



Natural Gas - It's Strategic and Economic Implications : A Bangladesh Perspective

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ABSTRACT

Natural gas is the most promising energy resource for Bangladesh. It is used in various domestic sectors like, power generation, production of urea fertilizer, commercial and industrial sector etc. The gas reserve estimation by different agencies varies widely. The recoverable gas reserve is 16.513 TCF and reserve estimate in undiscovered area varies 32 to 62 TCF. Its use in various sectors together with the hope of becoming middle-income country by exporting gas has created dilemma. This paper discusses maximum possible domestic as well as strategic use of gas to be done from the proven recoverable reserve. It also suggests that export of gas is not possible from the present reserves for Bangladesh.

INTRODUCTION

1. Natural gas has got many uses like as fuel, raw material for production of nitrogen fertilisers, petrochemical industries etc. But in our country consumer base of natural gas is not very encouraging. Only 10% of our population gets the privilege of natural gas¹. Nearly 85% people in the country do not have access to electricity. Per head energy consumption in Bangladesh is only 100 KW/hr, which is only 1% of the developed countries. The uses of gas in other sectors like; fertiliser production, industry commercial sectors etc are also not encouraging. As of 2002, total yearly gas consumption in the country was 392 BCF, which is only 40 BCF more than that of 2001. Since 1961 to June 2003, the total consumption has been 5.093 TCF only, whereas the proven recoverable reserve is 16.513 TCF. This slow pace of utilisation of natural gas has raised question whether Bangladesh is making optimum use potential natural gas resources for the countries overall economic well being.

2. Energy is a strategic commodity for survival and economic development. Each country tries to adopt appropriate policies to ensure security by harnessing indigenous energy resources and or by import. Various factors that affect energy use pattern of different countries in short, medium and long term are: availability of indigenous energy sources, technological capability, financial capability, political power, energy price in the world and regional markets, proximity of energy market, mode of transport, trained manpower, political stability, effective governance, costs etc. Energy balance of a country is the reflection of ultimate outcome of management capabilities of the above-mentioned factors. Most of the time developing countries remain busy in managing short-term energy crisis created due to neglect of long-term perspectives.

3. Natural gas is also an export commodity and is widely traded in international market as piped gas and as Liquefied Natural Gas (LNG). There exist demands for Bangladesh natural gas in neighbouring India as piped gas and in the Far East as LNG. Despite very low proven reserve of gas in the country different lobby groups both foreign and local have been insisting continuously to export this gas to India. Economic benefits regarding gas export will be evaluated. In doing so an estimation of natural gas, gas demands projection up to 2050 in Bangladesh will be made. The main focus of the paper will be the optimum use of gas for economic benefit for the development of Bangladesh. It will also examine the options for the export feasibility for better utilisation of this resource. At last some recommendations will be made.

ESTIMATION OF GAS RESERVE

4. **General.** Reserve estimation of gas is very important for the proper planning of the energy sector of Bangladesh. When talking about the

reserve we must be clear about the term reserve and gas initially in place (GIIP). GIIP is the total amount of gas found initially in a reservoir when it is discovered. Reserve is that portion of the GIIP that can be produced from the reservoir under the present technical and economic condition.

5. **Reserve Estimation.** Ninety-five years after the start of the search for natural gas and forty-six years since the first gas discovery, debate is still going on about gas reserve figures. In the recent past several agencies have estimated the country's natural gas reserves and their estimation differs widely, which creates confusion. The various opinions regarding natural gas reserve are given below:

a. **Petrobangla.** According to Petrobangla the country has GIIP of 24.25 Trillion Cubic Feet (TCF). Considering the rate of recovery to be 65%, initial recoverable reserve can be taken as 15.55 TCF out of which only 3.95 TCF has been consumed in the last 40 years since first gas production in 1960. Thereby some 11.60 TCF gas may be available for future consumption.²

b. **Petrobangla/USGS Resource Assessment Study, 2000.** The U.S Geological Survey (USGS) in association with Petrobangla, recently carried out an assessment study and concluded that Bangladesh's undiscovered gas resources, at probability rate of 95%, were 8.4 TCF, at a 50% probability rate 29.2 TCF and at 5% probability rate 65.7 TCF.

6. **Additional Reserve from the Existing Discoveries (Field Growth).** UNICOL estimated that by applying the new technology of recovery technique such as 3-D seismic surveys can increase recoverable gas reserve significantly, which is known as "field growth". After analysis, the field's estimated proved reserve increased over 10% (2.1 TCF to 2.4TCF). UNOCAL estimates that an additional 12.8 TCF can be contributed to Bangladesh's resource base by applying new technologies to existing gas fields.

7. **Findings on Gas Reserve.** The findings by different agencies on reserve situation of natural gas of Bangladesh. However, a details Study on this aspect have been carried out and concluded that the recoverable gas reserve of Bangladesh would be 16.513 TCF.

8. **Current Production Scenario.** At present, 12 gas fields out of 22 are in operation and capable of producing 1248 million cubic feet per day (MMCFD). Two IOC's like UNOCAL is producing 100 MMCFD from Jalalabad Gas Field and Shell is producing another 160 MMCFD from Sangu Gas Field.

IMPORTANCE OF NATURAL GAS AS ENERGY FOR BANGLADESH

9. **Gas Use Scenario in Various Countries.** Bangladesh is a mono energy country. Now gas is the only reliable mineral energy resource for Bangladesh. Bangladesh dependence on gas is enormous and the dependency is ever increasing. A recent comparative study (shown in Oil and Gas Journal, 2001) that includes both the developing and developed countries on the dependence on gas puts Bangladesh on the top of the countries.

Gas Consumption and Growth Rate in Bangladesh

10. Since the commercial production of gas started in 1962 the use of gas had been increasing every year making it one of the fastest growing sectors in Bangladesh. Energy has determinant influence on Human Developing Index (HDI); in the early stage of development where our Bangladesh exists. Per capita commercial energy consumption of 1,000 kgOE is necessary in order to support a reasonable level of development. In Bangladesh per capita consumption of energy in 2000 was 217.5 kgOE of which 70 per cent comes from gas alone. There is no alternative of gas at present in Bangladesh to attain a reasonable level of HDI from .365 to .80 at a future year.

11. It is well known that there is a positive correlation between per capita energy consumption and per capita GNP. It means that countries having higher per capita GNP also have higher per capita energy consumption and vice versa.

Prospects of Renewable Energy

12. At present Bangladesh depends heavily on biomass fuels to meet its total energy need. It is not possible to enhance sustainable economic development by increasing the supply of biomass fuels. Increasing consumption of commercial energy will be necessary to enhance economic growth. In this case Bangladesh has only gas as reliable commercial energy source. In future no prospect of increasing biomass fuels supply will be possible. There is very limited prospect of expansion of hydropower in Bangladesh. The total hydropower potential of the country in three locations (kaptai, Sangu and Matamuhuri) is 1500 GWh/year (7550 MW) of which about 1000 GWh/year has been harnessed at kaptai through 5 units (2x50 MW= 100 MW). Further expansion of hydropower may not be feasible due to socio-political and environmental reasons. There is limited contribution of indigenous coal and sudden increase of yearly supply of coal will not be possible to meet increased demand. There is no prospect of nuclear power due to geopolitical reasons. Bangladesh has very limited prospect of power generation by renewable energy technologies also. In the future energy consumption will increase so the consumption of oil. Dependence on imported oil will have to be minimised to save hard earned foreign currency. Wherever possible oil will have to be substituted by indigenous natural gas.

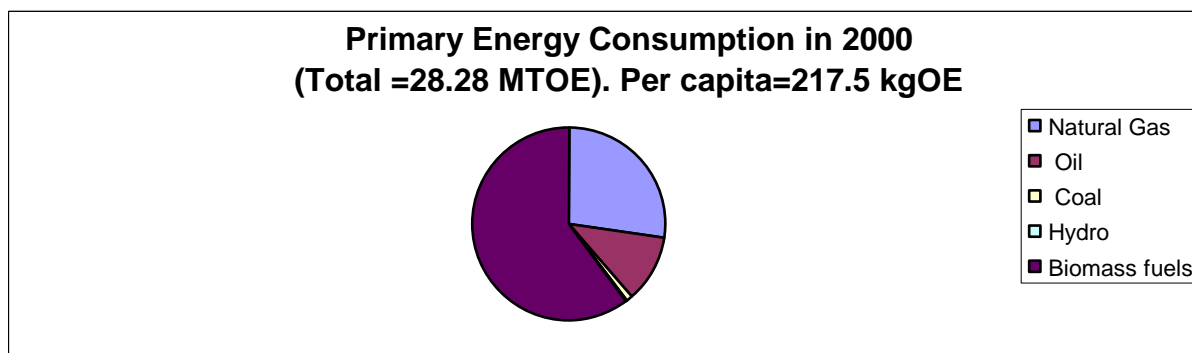
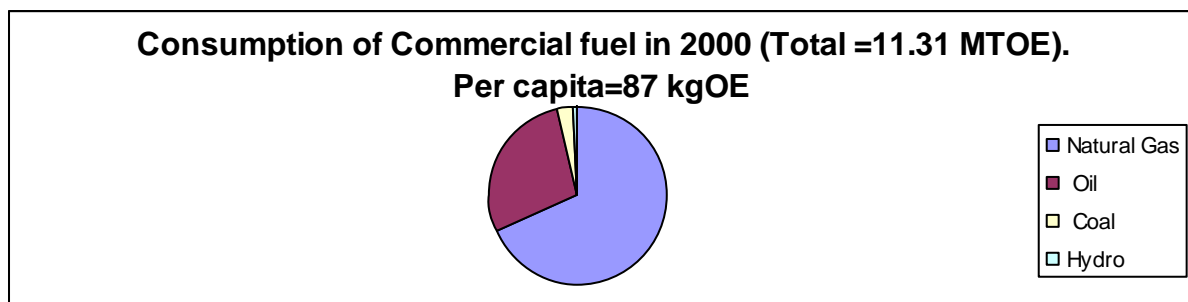


Fig-1: Energy Consumption mix in 2000

ECONOMIC IMPLICATIONS OF GAS IN BANGLADESH

Power Generation

13. **Existing Capability.** Though 25 power stations are being provided fuel with natural gas, which produce 12600 GWH (88%) power. Per capita energy use in Bangladesh is among the lowest even in the South Asia Region. Per capita electricity use in Bangladesh is only 100 KWH, which is only 1% than that of modern countries. Only about 17% households are connected to electricity.

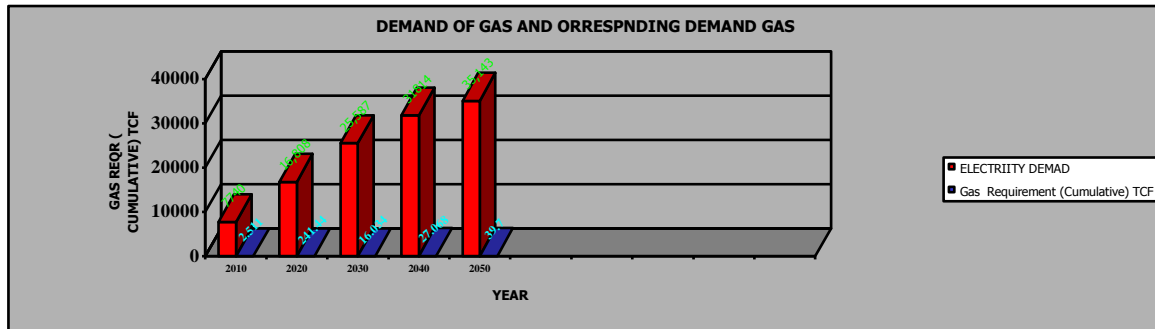


Fig-2 Graphical Representation of Demand of electricity versus demand of gas.

14. **Gas the Ultimate Source of Energy.** In order to succeed in developing the country, Bangladesh needs to make a sustained effort at energy sector development. The country has an installed capacity of 3,300 MW of electricity. As a result, the country has been unable to meet the demand for electricity. The demand forecast of the power is about 16808 MW by 2020. The use of gas will rise up about five times more than the present consumption in power generation sector. The cost of gas based electricity production is one-fourth of oil based production.

Fertiliser

15. **Production of Urea Fertiliser/Ammonia.** At present 8 Urea Fertilizer factories are using Natural gas as raw material and capable of producing 29 metric tons of urea. This is the only sector of use of natural gas as feedstock in chemical process. The sector consumes on the average 84,900 MMCF natural gas representing second largest consumer sector of natural gas in Bangladesh (28%). The use of natural gas for fertiliser has a strategic significance for Bangladesh. It has provided a secured supply of fertilizer for agriculture in Bangladesh, which contributes 40.8% to the GDP.

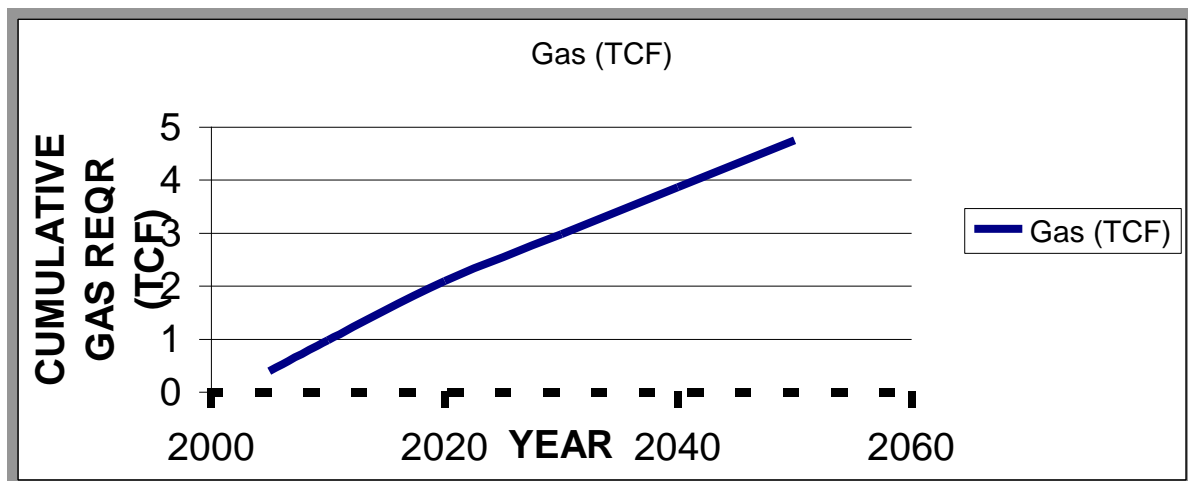


Fig 3: Graphical Representation of Estimated future Gas Requirement in Fertiliser sector

16. **Use of Gas in Industrial Sector.** The use of natural gas in industrial sector as fuel started since 1961. A total of 2362 industrial units in the eastern part of the country have been provided with natural gas connection till October 1996. These industrial units together consume 41270 MMCF gas, which are about 13% of total consumption. Use of gas in many production sectors like iron, glass, ceramics has contributed significantly towards product quality and preservation of environment.

17. **Commercial and Domestic Sector.** The use of natural gas in these sectors in Bangladesh started in 1986. Since then till 1 September 1996, 8,347 commercial holding and 6,98,180 domestic holding have been provided piped gas connection. These represent the largest consumer group of natural gas in Bangladesh though their total gas consumption is only 11% of total use. The number of such customers will increase at a rapid rate in future as the new main and distribution pipelines are constructed.

18. **Gas- A Substitute of Petroleum.** To develop and popularise Compressed Natural Gas CNG, Rupantarita Prakritik Gas Company limited was formed in 1991. Now it operates a good no of CNG filling stations in Dhaka and Chittagong city. The conversion of fuel supply system has increased. This has reduced the import bill of petroleum product. In addition, use of CNG is environmental friendly and will reduce environmental

pollution. The fuel import bill is over 70 per cent of the country's total export earning³. We are now spending US\$ 500 million (Taka 2900 core) to import about 3.35 million tone petroleum and related goods.

19. **Cylinder Liquidified Petroleum Gas (LPG).** Bangladesh government established a LPG plant at Kailastilla, which estimated to produce 5,000 tons LPG every year. A good number of private companies also started producing LPG in cylinder. This Cylinder LPG can be made in large-scale use in the rural areas where natural gas with pipeline cannot be reached. It has very positive impact both on our economy and environment.

STRATEGIC IMPLICATIONS OF NATURAL GAS

20. **General.** Natural gas the most important asset for Bangladesh that is likely to prosper the country in this century. It is a strategic commodity for Bangladesh. The strategic implications of gas are mentioned under:

21. **Internationalisation of Gas Trade.** Presently estimated recoverable reserve of gas is 16.513 TCF. This figure is likely to increase after exploration of new fields. When the known recoverable reserve of natural gas will be proved to be in excess of the country's long term needs then it may be considered for export by establishing of gas pipeline to India or in the form of LNG to Fareast. In that case the country will earn huge amount of foreign currency by exporting gas and it will reduce trade deficit.

22. **Regional Co-Operation.** Gas sector can strengthen the regional co-operation by exchanging gas with other strategic commodities of other countries of south Asia. Nepal and Bhutan have the prospect of huge production of hydro electricity and India has enough other mineral resources. These resources can be exchanged with each other to meet the country's requirement and develop economic prospect. Each country can be benefited from others and develop their economy. A study showed that Nepal alone has the potential to meet 15 per cent (83000MW) of the world's present requirement with its hydroelectric resources.

23. **Area Based Planning.** Presently the entire natural gas and oil discovery except one is in the eastern zone of the country. People of eastern region are getting the benefit of gas. Gas based industries have been set up in the eastern region. It has created a positive impact on the life and economy of the people of that zone. To up lift the development of the country equally in all the areas gas based industry can be established in all suitable parts of the country. Jamuna multipurpose bridge facilitates supply of gas to the western region, which will help establishment of industries in that part.

24. **Complementary Dependency on Energy.** Presently our government imports about 3.23 million tone of petroleum fuels from outside. It costs near about Tk 2000 crore every year. Natural gas can be utilised against petrol, diesel and coal. In addition, widely use of LPG can reduce dependency on Kerosene. Use of gas has reduced our petroleum import bill. It would have been more if natural gas had utilised.

25. **Protection of Environmental Degradation.** Environmental degradation in our country is one of our prime concerns due to air pollution, soil erosion and deforestation. Dhaka city is a highly air polluted city. Black smoke of vehicles is mostly responsible for this. It is learnt that 50,000 people are suffering and 15,000 people are dying every year because of the diseases caused by air pollution. Presently people are using CNG for their vehicle. It has reduced air pollution of the city to a great extent. Use of CNG in vehicles and industries saves money and protect the environment. Biomass fuel meets up about 60-70 per cent of our fuel requirement.

26. **Energy Security Perspectives.** Gas is our prime source of energy. Presently strategic stock of petroleum products of the country is 40 days consumption. Since adequate reserve of gas is expected therefore sufficient stock of gas can be preserved considering future development of he country and extreme natural events like cyclone, drought and flood. Exploration of gas from some of the fields or sectors can be kept suspended/reserve considering country's long-term development plan. Natural gas to some extent has ensured our energy security. Natural gas supply in the west zone will ensure momentum of economic activities in that zone. Supply of gas to the rural areas will ensure energy security to them and improve their socio-economic condition.

27. **Human Resources Development.** Gas sector can provide a great opportunity for human resource development in Bangladesh. It has provided job opportunities for skilled and semiskilled workers. Gas related sector is highly technology dependent. High quality institutional training, personal experience in monitoring and handling of equipment is essential to form competent multi-disciplinary groups of professional in different areas of this strategically important sector. As per PSC IOC's are obliged to employ local employees in certain percentage, which will develop human resource of the country.

28. **Economic Value and Significance.** It has been found out that with proper development in gas sector total amount of Tk 6750 crore

yearly can be earned in local currency by the government. If imported fuel can be substituted by gas then Tk 6000 crore can be saved in foreign currency. Only 5 per cent people of the country are using gas for cooking. If the rate is raised by 2 per cent per year it will reach 45 per cent after 20 years. The sell price may be Tk 20,000 crore. After deductions cost of pipeline and extraction the net saving will be Tk10,000 crore.

29. **Gas Exchange.** Indian state of Tripura is rich with natural gas and low rate consumption. The West Bengal has an all-together different situation. Some IOCs have proposed a plan to take gas to Bangladesh and to draw the same quantity of Bangladeshi gas across the country's western border essentially creating a gas exchange between the two countries. In this case Bangladesh can earn the revenues for the use of pipeline within its territory.

GAS DEMAND PAST AND FUTURE PROJECTION

30. **Gas Used in the Past.** Use of natural gas started in Bangladesh in 1961. Since then use of natural gas steadily grew to the present level. If we look into the decade wise share of gas use, it appears that the amount of gas used during 1960-70 was 0.067 TCF, during 1971-1980 it was 0.279 TCF (more than four times the previous decade), during 1981-90 it was 1.067 TCF (2.3 times the previous decade) and during 1991- June 2003 it was 5.03 TCF. The gas used in last forty-three years is shown in figure 4.

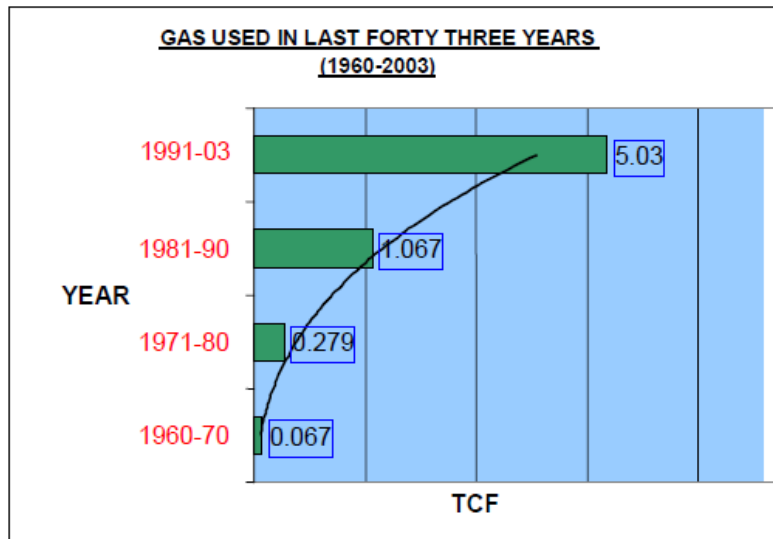


Figure-4

31. **Sector Wise Gas Demand.** The average daily gas production in Bangladesh is about 1060 MMCFD. More than 93% of this gas is consumed in power, fertilizer, industry, domestic and commercial sectors of the country. In 2001, the gas consumption was 372 BCF, which is 40 BCF more than previous year. The present growth rate of use of gas is 7% per annum.⁴ The sector wise gas demand for 10 years is shown in Figure 5.

Sector Wise Gas Demand (2001-2010)

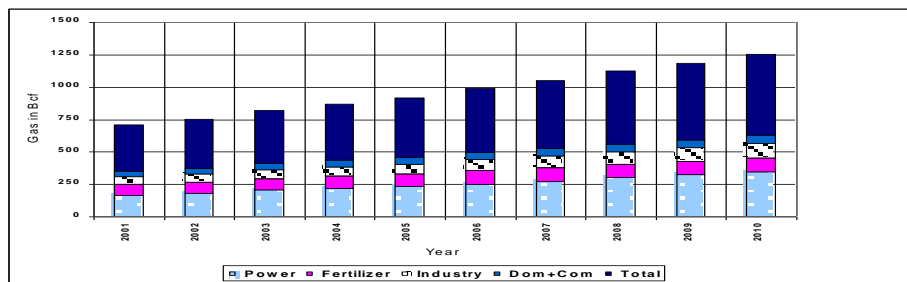


Figure –5 Source: Chairman, Petrobangla presentation at DSCSC 2002

32. **Future Gas Demand.** The gas demand projection up to 2050 is based on the current consumption, past trends and feasible development in the major consumption sectors such as power and fertiliser. The government has carried out a study of the future demand of natural gas in the next 50 years, which is shown in Figure 6. The demand forecast is done on yearly basis from 2001 to 2050 taking care of individual sectors and fifty years demand in different sectors of the country is 62.99 TCF⁵. In case of fast development of physical infrastructure and rapid industrialization, the gas demand is likely to increase further. In that case the gas demand would be much higher than projected in Figure- 6.

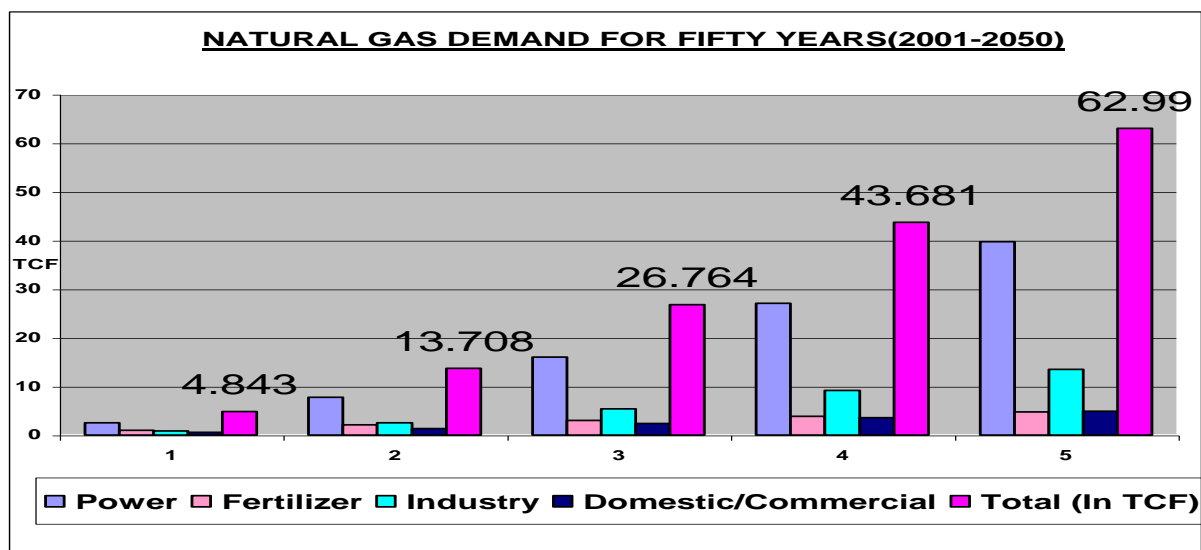


Figure-6 Source: Bangladesh Oil, Gas and Mineral Corporation (Petrobangla): Natural Gas Demand and Supply Forecast Bangladesh. (Modified)

CONCLUSION

33. Natural gas is a very vital fuel resource in Bangladesh and mostly available in the eastern part of the country. So far a total of 22 gas fields have been discovered in the country and the total recoverable reserve is 16.513 TCF. There are debates on gas reserve figures in Bangladesh. According to Petrobangla Bangladesh has Gas-Initially In Place (GIIP) of 24.25 TCF and initial recoverable reserve is 15.55 TCF. Deducting the consumed 5.03 TCF, some 11.48 TCF gas may be available for future. But the different IOCs give opinions, which shows different picture. Petrobangla/USGS Resource assessed the recoverable gas reserve is about 40 TCF, HCU/NPD assessed 41.6 TCF, Bangladesh Study Group, opined that the minimum recoverable reserve in Bangladesh is 62 TCF. After analysing it is learnt that recoverable gas reserve would be 16.513 TCF.

34. The requirement and dependency on the natural gas in our country is increasing. Natural gas meets about 70 per cent of total commercial energy needs of the country which is the highest in the world. However, gas is the only sector that has potentialities to prosper. Energy has impact on HDI. Per capita commercial energy consumption of 1,000 kg OE is necessary to maintain minimum level of development. In Bangladesh it is only 217.5 kg OE, which is one of the lowest in the world. In Bangladesh only gas is reliable commercial energy source. There is no prospect of hydro power, nuclear power and renewable energy source for various reasons. Wherever possible oil will have to be substituted by natural gas to save foreign currency.

35. The issue of gas should be viewed on the national interest. Economic enhancement of Bangladesh is possible from gas through its proper use within the country. More number of power plants, fertiliser plants, LNG plants are to be established to increase domestic use. Bangladesh Petroleum Corporation (BAPEX) should be developed as an institution both infra structurally and structurally. Financial involvement would be fruitful in making own expertise and professionals, and acquiring technologies. Approach to technical issue should be governed by a viable energy policy.

RECOMMENDATIONS

36. Following recommendations are made:

- a. **Create In-house Expertise.** Bangladesh needs to develop in-house expertise in order to sure about the actual reserve situation of gas.
- b. **Long Term Future Development Plan.** A long-term plan should be formulated after accurate estimation of gas reserve that

will integrate the country's future development plan and user sector objectives and export policies.

c. **Ensure Long Term Energy security.** Bangladesh should adopt a strategy on export of natural gas that ensures her long-term energy needs. Decision to export gas after keeping 50 years reserve would be prudent in this respect.

d. **Export Gas after Value Addition.** Bangladesh should consider exporting value-added products of gas. In the long run it would help build infrastructure of the country and generate the much needed job opportunities. Thus it would help sustainable development of the country.
