of a dedicated pipeline, offer greater flexibility due to the diversity of usage by commercial, industrial, residential and other users. The current production-sharing contract allowed exports only in the form of liquefied petroleum gas (LPG). Fertilizer and electricity exports carried commercial and political risks. Preliminary analysis indicates that, among the three options, the commercial risks of fertilizer exports are high; electricity exports are fraught with political risks, not to

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### Gas Monetization in Bangladesh

mention the incompatibility of Indian and Bangladeshi power grids. The reserves/production ratio of Bangladesh stood at 35 years, but was likely to increase if exploration efforts were intensified. Gas exports are important for building comfortable foreign exchange reserves and ensuring a market for private gas companies beyond the saturated domestic market."

There was some indication that the new government of Prime Minister Khaleda Zia would be more favorably disposed to natural gas exports to India, and it created a panel in December 2001 to study the issue and recommend a decision. Unocal had submitted a formal proposal for an export pipeline to India in November 2001, which would link the Bibiyana field to India's main natural gas backbone, the HBJ Pipeline. Unocal has stated that the costs of this pipeline would run \$880 million, \$550 million of which would be spent on development within the Bangladesh.

The decision to export gas at the moment is a political one that has not been resolved as of April 2003. India is putting pressure for the project to go forward, while Bangladesh is bringing up other trade related issues as reasons to block the project.